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

October 9, 1984

Docket No. 50-423
B11243

Director of Nuclear Reactor Regulation
Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

References:

(1) B. J. Youngblood to W. G. Counsil, Draft SER for Millstone Nuclear Power Station, Unit No. 3, dated December 20, 1983.

(2) W. G. Counsil to B. J. Youngblood, NRC-CMEB Review Meeting (February 16, 1984), dated March 9, 1984.

(3) W. G. Counsil to B. J. Youngblood, NRC-CMEB Review Meeting (March 7, 1984), dated March 23, 1984.

(4) B. J. Youngblood to W. G. Counsil, SER for Millstone Nuclear Power Station, Unit No. 3, dated August 2, 1984.

Dear Mr. Youngblood:

Millstone Nuclear Power Station, Unit No. 3
NRC-Chemical Engineering Branch (CMEB) (Fire Protection)
Review Meeting, May 10, 1984

Northeast Nuclear Energy Company (NNECO) presented to the NRC-CMEB Staff an assessment of the fire protection features for the cable spreading room for conformance to the Branch Technical Position (BTP) CMEB 9.5-1, section C.7.c (Draft SER open item FP-19, Reference (1)) at the February 16 and March 7, 1984 fire protection meetings. References (2) and (3) transmitted written responses to complement the information presented during the above meetings.

On May 10, 1984, NNECO representatives met with the NRC-CMEB at Bethesda, Maryland, to present and discuss additional information on the cable spreading room fire protection features. It was our intention at the meeting to reach closure on all outstanding Staff concerns contained in Reference (3) and thereafter, to provide the Staff with a letter committing NNECO to agreements reached during the meeting regarding closure. However, due to a variety of factors all outstanding Staff concerns were not resolved to the satisfaction of the NRC. Therefore, at the meeting it was agreed that a subsequent submittal would be docketed to comprehensively address all pertinent issues.

B002
1/1

It is the purpose of this letter to provide information intended for presentation at the May 10, 1984 meeting and to address the Staff's questions raised during that meeting so that the Staff may utilize it in finalizing the fire protection input to the SER for Millstone 3. We expect that the information contained herein will enable the NRC Staff to grant a deviation from the BTP CMEB 9.5-1 Section C.7.c for Millstone 3.

In general, the attached information (Attachment I) elaborates on the technical issues presented and discussed with the Staff at the May 10, 1984 meeting. Attachment I also provides NNECO's responses/positions with regard to each area of the Staff's concerns identified at the May 10, 1984 meeting. Attachment II is a discussion of a probabilistic risk assessment for a fire in the cable spreading room at Millstone 3. The results indicate that the probability of loss of safe shutdown capability resulting in core melt is sufficiently low with the existing design that a different fire suppression system would not change the overall core melt frequency. Thus no design changes are necessary, and equivalent protection is demonstrated.

In conclusion, we are hopeful that the information presented in this letter will be sufficient to allow the NRC Staff to act favorably on the request for a deviation from the BTP CMEB 9.5-1 Section C.7.c. Given that the NRC characterized this issue as significant in Millstone 3 SER (Reference 4), we request that prompt attention be given to resolving this open item.

If there are any questions, please contact our licensing representatives directly.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY
et. al.

BY NORTHEAST NUCLEAR ENERGY COMPANY
Their Agent

W. G. Counsil

W. G. Counsil
Senior Vice President

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

Then personally appeared before me W. G. Counsil, who being duly sworn, did state that he is Senior Vice President of Northeast Nuclear Energy Company, an Applicant herein, that he is authorized to execute and file the foregoing information in the name and on behalf of the Applicants herein and that the statements contained in said information are true and correct to the best of his knowledge and belief.

Lorraine J. D'Amico

Notary Public

My Commission Expires March 31, 1988

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

October 9, 1984

Docket No. 50-423
B11243

Director of Nuclear Reactor Regulation
Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

References: (1) B. J. Youngblood to W. G. Counsil, Draft SER for Millstone Nuclear Power Station, Unit No. 3, dated December 20, 1983.

(2) W. G. Counsil to B. J. Youngblood, NRC-CMEB Review Meeting (February 16, 1984), dated March 9, 1984.

(3) W. G. Counsil to B. J. Youngblood, NRC-CMEB Review Meeting (March 7, 1984), dated March 23, 1984.

(4) B. J. Youngblood to W. G. Counsil, SER for Millstone Nuclear Power Station, Unit No. 3, dated August 2, 1984.

Dear Mr. Youngblood:

Millstone Nuclear Power Station, Unit No. 3
NRC-Chemical Engineering Branch (CMEB) (Fire Protection)
Review Meeting, May 10, 1984

Northeast Nuclear Energy Company (NNECO) presented to the NRC-CMEB Staff an assessment of the fire protection features for the cable spreading room for conformance to the Branch Technical Position (BTP) CMEB 9.5-1, section C.7.c (Draft SER open item FP-19, Reference (1)) at the February 16 and March 7, 1984 fire protection meetings. References (2) and (3) transmitted written responses to complement the information presented during the above meetings.

