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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

8005130719

April 4, 1980

Docket No. 50-336

Mr. W. G. Counsil, Vice President
Nuclear Engineering & Operations
Northeast Nuclear Energy Company
P. O. Box 270
Hartford, Connecticut 06101

Dear Mr. Counsil:

We have been reviewing your Fire Protection submittals for Millstone Nuclear Power Station, Unit No. 2, dated July 31, September 21, October 9, November 21, and December 12, 1979. The current review status of the items requiring additional information or further evaluation by our September 19, 1978 Safety Evaluation Report (SER) is presented in Enclosure 1. Enclosure 2 is the detailed Fire Protection Status Report.

By letter dated December 12, 1979, you requested clarification regarding the relationship between our September 21, 1979 request, and your understanding of previously negotiated agreements. This request is also addressed in Enclosure 2.

We request that you provide a written response to our concerns presented in the enclosures for Items 3.2.1 through 3.2.5 within 30 days of the date of this letter. Your response should include commitments necessary to resolve all fire protection items by October 1, 1980. Your staff has indicated that a meeting on this subject is requested for your Haddam Neck and Millstone plants. Such a meeting should be scheduled as soon as possible.

Sincerely,

Robert W. Reid

Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

Enclosures:
1. Fire Protection Status
2. Fire Protection Status Report

cc w/enclosures: See next page

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Enclosure 1

MILLSTONE, UNIT NO. 2

FIRE PROTECTION STATUS

Item No.	Title	Status
3.1.1	Fire Detection System	Complete
3.1.5	Water Suppression System	Complete
3.2.1	Cable Spreading Area	Incomplete - protection of redundant safety related systems is not assurred
3.2.2	Protection of Redundant Cable Trays	Sames as 3.2.1
3.2.3	Smoke Detection System Test	
	a. In-situ Testing	Postponed until acceptance criteria is developed
	b. Bench Testing	Incomplete - no information provided
3.2.4	Cable Fire Barrier Penetrations Test Data	Incomplete - pressure differential across seal not shown
3.2.5	Reactor Coolant Pump Lube Oil Fire Hazard	Incomplete - design not complete and does not meet SSE requirements
6.0	Administrative Controls	Incomplete - no commitment to fire brigade training and size requirements

FIRE PROTECTION STATUS REPORT FOR

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 2

DOCKET NO. 50-336

In our Safety Evaluation Report (SER) dated September 19, 1978, we concluded that eight items in Sections 3.2 and 6 remain to be completed before we can make a final conclusion regarding the overall acceptability of the fire protection program at Millstone, Unit No. 2. In addition, certain items covered in Section 3.1 of the SER dealing with plant modifications required additional information to be reviewed by the staff. Northeast Nuclear Energy Company (NNECO or the licensee) has provided additional information by letters dated July 31, September 21, October 9, November 21, and December 12, 1979. This status report evaluates these submittals from NNECO.

In the letter dated December 12, 1979, NNECO requested clarification from the staff regarding the relationship between our September 21, 1979 request and their understanding of previously negotiated agreements concerning ensurance that safe shutdown capability will be maintained if a fire should occur in certain areas of the plant.

3.2.1 Cable Spreading Area and Protection of Redundant Cable Trays 3.2.2

At the time the reference SER was issued, the need for alternate shutdown capability was identified as incomplete in Sections 3.2.1, 3.2.2, 4.1, 5.2, and 5.8 which stated:

3.2.1 Cable Spreading Area

The licensee will conduct an evaluation to determine a suitable method to provide isolation, separation or protection of redundant safety-related cables in the cable spreading area (4.1), (5.2).

3.2.2 Protection of Redundant Cable Trays

The consequences of fire damage to systems required for safe shutdown will be determined where the physical separation of cables in the auxiliary building may not preclude damage to redundant safety-related systems. Fire retardant coatings, automatic sprinkler, suitable fire barriers or early warning detection will be provided to assure that fire damage does not result in a loss of shutdown capability where prompt action is not taken to suppress fires in these areas (5.2), (5.8).

A fair reading of these sections indicate our concern of whether safe shut down capability will survive a fire in either the cable spreading areas or in the auxiliary building and that the licensee had committed to conduct further evaluations of separation and fire protection features with the goal of demonstrating that safe shutdown capability would survive fire in those areas. In the referenced sections, our concern is stated more explicitly, in part, as:

4.1 Safe Shutdown Systems

There are several combinations of safe shutdown systems, which are capable of shutting down the reactor and cooling the core during and subsequent to a fire. The licensee has identified these systems in his fire hazards analysis. The combinations available in a fire situation will depend upon the effects of the fire on such systems, their power supplies, and their control stations.

