NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

General Offices • Selden Street, Berlin, Connecticut

P.O. BOX 270
HARTFORD, CONNECTICUT 06141-0270
(203) 665-5000

September 30, 1985

Docket No. 50-245
B11714

Director of Nuclear Reactor Regulation
Attn: Mr. Christopher I. Grimes, Chief
Systematic Evaluation Program Branch
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Millstone Nuclear Power Station, Unit No. 1
Integrated Safety Assessment Program

In a letter dated July 31, 1985,(1) Northeast Nuclear Energy Company (NNECO) was requested to provide the Staff with reviews of the planned NNECO plant improvement projects.

In response to this request, and in accordance with our understanding of the ISAP process, we are providing the Staff with reviews of the following projects:

1) ISAP Topic No. 2.29 - "FWCI Assessment Study"

2) ISAP Topic No. 2.30 - "MSIV Closure Test Frequency"

3) ISAP Topic No. 2.31 - "LPCI Lube Oil Cooler Test Frequency"

As further reviews are completed, we will promptly forward them to the Staff for review.

If you have any questions on this material, please feel free to contact my staff.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

J. F. Opeka
Senior Vice President

cc: J. A. Zwolinski

(1) H. L. Thompson letter to J. F. Opeka, "Integrated Safety Assessment Program," July 31, 1985.

A001
1/1

ISAP TOPIC NO. 2.29

FWCI ASSESSMENT STUDY

ISAP Topic No. 2.29
FWCI Assessment Study

Background

The primary purpose of the feedwater control system is to maintain the water level in the reactor vessel within the normal operating range for different modes of operation. Included in the feedwater control system is the feedwater coolant injection (FWCI) system which uses feedwater system components to supply emergency core cooling during a small break LOCA (SBLOCA). Thus, the feedwater control system is an important part of the design basis of Millstone Unit 1, both as a potential initiator of a transient, if a component failure occurs, and as a safety system that mitigates an accident.

During the past few years, several changes to the feedwater system have been made. The following two recent changes have pointed out the need for a review of the feedwater control system and the FWCI system:

a) PDCR 1-92-83(1) - Modification of the Feedwater Control Flow/Level Selection Logic

b) PDCR 1-120-84(1) - Feedwater System Flow Control Logic Modifications

During the implementation of PDCR 1-92-83, it was found that the logic to transfer from level control to flow control was different from the original system description provided by General Electric (GE). The field changes made during installation of the control system degraded the system protection for reactor vessel overfill. The PDCR was initiated to return the system back to original GE design.

PDCR 1-120-84 was implemented to expand the run-out protection of the feedwater control system to low pressures. At low pressures, the switch from level control to flow control would not occur fast enough and the feedwater pumps may trip on low suction pressure if they have been started for FWCI. The change modifies the setpoints and delay times to allow the switch to take place for this situation. However, the failure to switch from level to flow control at low pressures was not expected and indicates a need to review the system description and design basis of the feedwater control system to clearly identify its limitations on operation.

Additionally, the impact of the method of feedwater control on the design basis is a potential concern. GE has provided a three element and a single element control mode for the feedwater control system. In general, Millstone Unit 1 is operated in the single element mode. At the present time it is believed that the difference in the two modes has no impact on the design basis, although the difference between the two modes may need to be addressed.

---

(1) Summary descriptions of these modifications can be found in previous annual operating reports.

Project Description

As a result of the needs identified through the evaluation of the PDCRs, the proposed project consists of the following:

a) Comparison of the system drawings with the as-wired system.

b) Revision of drawings as necessary.

c) Comparison of the system descriptions with the verified wiring drawing.

d) Identification of the limits of operation of the control system.

e) Review of the assumptions and impact of the feedwater control system on the design basis transients.

NNECO Evaluation

Implementation of this project will provide:

a) Confirmation of the wiring drawings as correct or identification of the modifications required to the current drawings.

b) Confirmation of the system descriptions as correct or identification of the modifications required to the system descriptions.

c) Identification of the feedwater control system/FWCI assumptions utilized in the design basis of Millstone Unit 1.

d) Assessment of the impact of different modes of feedwater control system operation on the current design basis.

e) Recommendations for improvements or additional documentation on the feedwater control system.

ISAP TOPIC NO. 2.30

MSIV CLOSURE TEST FREQUENCY

ISAP Topic No. 2.30
MSIV Closure Test Frequency

Background

The Millstone Unit 1 Reactor Protection System (RPS) design incorporates a MSIV closure trip function which initiates reactor trip when one-out-of-two taken twice coincidence logic senses closure greater than 10%, based on valve travel limit switches. This trip function is an anticipatory trip which provides for reactor trip before the reactor pressure and neutron flux respond to the collapse in reactor coolant voids that accompanies MSIV closure. The failure of this trip function is backed up by the high-high Average Power Rate Monitor (APRM) and high reactor pressure trip functions.