On May 10, 1984, NNECO representatives met with the NRC-CMEB at Bethesda, Maryland, to present and discuss additional information on the cable spreading room fire protection features. It was our intention at the meeting to reach closure on all outstanding Staff concerns contained in Reference (3) and thereafter, to provide the Staff with a letter committing NNECO to agreements reached during the meeting regarding closure. However, due to a variety of factors all outstanding Staff concerns were not resolved to the satisfaction of the NRC. Therefore, at the meeting it was agreed that a subsequent submittal would be docketed to comprehensively address all pertinent issues.

It is the purpose of this letter to provide information intended for presentation at the May 10, 1984 meeting and to address the Staff's questions raised during that meeting so that the Staff may utilize it in finalizing the fire protection input to the SER for Millstone 3. We expect that the information contained herein will enable the NRC Staff to grant a deviation from the BTP CMEB 9.5-1 Section C.7.c for Millstone 3.

In general, the attached information (Attachment I) elaborates on the technical issues presented and discussed with the Staff at the May 10, 1984 meeting. Attachment I also provides NNECO's responses/positions with regard to each area of the Staff's concerns identified at the May 10, 1984 meeting. Attachment II is a discussion of a probabilistic risk assessment for a fire in the cable spreading room at Millstone 3. The results indicate that the probability of loss of safe shutdown capability resulting in core melt is sufficiently low with the existing design that a different fire suppression system would not change the overall core melt frequency. Thus no design changes are necessary, and equivalent protection is demonstrated.

In conclusion, we are hopeful that the information presented in this letter will be sufficient to allow the NRC Staff to act favorably on the request for a deviation from the BTP CMEB 9.5-1 Section C.7.c. Given that the NRC characterized this issue as significant in Millstone 3 SER (Reference 4), we request that prompt attention be given to resolving this open item.

If there are any questions, please contact our licensing representatives directly.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY
et. al.

BY NORTHEAST NUCLEAR ENERGY COMPANY
Their Agent

W. G. Counsil
Senior Vice President

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

Then personally appeared before me W. G. Counsil, who being duly sworn, did state that he is Senior Vice President of Northeast Nuclear Energy Company, an Applicant herein, that he is authorized to execute and file the foregoing information in the name and on behalf of the Applicants herein and that the statements contained in said information are true and correct to the best of his knowledge and belief.

Lorraine J. D'Amico
Notary Public

My Commission Expires March 31, 1988

Attachment I

FP-19 Cable Spreading Room Protection

Open Items

Chemical Engineering Branch - Fire Protection

FP-19, Cable Spreading Room Protection (Draft SER Section 9.5.1.6)

The primary fire suppression in the cable spreading room is a total flooding automatic carbon dioxide system. We will require the applicant to provide an automatic fixed water suppression system as the primary fire suppression means in the cable spreading room with the carbon dioxide system as a backup to meet the guidelines of BTP CMEB 9.5-1, Section C.7.c. This is an open item.

Response (10/84)

In response to the guidelines of Branch Technical Position 9.5-1, Section C.7.c, Cable Spreading Room Fire Protection, Millstone Unit No. 3's fire protection design has incorporated an automatic total flooding carbon dioxide suppression system in lieu of the NRC recommended water suppression system. It is NNECO's position that the automatic carbon dioxide suppression system offers, as a minimum, an acceptable level of fire protection for Millstone 3's cable spreading room. Millstone 3's CO_2 system has been designed in accordance with the applicable guidelines of NFPA-12, American Nuclear Insurers (ANI), and the NRC's BTP (Section C.6.e). Therefore, NNECO is requesting that a deviation from the BTP 9.5-1 guidelines be granted.

Prior to presenting a detailed discussion/justification on the technical merits of CO_2, some history and background is in order.

Historical Background (see Attachment FP19-1)

In 1972, NNECO established it's intention to install an automatic CO_2 system for cable type environments of Millstone Unit No. 3. This decision was accepted and reinforced by NRC when on March 13, 1974, Millstone Unit No. 3's construction permit was issued. It should be noted that NNECO specifically addressed the use of CO_2 and the NRC found it acceptable. Since the issuance of the CP, much has transpired in terms of new fire protection philosophies, guidelines and regulations on fire protection. In response to these evolving regulatory positions, on June 13, 1977, Millstone Unit No. 3 submitted its Fire Protection Evaluation Report and again, documented that CO_2 was chosen as the primary fire suppressant agent for the cable spreading room and other cable concentration areas. And finally, on February 20, 1980, a letter was written to the NRC specifically stating that our fire protection concept for Unit No. 3 was well into the installation stage, and that if NRC had any reservations about our fire protection philosophy, a timely response was needed (see Attachment FP19-2).

Discussion

In discussing the merits of CO_2, it should be recognized that the subject of fire protection for cable spreading room (CSR) environments does not represent the most straight-forward application of established fire protection principles. Providing an acceptable level of fire protection for CSR's involves consideration

of many parameters and not simply is CO_2 better than water, or water better than CO_2. Such a simple comparison between CO_2 and water only serves to distort conclusions. It is fully recognized that if water can be directly applied to a burning cable (as can be done in controlled laboratory conditions), it is the preferred agent. However, the issue in question deals with the cable spreading room in a power plant environment. Cable system designs are far from controlled laboratory conditions and the advantages of water are offset to some degree by other considerations.