Most of the system components required for safe shutdown are located in separate fire areas to preclude fire damage to redundant systems. In many areas of the plant, physical separation of redundant safe shutdown systems is adequate to prevent fire damage to redundant systems. Where physical separation alone does not assure that systems could not be damaged by fire, additional measures will be taken to assure that fires do not result in damage to redundant shutdown systems. The licensee will conduct a study of the physical routing of electrical cables for safe shutdown systems in the auxiliary building to determine the extent of protective measures required for areas where cable insulation or exposure fires could damage redundant systems.

We have evaluated the separation between redundant safe shutdown systems and components to determine that they are either separated from each other or protected by suppression systems such that a fire will not affect redundant equipment, and therefore a sufficient number of systems and components will be available to perform their shutdown function following a fire. The adequacy of separation between redundant shutdown equipment is discussed in Section 5.2 of this report.

5.2 Cable Spreading Area

5.2.1 Safety-Related Equipment

The cable spreading area is located below the control room and is open on one end which joins with cable vaults that extend into the turbine building. Instrument, control, and power cables are routed through the cable spreading area. Access to the cable spreading area is provided from an enclosed stairwell from the control room above and the D-C equipment room below.

5.2.3 Consequences if No Fire Suppression

An unmitigated fire in the cable spreading area would result in the loss of redundant systems required for safe shutdown.

5.2.5 Adequacy of Fire Protection

The cable spreading area is an extremely congested area which is not readily accessible. Cable trays stacked from the floor to

near the ceiling barricade the single direct access entrance. A ceiling opening to the HVAC area adjacent to the control room is a non fire-rated penetration. The lack of fire extinguishers in the area or readily accessible hose stations prevents any attempt at manual fire fighting prior to operation of the manual deluge system. Cable penetrations are unsealed in a few areas.

Due to the limited separation between redundant electrical cables for shutdown systems, the limited access which prevents effective manual fire fighting, and a concern for the effectiveness of the ceiling mounted manually actuated deluge system, the present fire protection for this area does not provide adequate assurance that fire damage could not result in a loss of shutdown capability.

5.2.6 Modifications

The licensee will conduct an evaluation to determine a suitable method to provide isolation, separation, or protection of redundant safety-related cables in this area. We will address the adequacy of the proposed method to assure the capability for safe shutdown for this area in a supplement to this report.

5.8 Auxiliary Building

5.8.1 Safety-Related Equipment

An enclosed stairwell provides access to three elevations below grade in the auxiliary building. At the lowest elevation, -45 feet, the high and low pressure safety injection pumps and shutdown heat exchangers are located in separate rooms. At elevation -25 feet, separate cubicles are provided for the charging pumps and reactor building closed cooling water heat exchangers and pumps. Safety-related cables are routed in cable trays and conduit throughout many areas of the auxiliary building. Two motor control centers are widely separated at grade elevation, 14 feet.

5.8.2 Consequences if No Fire Suppression

An unmitigated fire in the auxiliary building could result in the loss of redundant shutdown systems.

5.8.5 Adequacy of Fire Protection

The hose stations in the auxiliary building do not have adequate reach to provide fire water coverage of all areas. In many areas clothing storage lockers present an exposure fire hazard to safety-related cables. Transients combustibles are inadequately controlled to reduce the fire hazards in safety-related areas. The physical separation of redundant safety-related cables does not provide adequate assurance that redundant systems required for safe shutdown would not be damaged by fire. The lack of fire detection prevents prompt response to control and extinguish fires in these areas.

5.8.6 Modifications

The consequences of fire damage to systems required for safe shutdown will be determined where the physical separation of cables may not preclude damage to redundant safety-related systems. Automatic sprinklers or suitable fire barriers will be provided to assure that fire damage does not result in a loss of shutdown capability where prompt action is not taken to suppress fires in these areas. We will address the adequacy of the resolution of this item in a supplement to this report.

We find that, subject to the implementation of the above described modifications, the fire protection for the auxiliary building, with the exception of the protection provided for cable trays, satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

NNECO has conducted the further evaluations and we have reviewed their results. We have concluded that their evaluations do not provide reasonable assurance that shutdown capability will survive a fire in certain areas of the cable spreading area and the auxiliary building.

In particular, the licensee's evaluations of the cable spreading room provided by letter dated July 31, 1979, proposed a wet sprinkler system in the cable spreading room and fire retardant barriers because of redundant cable exposure.

Our consultant inspected the cable spreading room on August 31, 1979, and the licensee by letter dated October 9, 1979, subsequently agreed to implement the following: (a) combustible penetration damming material be removed, (b) fire rated dampers be installed in the two ventilation openings of the block wall separating divisional cabling, (c) fire retardant barriers will be installed to separate redundant non-essential cables, and (d) a wet pipe automatic sprinkler system will be installed for cable tray protection in the 90 X 60 foot area containing a large concentration of cables. The system will have branch lines extending from the ceiling with spray heads over the trays.

