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

July 17, 1990

Docket No. 50-336

Mr. Edward J. Mroczka
Senior Vice President
Nuclear Engineering and Operations
Connecticut Yankee Atomic Power Company
Northeast Nuclear Energy Company
P. O. Box 270
Hartford, Connecticut 06141-0270

Dear Mr. Mroczka:

SUBJECT: REVOCATION OF EXEMPTION FROM 10 CFR PART 50, APPENDIX R, SECTIONS III.G AND III.L FOR CERTAIN FIRE AREAS - MILLSTONE NUCLEAR POWER STATION, UNIT NO. 2 (TAC NO. 65126)

We have reviewed your submittal dated May 29, 1987 transmitting the Updated Fire Hazards Analysis, in which you have described your revised approach to post-fire safe and alternate shutdown for Millstone Unit 2. We have also reviewed your responses to our requests for additional information. Based on our review, we conclude that your post-fire alternate shutdown capability for Millstone Unit 2 meets the requirements of 10 CFR Part 50, Appendix R. Details of this review are provided in the enclosed Safety Evaluation (Enclosure 1).

Your submittal dated May 29, 1987, presented information that precluded the need for exemption from the requirements of 10 CFR Part 50, Appendix R for certain fire areas that was granted by letter dated April 15, 1986. We have reviewed the need for these exemptions and have determined it necessary to grant a revocation of seven of the eight exemptions granted. Therefore, revocation of exemption in seven of the eight areas is granted (Enclosure 2). Following is a summary of the areas:

1. Closed Cooling Water Pump Area (new area - A-13, old area - A-1B)
2. Boric Acid Pumps-Spent Fuel Pool Heat Exchangers (new area - A-12, old area - A-14)
3. Boric Acid Batch Tank-Chemical Addition Tank Area (new area - A-2, old area - A-24) (Partially revoked, certain areas retained)
4. Cable Vault (new area - A-4, old area - A-40)
5. Main Control Room (new area - A-1, old area - A-42)
6. Intake Building (new area - I-1, old area - I-1)
7. Charging Pump Room (new area - A-18, old area - A-9)

The exemption granted on April 15, 1986, relating to the Auxiliary Feed Pump Pit Area (new area - T5B, old area T9) remains in effect.

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Our basis for granting these revocations of exemptions are contained in the enclosed Safety Evaluation (Enclosure 1).

Sincerely,

/s/

Steven A. Varga, Director
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Safety Evaluation
2. Revocation of Exemption

cc w/enclosures:
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Our basis for granting these revocations of exemptions are contained in the enclosed Safety Evaluation (Enclosure 1).

Sincerely,

Steven A. Varga, Director
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Safety Evaluation
2. Revocation of Exemption

cc w/enclosures:
see next page

Mr. Edward J. Mroczka
Northeast Nuclear Energy Company

Millstone Nuclear Power Station
Unit No. 2

cc:

Gerald Garfield, Esquire
Day, Berry and Howard
Counselors at Law
City Place
Hartford, Connecticut 06103-3499

W. D. Romberg, Vice President
Nuclear Operations
Northeast Utilities Service Company
Post Office Box 270
Hartford, Connecticut 06141-0270

Kevin McCarthy, Director
Radiation Control Unit
Department of Environmental Protection
State Office Building
Hartford, Connecticut 06106

Bradford S. Chase, Under Secretary
Energy Division
Office of Policy and Management
80 Washington Street
Hartford, Connecticut 06106

S. E. Scace, Nuclear Station Director
Millstone Nuclear Power Station
Northeast Nuclear Energy Company
Post Office Box 128
Waterford, Connecticut 06385

J. S. Keenan, Nuclear Unit Director
Millstone Unit No. 2
Northeast Nuclear Energy Company
Post Office Box 128
Waterford. Connecticut 06385

R. M. Kacich, Manager
Generation Facilities Licensing
Northeast Utilities Service Company
Post Office Box 270
Hartford, Connecticut 06141-0270

D. O. Nordquist
Director of Quality Services
Northeast Utilities Service Company
Post Office Box 270
Hartford, Connecticut 06141-0270

Regional Administrator
Region I
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, Pennsylvania 19406

First Selectmen
Town of Waterford
Hall of Records
200 Boston Post Road
Waterford, Connecticut 06385

W. J. Raymond, Resident Inspector
Millstone Nuclear Power Station
c/o U. S. Nuclear Regulatory Commission
Post Office Box 811
Niantic, Connecticut 06357

Charles Brinkman, Manager
Washington Nuclear Operations
C-E Power Systems
Combustion Engineering, Inc.
12300 Twinbrook Pkwy
Suite 330
Rockville, Maryland 20852

UNITED STATES
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WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO POST-FIRE ALTERNATE SHUTDOWN (10 CFR 50, APPENDIX R)

FOR

MILLSTONE NUCLEAR POWER STATION, UNIT 2

NORTHEAST NUCLEAR ENERGY COMPANY, ET AL.

DOCKET NO. 50-336

1.0 INTRODUCTION

The licensee for Millstone Unit 2, Northeast Nuclear Energy Co. (NNECO), in a letter dated May 29, 1987, provided an updated evaluation of the plant's compliance with the requirements of 10 CFR 50, Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979." In that submittal, the licensee elected to review the fire protection afforded the plant on a fire area basis. The licensee provided additional information in a letter dated April 22, 1988.