Some of those parameters that must be considered when determining the type and level of fire protection that is considered acceptable for CSR's are as follows:

- o Cable tray congestion and geometry;
- o Room construction and layout with respect to other areas;
- o Type of combustibles present (only cable, IEEE-383 qualified cables, etc.);
- o Potential sources of ignition;
- o Type of occupancy (is room occupied, is room a general passage way to other areas, any rotating equipment, need to enter for monitoring instrumentation/equipment).

With respect to the cable system layout of the Millstone Unit No. 3 CSR, it should be noted that cable tray geometry and cable tray congestion make it extremely difficult for water to be effectively applied to a fire by the NRC's recommended fixed piped sprinkler system. Even with the best of sprinkler system designs, water discharge patterns would be severely obstructed and the best that can be expected is to establish a water curtain effect. It should be noted that cable tray geometry and cable tray congestion does not handicap the effectiveness of CO_2 systems. CO_2 gas extinguishes fires by inerting the entire volume of the CSR, thus displacing the air/oxygen mixture necessary to support combustion. One of the major advantages and attractive features of CO_2 for this type of hazard is its capability as a gas to effectively penetrate complex/congested cable tray systems.

Another feature that must be accounted for in evaluating the merits of CO_2 is the risk of water damage/flooding associated with all automatic water suppression systems. The east switchgear room is located directly below the cable spreading room. This room houses all equipment necessary to provide alternate shutdown capability as specified in BTP CMEB 9.5-1 Section C.5.c.

As a final major consideration in the use of CO_2 for this specific area, the detection/actuation concept associated with this system needs amplification.

Fires in cable systems, especially IEEE-383 rated cables, generally develop as slow smoldering type fires. Considerable amounts of smoke are generated before much heat is created in cable fires. Automatic wet pipe sprinkler systems basically depend on a fusible link element to melt when exposed to heat (fixed temperature setting) before sprinkler heads become activated. Note, the fusible link concept depends on heat to activate and therefore considerable time can elapse before the affected sprinkler head(s) become activated. To further compound this slow response, ceiling height and already noted cable tray arrangement/congestion could easily divert and/or dissipate heat away from sprinkler heads preventing or delaying the activation of the water sprinkler system.

Millstone Unit No. 3's CO_2 detection/activation concept for the cable spreading room CO_2 system utilizes ionization and photoelectric type detectors in combination with each other to form a cross-zone detection system (two circuits) for activation of the CO_2 system. The point that should be obvious, is that the CO_2 system detection/activation concept is designed for the hazard it serves and therefore will activate quicker thus minimizing damage, and more important, a large damaging fire is much less likely to develop.

NRC's Branch Technical Position CMEB 9.5-1 endorses the concept of defense-in-depth with respect to fire protection for a nuclear power plant. In part, the BTP states,

> "the defense-in-depth principle is aimed at achieving an adequate balance in:
>
> a. Preventing fires from starting;
>
> b. Detecting fires quickly, suppressing those fires that occur, putting them out quickly, and limiting their damage; and
>
> c. Designing plant safety systems so that a fire that starts in spite of the fire prevention program and burns for a considerable time in spite of fire protection activities will not prevent essential plant safety functions from being performed.
>
> No one of these echelons can be perfect or complete by itself. Each echelon should meet certain minimum requirements; however strengthening any one can compensate in some measure for weakness, known or unknown, in the others".

NNECO recognizes the importance of the defense-in-depth philosophy and has incorporated several features above and beyond just an automatic fire protection system in order to ensure that an acceptable level of fire protection is maintained.

NNECO's defense-in-depth philosophy with regard to the cable spreading area can best be summarized as three independent levels of fire defense. They are:

Level One - Features that limit the probability of a fire from occurring.

Level Two - Features that provide early detection and suppression of a fire before redundant train damage can occur.

Level Three - Features to limit any fire damage and ensure that alternate shutdown outside of the CSR can be achieved.

Each of these levels, while unique in themselves, are combined in order to limit the probability of a fire occurring and to maintain the plant's capability to achieve safe shutdown at all times.

A more detailed review of each level of protection and the characteristics provided are presented below:

- <u>First Level of Protection-Features Provide Low Probability of Fire</u>

    - Three-hour barriers separate the CSR from other areas of the plant.

    - Restricted access (two points of entry, vital access point electronically supervised by security, not a normal access/egress path, low probability of introduction of transient combustibles).

    - Low activity area (mostly cable, conduit, with no rotating equipment).

    - IEEE-383 qualified cable (fire retardent cable)

    - Administrative control procedures control access, transient combustibles, ignition sources, and work activity within the CSR.

- <u>Second Level of Protection-Rapid Detection & Suppression Capability Before Redundant Trains Can Be Damaged</u>

    - Ionization and smoke detection provide both an early warning of a possible fire condition as well as rapid actuation of CO_2 suppression system.

      This dual detection concept utilizes two types of detectors to sense a fire condition. Ionization detectors (products of combustion) are used to detect the incipient fire condition and photoelectric detectors will respond to a smoke condition. Two different types of sensing devices are utilized to provide early warning.