At present, Technical Specification 4.1.A requires monthly surveillance testing of this trip function. The actual test performed requires 10% closure of the valve to ensure that a reactor trip signal is generated. Another surveillance test (performed quarterly at 60% power) determines the closure time of the MSIVs.

On two occasions, while performing the 10% MSIV closure surveillance test at 100% power, the individual valve being tested over travelled and closed causing high steam flow in the remaining three steam lines. This generated a main steam line isolation signal and the closure of the remaining MSIVs. There is some potential for this type of event to occur any time the test is performed while at 100% power. At Millstone 1, two out of a total of five MSIV closure events have been caused by over travelling of the valve during testing. The Millstone Unit 1 Probabilistic Safety Study evaluated MSIV closure events and concluded that they contributed to 93% of the causes of reactor transient events with the main condenser unavailable, which account for 2.44% of the predicted core melt frequency. Therefore, by reducing the frequency of 10% MSIV closure testing, the frequency of such MSIV closure events can be reduced.

Project Description

The proposed project calls for a change in the surveillance test procedures by requiring that the surveillance test for 10% MSIV closure be conducted in conjunction with the quarterly MSIV closure stroke test required by Technical Specification 4.7.D.1.c. In performing this surveillance reactor power is reduced to roughly 60% to avoid high steam flows in the steam lines not being tested.

NNECO Evaluation

The main purpose of 10% closure testing is to verify that a RPS trip signal is generated on MSIV closure. Increasing the testing interval may slightly reduce the reliability of the RPS signal generated by MSIV position. However, this slight reduction in the reliability of the RPS signal generated by MSIV position is more than offset by a reduction in the frequency and potential safety hazards of inadvertent MSIV closures during testing. Thus it is expected that implementation of this project will result in a net decrease in risk to the public.

ISAP TOPIC NO. 2.31

LPCI LUBE OIL COOLER TEST FREQUENCY

ISAP Topic No. 2.31
LPCI Lube Oil Cooler Test Frequency

Background

The Millstone Unit 1 Probabilistic Safety Study identified that one of the major contributors to low pressure coolant injection (LPCI) system unavailability is the failure of the solenoid valve controlling LPCI pump motor bearing lube oil cooling. The LPCI pumps are used both for injection into the RPV (to maintain or restore water level) and for long-term cooling in the alternate shutdown cooling mode. LPCI system unavailability, especially in the alternate shutdown cooling mode, is a dominant contributor to the core melt frequency. Therefore, any improvement in the LPCI system reliability will offer a significant reduction in public risk.

Flow from LPCI discharge is used in cooling the lube oil for the pump motor bearings. The flow is admitted to the oil reservoir cooling coil through a solenoid valve. The valve is normally closed and opens automatically on a pump start signal. One valve in each LPCI train allows cooling flow from both LPCI pumps in the train.

The LPCI pumps are started on a monthly basis for surveillance testing. However, in these tests the pumps are run only for a short time (5-10 minutes), which does not confirm that the solenoid valves have opened to allow cooling flow to the lube oil. (Note: The LPCI pumps can function for a limited time without cooling to the motor bearing lube oil.) Operation of the solenoid valve is indirectly confirmed during refueling when the LPCI pumps are run for extended periods of time.

Due to the infrequent confirmed testing of the solenoid valves, the Millstone Unit 1 PSS calculated a high probability of the valve failing to open. This high failure probability reflects the fact that any failure of the valve since the last refueling outage would go undetected until the next outage. The high unavailability of the valve is a dominant contributor to the LPCI system unavailability (especially in the alternate shutdown cooling mode), which in turn is a major contributor to the core melt frequency and therefore to public risk.

Project Description

The proposed project is a change in the surveillance testing procedure of the LPCI system. The proposed change is for the operator to confirm opening of the solenoid valve 1-LP-52A(B) during monthly testing of the LPCI pump. The opening of the valve can be confirmed by checking the pressure of the water used for lube oil cooling.

NNECO Evaluation

As LPCI system unavailability is a major contributor to the core melt frequency at Millstone Unit 1, implementation of this project is expected to result in a significant increase in LPCI system reliability with a concurrent significant decrease in safety risk to the public.

In response to the potential safety concern surrounding operation of the LPCI lube oil cooler solenoid valves, NNECO has modified the LPCI pump operability procedures to assure that the solenoid valves operate as intended and LPCI cooling remains available.