Some areas of the cable spreading room have no crossovers and redundant cables are widely separated. For those areas, the fire protection will consist of detection and manual suppression. In the 90 X 60 foot areas of the cable spreading room the licensee has not confirmed what the actual separation is between redundant cables important to achieving safe shutdown. We require that alternate shutdown be provided independent of the 90 X 60 foot area if adequate separation is not demonstrated.

In our review, we noted that the consequences of fire damage to systems required for safe shutdown would be determined where physical separation of cables in the auxiliary building may not preclude damage to redundant

safety-related systems. Fire retardant coatings, automatic sprinklers, suitable fire barriers or early warning detection would be provided to assure that fire damage does not result in a loss of shutdown capability where prompt action is not taken to suppress fires in these areas.

An evaluation of cable routing in the auxiliary building was conducted by the licensee, and the results were submitted by letter dated July 31, 1979. After review of the submittal, the adequacy of proposed solutions remained in doubt. A site visit to specifically examine those areas in question was conducted on August 31, 1979, by our fire protection consultant. As a result of this visit, certain modifications were documented by letter dated October 9, 1979, and clarified by letter dated November 21, 1979.

The modifications proposed for the various areas are as follows:

(1) Elevation -45 feet Zone 1A, Column F.8/H.2 and 16.6/17.2

Automatic sprinklers will be provided in the trays to protect crossovers in a balcony area. Ionization detectors will be provided at the ceiling. The sprinklers will be fed from an adjacent standpipe.

(2) Elevation -45 feet Zone A-1A, Column F.8/H.2 and 17.2/18.4

Ionization detectors will be provided between Z1 and Z2 trays for the length of the zone.

(3) Elevation -25 feet Zone A-9 Charging Pump Area

The general area ionization detectors will provide sufficient early notification to prevent involvement of the adjacent division.

(4) Elevation -5 feet Zone A-18, Column F.3/F.8 and 18.9/19.6 Pipe Penetration Room

The cable trays involved in the crossovers will be completely enclosed to prevent fire impingement on the conduits above. Ionization detectors will also be installed above the trays.

(5) Elevation -5 feet Zone A-14, Column F.8/H.2 and 18.1

General ionization detection will be provided in the zone with a number of detectors installed at the crossover. Fire barriers will be installed above Z14FK10. The clothing storage rack will be relocated to reduce the combustible exposure to safety-related cable trays.

(6) Elevation -5 feet Zone A-14, Column L.5/M.4 and 17.7

Ionization detectors and barriers will be installed for protection of the Z1 and Z2 crossover.

(7) Elevation -5 feet Zone A-14, Column M.4 and 17.8

Ionization detectors and a barrier between the trays and conduit will be installed to protect the crossover.

(8) Elevation -14 feet 6 inch Zone A-27D, Column M.7 and 18.9/20.0

The protection of the crossover will consist of both area and tray automatic sprinklers. The area sprinklers will extend 15 feet into fire Zone A-27D. General Area protection will also be provided in the vicinity of the crossover.

(9) Elevation -14 feet 6 inch Zone A.24, Column H.2/H.4 and 17.1/17.5

A general area detection system with specific detectors located at the tray crossovers will be installed and where the tray stacks run parallel with one another. Fire barriers will also be provided at these crossovers.

(10) Elevation -14 feet 6 inch Zone A-24, Column F.8/H.2 and 17.4

Ionization detectors will be provided over the crossovers and the trays involved will be totally enclosed from column line 16.6 to 17.7.

We find these modifications assure adequate operation with the exception of the following areas. We will require alternate shutdown capability in the following areas:

(a) Auxiliary Building Zone 1A, Column F.8/H.2 and 16.6/17.2 elevation -45.

(b) Auxiliary Building Zone A-24, Column F.8/H.2 and 17.4 elevation 14' -6".

(c) Auxiliary Building Zone A-14, Column F.8/H.2 and 18.1.

3.2.3 Smoke Detection System Tests

The reference SER noted that in-situ tests would be conducted with a suitable smoke generating device to verify that a fire would be promptly detected by installed smoke detectors and that ventilation air flow patterns in the area do not significantly reduce or prevent detection response. Bench tests would be conducted to verify that smoke detectors would provide prompt response and have adequate sensitivity to the products of combustion for the combustibles in the area where smoke detectors are installed. If any fire detection systems are found to be inadequate, appropriate modifications will be made to provide adequate performance.

By letter dated July 31, 1979, the licensee indicated that various concepts had been reviewed and that use of a technique developed by NUTECH Corporation for siting of fire detectors showed some merit. The licensee evaluated NUTECH's technique in a demonstration test held at the Yankee Nuclear Power Plant on August 23 and 24, 1979.