    - A cross-zoned detection system concept activates the CO_2 suppression system. A time delay of one (1) minute has been designed into the system to facilitate evacuation.

    - The CO_2 suppression system is capable of 2½ discharges at 50% concentration for the cable spreading room. The extended discharge feature has been incorporated into the design to ensure that the design concentration (50%) is maintained for the required extinguishment time (20 min.).

- o Hose stations and portable extinguishers are provided as back-up fire protection.

o Third Level of Protection-Plant Has Been Designed For Alternate Shutdown Capability

- o Alternate shutdown capability, independent of the cable spreading room exists in other areas of Millstone Unit No. 3.
- o Three-hour rated fire barriers will contain a fire within the CSR since its calculated fire loading is less than three hours.

It is NNECO's position that the three levels of fire protection features provided offer an acceptable level of protection and thus ensures the plant's ability to achieve safe shutdown.

CO_2 System Design and Capability

The CO_2 system for the Millstone Unit No. 3 CSR has been engineered, designed, and installed in accordance with the guidelines of NFPA-12. The system is fully automatic and is energized by a cross-zoned ionization/photoelectric detection system. The design includes the following major features:

- o 50% design concentration.
- o Double discharge capability.
- o Continuous discharge feature has been provided to maintain concentration for 20 minutes per discharge.
- o Pressure relief systems to prevent overpressurization.
- o Meets CO_2 design criteria of BTP 9.5-1, Section C.6.e.
- o Local, remote, and predischarge alarms.
- o Odorizer in CO_2 to warn personnel of presence of CO_2 within the area.
- o Can also be manually activated.

System Features/Operation

A 45 ton low pressure CO_2 storage unit has been provided at Millstone Unit No. 3. This unit is a self contained refrigerated low pressure vessel which stores liquid CO_2 at a temperature of approximately $0^{o}F$ and a pressure of 300 psi. Automatic controls, monitoring alarms and safety devices have been provided for this unit. The 45 ton capacity was selected in order to provide as a minimum double total flooding discharge capability for the largest area which, in this case, is the cable spreading room.

Distribution piping/valving has been arranged to allow CO_2 discharge directly into the affected area (refer to Sketch #1). Predetermined time discharges provide the proper amount of CO_2 to enter the area as required to satisfy NFPA 12 guidelines/design concentrations.

Logic of Operation

Any detector within the CSR can detect a fire and transmit an alarm to the Control Rooms' Main Fire Control Panel, Local CO_2 Control Panel and Local Detection Zone Panel. Warning lights, bells and horns are actuated both inside and outside the hazard area as well as at each of the Control Panels.

Whenever the second unaffected detection circuit (zone) detects a fire condition, a second transmission (alarm) is sent to the Main Fire Control Panel in the Control Room. In addition, an electrical signal is sent to open master selector valve (V15) and to energize the predischarge timer delay circuit (60 second timer delay).

At the end of 60 seconds, the predischarge timer circuit deenergizes and the main discharge and extended discharge circuits energize, causing the associated area selector valves (V5 and V970) to open, thus starting CO_2 discharge into the CSR. The Main Timer circuit remains energized for approximately 150 seconds and then deenergizes. At this point the main CO_2 discharge is completed. The extended discharge timer circuit remains energized for a full twenty (20) minutes allowing CO_2 at a reduced rate to enter the room.

At the completion of the twenty minute extended discharge cycle, the system (control cabinet) automatically resets itself for manual pull station actuation.

Additional Design Features

- Normal Means of Initiating a CO_2 Discharge

  - Automatic mode by actuation of two separate smoke detection systems. (Electric)

  - Manual pull stations located at each entrance door. (Electric)

  - Main fire protection console within Control Room. (Coded electrical signal via simplex detection/annunciation system)

- Actuation with Loss of AC Power

  The CO_2 system has been provided with electromanual pilot valves which normally operate electrically controlled solenoid valves in conjunction with the system's timer discharge circuit. However, if in the case where AC power was lost, operator action (repositioning of release lever at pilot valve) would override/bypass electric solenoid valves thus allowing CO_2 to be discharged into the area.

- o Failure of Selector Valves to Close

  NNECO has considered the possibility of selector valve failure (fail open) which would allow CO_2 to continue discharge into the area. NNECO believes that this event (continuous CO_2 discharge) is very unlikely, due to the fact, that both the Master Selector Valve (V15) and the Area Selector Valves (V5 & V970) would have to fail to cause such a condition. However, as a back-up control device to prevent such a condition from occurring, a handwheel operated gate valve (V14) has been provided for manual control. Operator action (closing the valve) will stop the CO_2 discharge.

Responses to the Staff's Concerns

As the result of previous NNECO/NRC meetings, several questions have been raised regarding Millstone Unit No. 3's fire protection (CO_2) within the Cable Spreading Room. The areas of concern relating to the use of CO_2 Suppression Systems expressed by the NRC, were:

- o Testing/maintenance
- o Availability
- o Reliability
- o Toxicity

In order to resolve any misunderstandings which the NRC may have, the following represents NNECO's responses/positions with regards to each area of concern.

