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

August 26, 1985

Docket No. 50-245
B11664

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. 2.09 - "Upgrading of P&IDs"

2) ISAP Topic No. 2.26 - "Reliability Equipment"

3) ISAP Topic No. 2.28 - "Long-Term Cooling Study"

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
J. F. Opeka
Senior Vice President

C. F. Sears
By: C. F. Sears
Vice President

cc: J. A. Zwolinski

A001
1/1

---

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

ISAP TOPIC NO. 2.09

UPGRADING OF P&IDs

ISAP Topic No. 2.09
Upgrading of P&IDs

Background

Upgrading of the Piping and Instrumentation Diagrams (P&ID) involves a change in plant design documentation which evolved because of a developing problem of overcrowding, inconsistencies and illegibility of the existing P&IDs and associated equipment listings. The purpose of this project is to upgrade the existing P&IDs to make them legible and consistent in their reflection of plant design.

Project Description

This issue is expected to be a long-term project (4-5 years) and encompass a multitude of engineering disciplines. The actual outline of the project has been formalized and implementation begun.

The project includes:

- a multi-discipline review of each drawing,
- a walk down of each system,
- a review of the P&IDs against existing drawings and equipment listings, and
- a standardizing of drawing nomenclature.

NNECO Evaluation

The planned effort represents a complete upgrading of current plant information to make it consistent and more retrievable. For example, a specific component (e.g., valve) may be identified by three different numbers depending on whether the drawing originated with the NSSS vendor, the architect-engineer or within NUSCO. The benefit of upgrading the P&IDs is that existing information will be consolidated into a single accessible base of information. Such a change will increase the efficiency in what may be broadly termed the backfit design and day-to-day engineering of the plant by cutting down the time needed to chase down/confirm information. It should be noted that plant hardware changes, plant procedures or plant technical specifications changes are not part of this effort.

ISAP TOPIC NO. 2.26

RELIABILITY EQUIPMENT

ISAP Topic No. 2.26
Reliability Equipment

Background

This project consists of the procurement of computerized UT instrumentation, vibration monitoring and diagnostic equipment, closed circuit TV cameras for visual inspections, and miscellaneous accessories for this equipment. The equipment and instrumentation will be utilized by NUSCO's Reliability Engineering Group for performing nondestructive field tests and analyses on turbines, fans, piping, vessels, etc., in the generating stations.

The ability to perform localized tests is expected to aid the Reliability Engineering Group in assessing the performance of and determining methods for improvement of Millstone Unit 1. One of the objectives of this effort is to perform less corrective maintenance and more preventative maintenance which improves both plant safety and reliability.

ISAP TOPIC NO. 2.28

LONG-TERM COOLING STUDY

ISAP Topic No. 2.28
Long-Term Cooling Study

Background

The Millstone Unit No. 1 Probabilistic Safety Study (PSS) determined that approximately 64% of the total calculated core melt frequency at Millstone Unit No. 1 is due to a failure to maintain adequate long-term decay heat removal capability.

The PSS modeled four long-term cooling systems. The conditions under which each of the systems could be used are summarized below.

- Main Condenser - The main condenser can be used only if the feedwater system is operating and no significant fuel damage has occurred during the transient. The latter constraint is necessary to prevent possible fission product release to the environment through the condenser off-gas system.

- Isolation Condenser - The isolation condenser does not provide reactor vessel make-up, and is sufficient to remove long-term decay heat only in the event that there are no breaks or leaks in the RPV cooling system.

- Shutdown Cooling System (SDC) - The SDC can be used only if RPV level is restored to the normal operating level. This system may not be used in the event of a LOCA where the RPV level can not be restored to the normal level.

- Alternate Shutdown Cooling (ASDC) (or Containment Cooling) - ASDC can be used during all accident sequences except an ATWS event in which the standby liquid control system has been used to reduce reactor power. This is to prevent dilution of the boron injected into the RPV, which could result in an increase in reactor power.

  Both ASDC and containment cooling provide a mechanism for cooling the torus water and injecting it into the RPV. In ASDC, coolant is transferred back to the torus via a manually opened S/R valve. Following a LOCA, in the containment cooling mode, coolant is transferred to the torus via the break opening.

By reviewing the dominant core melt sequences, it can be seen that failures of SDC and ASDC are the major contributors to core melt frequency. Unavailability of the main condenser and isolation condenser systems also contribute to core melt risk; however, the calculated unavailabilities are an order of magnitude lower than those of the SDC and ASDC systems. Therefore, to reduce core melt risk, it is most important to understand the major causes of failures of the ASDC and SDC systems.

1) Shutdown Cooling System

   There are two major contributors to SDC system unavailability:

   a) Failure of either of the two normally closed motor operated isolation valves which are common to both SDC trains. MOV 1-SD-1 is located within the drywell and is inaccessible during an accident. MOV 1-SD-

5, located outside the drywell would be inaccessible due to high radiation levels during an accident, and if accessible, could be opened approximately 50% of the time (based on plant operating data) should remote operation fail.

b) Maintenance unavailability of the SDC system. Based on plant-specific data, the maintenance unavailability of the SDC system has been high. The SDC system is not included in the Technical Specifications.

2) Alternate Shutdown Cooling

The ASDC procedure requires use of two LPCI pumps (one in each train) to take suction from the torus and inject coolant into the RPV. Coolant returns to the torus via the S/R valves (which are manually opened) or via the break opening in the case of a LOCA. To establish torus cooling, LPCI flow is established through the LPCI containment cooling heat exchangers. These heat exchangers are cooled by emergency service water (2 ESW pumps per heat exchanger). Each LPCI heat exchanger is rated at 40×10^6 BTU/hr. at the following conditions:

Torus Temperature - 165°F
ESW Temperature - 75°F
ESW Flow - 5000 GPM
LPCI Pump Flow - 5000 GPM

As a result of the limited heat removal rate of each LPCI heat exchanger, operation of both LPCI heat exchangers is required to cool the torus. Since 2 (out of 2) trains of the ASDC systems are required to maintain adequate long-term cooling capability, the calculated ASDC unavailability is high.

If adequate torus cooling is not provided, the torus slowly heats up resulting in a decrease in net positive suction head (NPSH) available to the LPCI pumps. In the Alternate Shutdown Cooling mode with the reactor pressure vessel depressurized, only several hundred gpm of LPCI flow is needed to maintain normal water level in the reactor pressure vessel. This flow can be maintained until the torus heats up to 176°F. At this time the NPSH available will fall below the NPSH required to maintain normal water level utilizing LPCI flow.

NNECO Evaluation

The proposed project is an integrated study of the long-term cooling capability at Millstone Unit 1. The study will include:

- A review of all potential decay heat removal schemes (including those not directly considered in the Millstone Unit 1 PSS).

- Plant-specific thermal hydraulic analyses of long-term core cooling and containment cooling utilizing systems and containment codes.

- o Identification of potential operator actions to improve on the existing decay heat removal capability (such as torus flooding from external sources to prolong injection) until permanent hardware improvements are incorporated.

- o Identification of decay heat removal systems requiring hardware modifications.

The study will consider all existing systems which can be used for long-term cooling (examples include but are not limited to: reactor water clean-up system nonregenerative heat exchanges, torus makeup and let-down and containment venting). The desired results will include:

- o A refinement of system success criteria.

- o Recommendations on possible emergency operating procedure changes.

- o Identification of weaknesses of existing long-term decay heat removal systems and recommendation of possible hardware modifications.