The licensee concluded that although NUTECH's concepts have advanced the state-of-the-art, more testing or qualification would be necessary to provide assurance of acceptability.

The staff has also evaluated the NUTECH tests and has concluded that the method does not satisfy the staff requirement; the test requirement is beyond present state-of-the-art technology. In addition, the NUTECH test report contains major deficiencies which detract from the credibility of the test method, such as inconsistencies in the interpretation and presentation of data, the use of unexplained rationale which require additonal in-plant testing to improve the derived test results.

The licensee is, therefore, relieved of any schedule or commitment with this requirement until acceptance criteria can be developed that can be applied with the present day technology.

However, the licensee has not provided any information on the requirement to conduct bench tests of smoke detectors for verification of prompt response and sensitivity to products of combustion in the area where installed. Therefore, we require that this be done to comply with the requirements of our September 19, 1978 SER.

3.2.4 Cable Fire Barrier Penetrations Test Data

The reference SER noted that test data will be provided to demonstrate the adequacy of electrical cable fire barrier penetrations.

By letters dated July 31, and October 9, 1979, the licensee provided information on the cable fire barrier penetrations. The data contained in the letter of July 31, 1979, indicates that the penetrations are sealed with Dow Corning Q3-6548 medium density Silicone RTV Foam. The installer certifies the materials used to the ASTM-E119 Fire Endurance Test and indicates that they have been installed as three hour fire seals with some exceptions.

The exceptions mentioned have been sealed with a minimum of 6 inches of silicone foam plus 1 inch of damming, which in most cases is the thickness of the penetrated structure. We have reviewed the fire load characteristics for the Cable Vault and Control Room. This review indicates that the maximum hourly fire severity is far less than the rating of the fire barrier seals which are provided.

We find that the certifications provided demonstrate the adequacy of the cable fire barrier penetrations except that they do not show that a pressure differential across the seal (with the higher pressure on the exposed side) that is equivalent to the maximum pressure differential a fire barrier is expected to experience has no effect on the performance of the penetration seal. Subject to such a demonstration we find these seals acceptable.

3.2.5 Reactor Coolant Pump Lube Oil Fire Hazard

Our September 19, 1978 SER noted that the licensee is evaluating a method of oil collection or routing to prevent the spread of oil or the use of alternative types of lubricants to reduce the fire hazards associated with the reactor coolant pump lube oil system.

By letter dated July 31, 1979, the licensee provided information on the evaluation conducted as a result of our concern. The licensee proposed the implementation of a drip pan collection system to collect oil from all exterior leakage points and route it to a storage tank located at the base of the reactor coolant pump supports. The licensee provided a description and sketch of the system.

We have reviewed the licensee's submittal. The licensee's submittals do not conform with the following staff's requirements:

The Reactor Coolant Pump lubrication system shall be protected by either an oil collection system, or an automatic fire suppression system.

Oil collection systems shall be capable of collecting lube oil from all potential pressurized and unpressurized leakage sites in the reactor coolant pumps' lube oil systems and drain the oil to a vented closed container. Requirements for a flame arrestor in the vent shall be determined on the basis of flash point characteristics of the oil involved. Leakage points to be protected shall include lift pump and piping, overflow lines, lube oil cooler, oil fill and drain lines and plugs, flanged connections on oil lines and lube oil reservoirs where such features exist on the reactor coolant pumps. Leakage shall be collected and drained to a closed container that can hold the entire lube oil system inventory. The drain line shall be large enough to accommodate the largest potential oil leak.

To provide adequate protection for an SSE, one of the following should be provided:

a. The lube oil system whose failures could result in leakage should be designed to withstand an SSE without leakage; and, the dropping of oil collection system components during an SSE should not cause loss of operability of safety-related equipment; or

b. The oil collection system should be designed to withstand an SSE and continue to be able to collect and drain leakage that may occur during an SSE. In this case, the oil collection system should be adequate to collect oil from any external lube oil piping not designed to withstand an SSE, in addition to leakage from points identified above.

If an automatic fire suppression system is selected, either the automatic and manual fire suppression system or the lube oil system components whose failure could result in leakage should be designed to withstand the SSE.

6.0 Administrative Controls

Section 6.0 of the reference SER concluded that NNECO provided an adequate program for fire protection administrative controls with the exception drills and training sessions. In addition, this SER stated that we have not yet resolved a difference between the minimum size of the fire brigade based on our evaluation and what the licensee proposes. Although considerable correspondence has been transmitted on these subjects, they still remain unresolved at this time.

3.1.1
3.1.5 Fire Detection System and Water Suppression System

The information provided by NNECO in regards to modifications of the fire detection system and water suppression system (Sections 3.1.1 and 3.1.5 of the reference SER) have been found acceptable by the staff.