TESTING/MAINTENANCE

As previously stated, Millstone Unit No. 3's CO_2 System has been designed in accordance with NFPA 12. In order to verify the system's compliance to NFPA 12 provisions, an acceptance test has been scheduled. At that time, NNECO will be able to verify that the design concentration (50%) will be achieved and maintained for the required time (20 minutes). In addition to verifying the design concentration, NNECO will be closely monitoring system components (valves, switches, etc.) to ensure their proper operation.

To ensure long term CO_2 system reliability, NNECO intends to establish a comprehensive inspection, testing and maintenance program. This program will be developed utilizing Technical Specification requirements, NFPA 12 guidelines and manufacturer's recommendations. It is NNECO's position that this type of inspection/testing/maintenance program performed on a regular basis will ensure that an acceptable level of operability of the CO_2 Suppression System is maintained at all times.

AVAILABILITY

NNECO has reviewed the anticipated work activity that would occur on a regular basis within the Cable Spreading Room. As a result, NNECO determined that this activity will be minimal based on the following:

The Cable Spreading Room:

- Is a security monitored vital access area. This status limits access only to personnel who have the proper security clearance.
- Is not a normal access/egress or walk-through route within the plant.
- Contains mainly cable and conduit with only a few electrical components (isolator cabinets) that will require periodic monitoring.

At this time, it is anticipated that limited access into the room will be made by operations personnel on a twice per shift basis. This evolution will not require that the CO_2 system be disarmed. Considering the minimal amount of anticipated activity within this area, NNECO intends to maintain the CO_2 Suppression System in the automatic mode of operation.

However, it is recognized that there will be times, where due to necessary maintenance or work activity within the CSR, the CO_2 may have to be disarmed.

In order to ensure that NNECO's multi-levels of fire defense are maintained at all times, NNECO is committed to having the CSR's CO_2 system governed by Technical Specifications. By designating this classification (Tech. Spec.) for the CSR CO_2 system, NNECO is ensuring that the availability of this system is maintained by the same mechanisms that ensures the availability of all other safety related systems throughout the plant. Therefore, any time that the CO_2 may be disarmed (either for maintenance or an activity within the area) set courses of actions, i.e., establishing a fire watch will be implemented.

As added reassurance that the activities which may occur within the CSR are closely monitored, NNECO will install an additional set of locks (key operated) for each access door. Key control/access to the CSR would be under the jurisdiction of the Operations Department.

In order to monitor the CO_2 system's status, NNECO has provided two distinct and separate annunciation alarms, both of which are located in the Control Room. One alarm, a light, is situated on the main control board console. The other is a combination of audible and visual alarms/signals located on the main fire detection/control panel. This combination alarm provides a flashing yellow light, audible signal (horn) and an alarm location display readout on the fire panel's Cathode Ray Tube. This combination alarm arrangement has also been designed to allow the audible alarm only to be silenced while all other alarms remain illuminated, until such time as the suppression system is returned to its normal on state.

It is NNECO's position that the following offer additional levels of personnel awareness as to the status of the CSR CO_2 system:

1) Technical Specification requirements.

2) Operations Department administrative controls.

3) The dual, independent monitor/alarm design feature.

RELIABILITY

As previously stated, in order to maintain the reliability of the CO_2 Suppression System within Millstone Unit No. 3's Cable Spreading Room (CSR), NNECO has provided the following features:

- The CSR CO_2 System has been engineered, designed and installed in accordance with NFPA 12 guidelines.

- The CSR CO_2 System has been designed to address all of the NRC guidelines regarding CO_2 systems as referenced in BTP 9.5-1, Section C.6.e. Please note that in the MP3 SER (issued by NRC in August, 1984) the CO_2 system design was found to be acceptable.

- An inspection/testing program of system components and its operations is currently being developed. This program will address Technical Specification requirements, NFPA 12 guidelines and manufacturer's recommended guidelines. The above guidelines/requirements are all directed toward ensuring the systems operability/reliability. All system components, such as selector valves, ventilation interface components and pressure switch operations will be regularly inspected and operationally tested. Associated components (lights, horns, etc.) will also be tested on a regular frequency in accordance with Technical Specification Requirements.

- Vital system components (i.e., level indicators, control valves, pressure switches) are electrically monitored to ensure their correct position thus maintaining the system's operability.

- In order to prevent overpressurization of the area as a result of CO_2 discharge which could cause door openings, damper failures, etc., NNECO will provide pressure relief venting. This vent path will be sized and designed in accordance with NFPA-12 guidelines. Upon the discharge of CO_2 into the area, a pressure switch operated by CO_2 pressure will initiate an electrical circuit that automatically opens the pressure relief dampers to the outside. Annunciation lights have been provided at door entrance in order to verify that the circuit/damper operated.

  With respect to NRC concerns that the pressure relief damper may fail to open, which could result in an overpressurization problem, NNECO will install a manual release device (mechanical type) outside of the CSR. This device will allow the fire brigade to take manual action to establish a pressure relief vent path, should the automatic mode of operation fail.

The design, testing and maintenance of the Cable Spreading Room's CO_2 Suppression System have all been directed towards ensuring the systems reliability to operate as designed, and to effectively extinguish any fire which may occur.

TOXICITY

The postulated fire for the CSR is a class A combustible type (cable insulation). In order to properly extinguish this fire, a CO_2 design concentration of 50% must be maintained for twenty (20) minutes. Due to this high CO_2 concentration, the oxygen supply within the room will be depleted which consequently creates a life safety concern.

In order to safeguard personnel within the area, NNECO has incorporated the following features into the design:

- Warning signs are furnished to inform personnel that the area is protected by an automatic CO_2 Suppression System. Additional information will be provided advising personnel of evacuation procedures in the event of a fire emergency.

- Cross-zone detection/actuation logic has been provided for the CSR's CO_2 system. This system, upon detecting a fire, will provide early warning to the control room as well as actuate alarms (lights and horns) locally, thus warning personnel in the area to evacuate. However a second separate detection circuit is required to reach the alarm state before the CO_2 discharge cycle will begin.

- A time delay has been incorporated into the CO_2 discharge cycle. This additional safeguard will allow personnel an additional sixty (60) seconds(1) to evacuate the area prior to actual CO_2 discharge. The time delay circuit will be actuated upon the receipt of the two separate circuit smoke detectors (cross-zone concept).

- As a means of making personnel aware that CO_2 may be within an area adjacent to a CO_2 protected area, NNECO has provided odorizers within the CO_2 system. These odorizers generate a wintergreen scent that alerts personnel to the fact that CO_2 concentrations (low levels) are present within an area. This feature will allow personnel ample time to evacuate the area.

Considering all of the safeguards that are provided within Millstone Unit No. 3's CO_2 design, it is NNECO's belief that toxicity concerns have been properly addressed. However, NNECO intends to closely monitor the toxicity concern during the system acceptance testing and will make adjustments that are necessary to ensure personnel safety. In any event, the toxicity issue is one that NNECO is addressing from a personnel safety standpoint and is not relevant to the "public health and safety" criterion of licensing basis.

(1) Time delay of sixty (60) seconds is tentative at this time. Actual evacuation times (walk-out) to the furthest exit and the actual delay time will be determined prior to the in-service date of the CO_2 system.

In summary, it is NNECO's position that an acceptable/equivalent level of fire protection has been provided for the Millstone Unit No. 3 cable spreading room because:

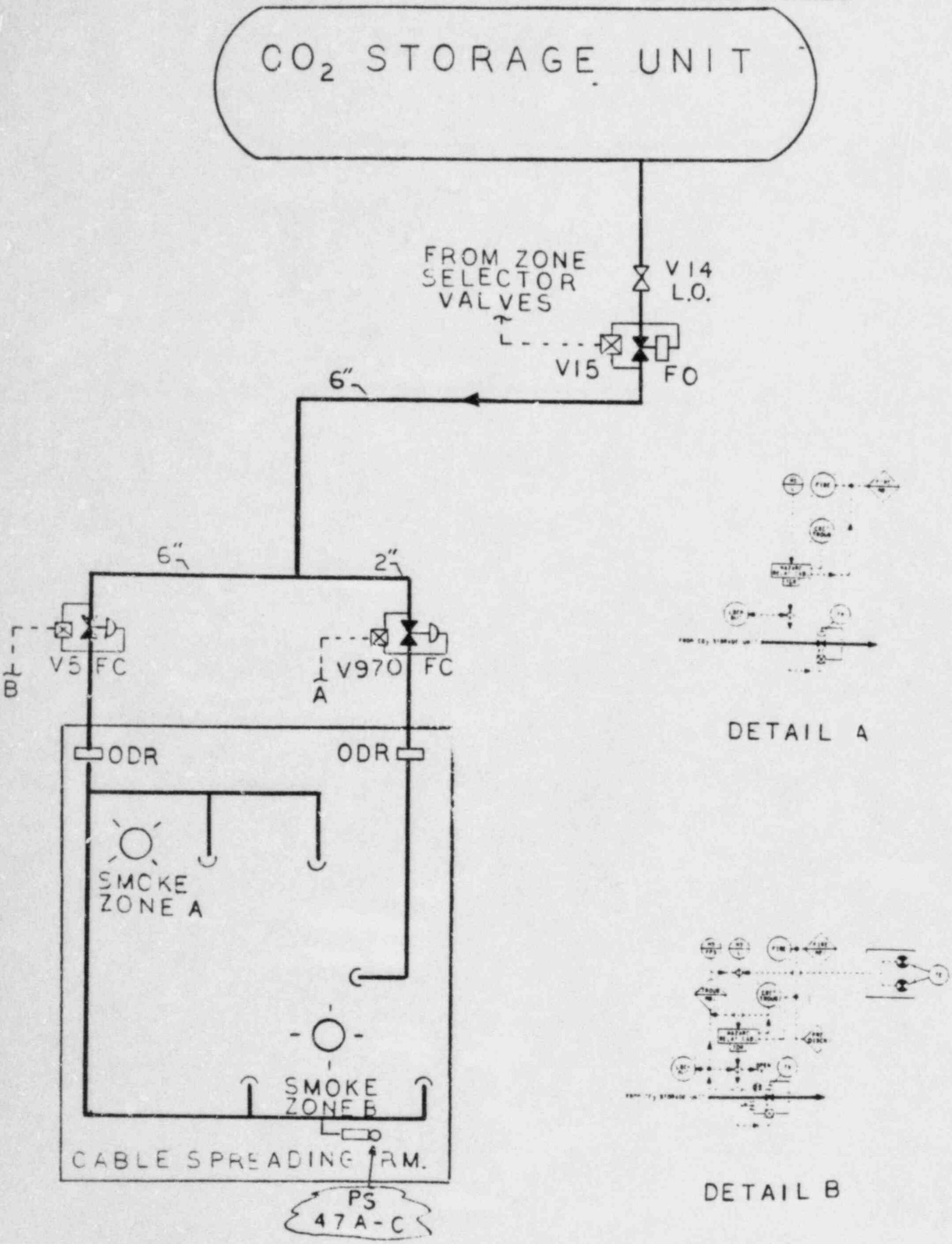
- o A defense-in-depth philosophy has been applied to: limit the probability of a fire; provide early warning and suppression capability, and to assure that alternate shutdown capability exists outside the CSR.
- o A suppression system specifically designed for this hazard (cable concentration/congested areas) has been provided.
- o A early warning/activation system for fast response has been provided.
- o A CO_2 system with 2½ discharge capability has been provided.
- o No potential for water damage/flooding has been introduced.
- o Administrative Controls and Technical Specifications will be developed to control, monitor, supervise this area, and assure the availability of the CO_2 system.
- o A comprehensive inspection and testing program will be developed to ensure the CO_2 system's reliability/operability.

Attachment FP 19-1

HISTORICAL BACKGROUND

JULY 13, 1972	STONE & WEBSTER AND NNECO AGREED TO PROVIDE A TOTAL FLOODING CO_2 SUPPRESSION SYSTEM FOR THE CABLE SPREADING ROOM.
MARCH 13, 1974	MILLSTONE III'S CONSTRUCTION PERMIT IS ISSUED.
SEPTEMBER 30, 1976	NRC REQUESTED REVIEW OF MILLSTONE UNIT NO. 3'S FIRE PROTECTION EVALUATION REPORT TO BTP 9.5-1, APPENDIX "A".
JUNE 13, 1977	NORTHEAST UTILITIES SUBMITTED MILLSTONE UNIT NO. 3'S FIRE PROTECTION EVALUATION REPORT TO THE NRC FOR THEIR REVIEW.
FEBRUARY 20, 1980	NORTHEAST UTILITIES REQUESTED NRC COMMENTS PERTAINING TO MILLSTONE UNIT NO. 3'S FIRE PROTECTION EVALUATION REPORT.
OCTOBER 21, 1981	NRC REQUESTED REVIEW OF MILLSTONE UNIT NO. 3'S FIRE PROTECTION EVALUATION REPORT TO BTP 9.5-1, APPENDIX "R".

CO_2 ARRANGEMENT CABLE SPREADING ROOM



9/25/8·
RSW

Attachment II

Probabilistic Safety Assessment of Cable Spreading Room Fires at Millstone Unit No. 3

Probabilistic Safety Assessment of Cable Spreading Room Fires at Millstone Unit No. 3

Detailed analyses of fire induced core melt accident sequences can be found in the Millstone Unit 3 Probabilistic Safety Study (P.S.S.) in Section 2.5. Each critical fire area in the plant was systematically analyzed to determine frequency of loss of safe shutdown systems. For a hypothetical fire to result in core melt the following chain of events must all occur:

- o a fire must be initiated leading to a manual shutdown or automatic scram due to an out of tolerance condition
- o the automatic CO_2 fire suppression system must fail to extinguish the fire
- o there must be a failure of manual fire suppression
- o the fire must then spread to the extent that all cables within the cable spreading room are affected and one entire train of safe shutdown systems is disabled.
- o there must be additional random failures or unavailabilities in the redundant train of safe shutdown systems

It is essential to recognize that there are no fire zones in the Millstone-3 design which by a single fire will damage both redundant trains of equipment and result in core damage. This is why additional random failures (not caused by fire) must also occur. This feature was taken credit for in the P.S.S. analysis of fires.

Table I shows the dominant core melt accident sequences which are initiated by fires, their best estimate (mean) frequency of occurrence, and percentage contribution to total fire initiated core melt frequency. To provide a perspective on the significance of these numbers it is important to note the following overall results of the P.S.S.:

- o The total core melt frequency due to internally initiated events is: 4.5×10^{-5}/yr.
- o The total core melt frequency due to all seismic initiated events is 0.91×10^{-5}*.
- o The total core melt frequency due to all fire initiated events is: 0.48×10^{-5}/yr.

Summation of the total core melt frequency from all causes yields: 5.89×10^{-5}/yr. The fire related core melt frequency amounts to 15.5% of total core melt frequency. The incorporation of a water sprinkler system in the cable spreading room would impact only sequence No. 4 of Table I. It should be noted however that this particular sequence is only 1% of the total core melt frequency. It

*Recently updated from 1.7×10^{-5}/yr as a result of NRC/LLNL review comments.

should also be noted that incorporation of a water sprinkler system does not assure the total elimination of this 1% contributor to the core melt frequency. Two additional factors must also be considered:

- o No matter what the design is, it is not possible to assure perfect reliability in the operation of water sprinkler systems to automatically actuate given the existence of a fire. American Nuclear Insurers reliability data (documented in Appendix 2-K of the P.S.S.) indicates a mean failure rate of local water sprinkler systems as 4.7×10^{-2}/demand.

- o Additionally, given that a local water sprinkler head successfully actuates given the heat from a cable tray fire, it is not possible to assure that the water will extinguish the fire prior to significant damage to the cables. This is because the density and physical location of individual cable trays may prevent the water from reaching a local fire until it has become more general in location.

When one recognizes these facts, it becomes readily apparent that for the specific case of the Millstone 3 cable spreading room there is no significant difference between net reliability of a CO_2 fire suppression system and a water sprinkler fire suppression system when both automatic actuation and overall fire suppression capability are considered.

Summary and Conclusions

Based on insights gained from the Millstone 3 P.S.S., NNECO has concluded the following regarding the merits of CO_2 vs. water sprinkler fire suppression systems in the cable spreading room.

- o Because of the separation of cabling for the redundant trains of safe shutdown systems in the Millstone 3 cable spreading room, a single fire by itself cannot disable redundant trains of safe shutdown systems regardless of which type of local fire suppression system is used.

- o The only way such a fire can result in a core melt accident sequence is if there are additional random failures, human error, or unavailabilities in the redundant trains of safe shutdown equipment.

- o The probabilities of such additional failures is low enough that when combined with the historical frequency of cable spreading room fires, the overall core melt frequency amounts to only 1% of the total core melt frequency.

- o The only way in which addition of a water sprinkler based fire protection system could provide any benefit in core melt risk reduction would be if the water sprinkler system had essentially perfect reliability in actuating and suppressing fires.

- If such perfect reliability were achievable, which is clearly not possible, the maximum impact would be a 1% reduction in total core melt frequency.

- In view of the fact perfect reliability is not achievable the benefits of backfitting a water sprinkler system in the cable spreading room are relatively insignificant.

- In view of the fact that the benefits are relatively insignificant even if the costs were insignificant, conversion to a water sprinkler system could not be justified from value/impact assessment.

- When one realizes that the costs associated with the conversion are in fact significant and substantial it is clearly evident that the impact is not outweighed by the value.

TABLE I

DOMINANT ACCIDENT SEQUENCES CONTRIBUTING TO FIRE INDUCED CORE MELT

Sequence Description	Mean Annual Frequency	Percent Contribution to Fire Core Melt Frequency
1. Fire induced loss of Charging and RPCCW pumps, failure of Water Curtain System and Manual Suppression, RCP Seal LOCA, failure of High Pressure Recirculation	8.E-7	16.7
2. Fire in Switchgear Room, failure of CO_2 Fire Suppression System, failure of Emergency Switchgear, failure of Auxiliary Feedwater, failure of Feed and Bleed (loss of PORVs)	7E-7	14.6
3. Fire in Electrical Tunnels, failure of CO_2 Fire Suppression System, failure of Emergency Switchgear Cables, Failure of Auxiliary Feedwater, failure of Feed and Bleed (loss of PORVs)	6E-7	12.5
4. Fire in Cable Spreading Room failure of CO_2 Fire Suppression System, failure of Auxiliary Shutdown Panel (failure of Manually Sequence Loads onto Emeregency Buses)	6E-7	12.5
5. Fire in Control Room, failure of Manual Fire Suppression, failure of Auxiliary Shutdown Panel (failure to Manually Sequence Loads onto Emergency Bases)	4E-7	8.3

ATTACHMENT [illegible]

NORTHEAST UTILITIES

P.O. BOX 270
HARTFORD, CONNECTICUT 06101
(203) 666-6911

February 20, 1980

Docket No. 50-423
AEC-MP3-204

Director of Nuclear Reactor Regulation
Attn: Mr. Olan D. Parr, Chief
Light Water Reactors Branch #3
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Gentlemen:

Millstone Nuclear Power Station, Unit No. 3
Fire Protection Requirements

In response to R. S. Boyd's letter to D. C. Switzer dated September 30, 1976, Northeast Nuclear Energy Company (NNECO) submitted to the NRC Staff the "Millstone Nuclear Power Station, Unit 3, Fire Protection Evaluation" in June of 1977. This evaluation followed guidelines set forth in Appendix A of Branch Technical Position APCSB 9.5-1 with the results following the form described in "Supplementary Guidance on Information Needed for Fire Protection Program Evaluation". Thus far, the "Millstone Nuclear Power Station, Unit No. 3, Fire Protection Evaluation" has conscientiously been the fire protection engineering and design basis. With unit construction being approximately 33 percent complete, many fire protection design features have already been incorporated. Furthermore, since no additional guidance applicable to our docket has been forwarded, construction continues under the assumption that we comply with fire protection requirements satisfactorily. However, if compliance is not recognized, a timely response is requested to prevent costly backfits and subsequent delays at later, more critical construction stages.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil

W. G. Counsil
Vice President

8002290327