Section 2.0 below contains the staff's evaluation of the licensee's plans for plant shutdown in the event of a fire. Section 2.1 discusses the licensee's general plan for shutdown; Section 2.2 contains an evaluation of the specific details involved in plant shutdown after a fire consistent with that plan; and Section 2.3 contains an evaluation of the licensee's plan for plant shutdown after a fire for those areas requiring alternate shutdown. Section 3.0 contains the conclusions reached after reviewing the licensee's plans. An identification of the fire areas in the Millstone Unit 2 Nuclear Plant is shown in Table 1. The licensee also had earlier proposed eight exemptions which were found acceptable by the staff. Subsequently, the licensee modified seven of the eight exemptions. These modifications have been reviewed and found acceptable by the staff; a detailed discussion of this review is provided in Section 4.0.

2.0 EVALUATION OF PLANS FOR PLANT SHUTDOWN AFTER A FIRE

2.1 Outline of General Plan

In the event of a fire, a loss of offsite power is assumed in accordance with Appendix R criteria, and therefore, the reactor coolant pumps (RCP's) are assumed to be unavailable. During the time period the plant is maintained in hot shutdown, the water in the reactor coolant system (RCS) flows, by natural circulation through the steam generators (SG's). The auxiliary feedwater system (AFWS) pumps provide water to the secondary side of the SG's in order

to cool the RCS. The AFWS continues to cool the RCS until the RCS temperature reaches 300°F. The RCS will be isolated after the start of a fire in order to prevent loss of inventory by maintaining the following valves closed:

(1) Pressurizer vent,
(2) Vessel vent,
(3) LPSI pump suction valves (from loop 2),
(4) Power operated relief valves,
(5) Sample system valves.

The SG's will also be isolated immediately after the start of a fire in order to conserve SG inventory by maintaining the main steam isolation valves (MSIV's), atmospheric dump valves (ADV's), blowdown valves, high pressure drain valves, and sample system valves closed. The ADV's will be opened, as needed, to vent the steam generated in the SG's to the atmosphere.

The shutdown cooling (SDC) system will be used to cool the reactor from 300°F to cold shutdown and to maintain the RCS at cold shutdown. The SDC system utilizes the low pressure safety injection pumps and the shutdown heat exchangers to cool the RCS. The reactor building closed cooling water (RBCCW) system absorbs the heat from the RCS in the shutdown heat exchangers and, in turn, transfers the heat to the service water (SWS) system via the RBCCW heat exchangers. The SWS then rejects the heated water and takes in cool water from Long Island Sound to replace the rejected water.

The service water system also serves to cool the emergency diesel generators (EDG's) via the diesel generator heat exchangers. When the service water system is unavailable, the EDG's are also unavailable and power for plant operation is obtained by feeding power back (back feed) from Millstone Unit 1 in the absence of offsite power.

2.2 Specific Details Involved in Shutdown After a Fire

2.2.1 Reactivity Control

In the event of a fire, the control room operators will trip the plant by inserting the control rods manually if automatic insertion does not occur, thus providing immediate reactivity control. During the cooldown process, before reaching cold shutdown, boron, in the form of a solution of boric acid, would be added to the RCS by the charging pump in order to counteract the added reactivity caused by cooling the RCS. The licensee stated that the changing pump would not be required for this service for as much as 4 hours after the start of a fire and provided further information to substantiate this statement in a letter to the staff dated February 17, 1989.

2.2.2 RCS Inventory Control

The charging pumps will also be used, as necessary, to maintain the inventory of the RCS. Inventory will be ascertained by the level of water in the pressurizer.

2.2.3 RCS Pressure Control

Primary system (RCS) pressure will be reduced by spraying water into the pressurizer by means of the charging pumps. In some instances when the RCS temperature approaches the saturation temperature, the plant operator will need to increase system pressure. The licensee, as noted in shutdown procedures, plans to use the pressurizer heaters for maintaining RCS pressure, as necessary. In the absence of the heaters, the licensee plans to use the charging pumps or HPSI pumps for this purpose.

2.2.4 RCS Heat Removal

The AFWS is used to pump water to either (or both) SG's to cool the RCS in hot shutdown. The ADV's may be used to exhaust the generated steam to the atmosphere when AC power is available. When AC power is not available, the hand wheel may be used to open the ADV manually. Otherwise, steam may be allowed to exhaust via the SG safety valves.

The motor driven AFW pumps (P-9A, P-9B) may be used in the event of available AC power. The turbine-driven AFW pump (P-4) may be used when AC power is not available. Any of the three pumps may be used to feed either (or both) steam generators. The AFW pump turbine receives steam from either (or both) SG's. The AFW pumps normally use water from the condensate storage tank (CST) for SG feedwater. In the event of a fire, the valve from the CST to the condenser is closed to maintain a water supply for the AFWS. An alternate water supply for SG feedwater may be provided from the fire water system via a permanently installed spool piece. The water supply for the fire water system consists of two 245,000 gallon fire water tanks plus makeup to the tanks from the city water system. Refill of a single fire water tank may be accomplished in approximately 8 hours.

The SDC system consists of the low pressure safety injection (LPSI) pumps and the shutdown heat exchangers. The LPSI pumps draw water from RCS loop 2, then pass it through either shutdown heat exchanger X-23A or X-23B where the RCS water is cooled by the RBCCW system. The cooled water is then transferred back into the RCS via any available RCS loop. The SDC system is used to cool the reactor in cold shutdown as long as is necessary during the post-fire period.

2.2.5 Supporting Systems

As noted above, the charging pumps will be used to maintain reactivity control and RCS inventory, and to control RCS pressure. The AFW system is used to cool the RCS to the point at which the SDC becomes operable, i.e., 300°F, after which the SDC continues the cooling process. The RBCCW system is used to cool the SDC system, reactor coolant pump seals, and other components. The RBCCW system, in turn, is cooled by the SWS. In addition, the SWS cools the emergency diesel generators.

2.2.6 Electrical Distribution Systems

Under normal circumstances, the plant shutdown systems may be operated from offsite power sources. In the absence of offsite power, onsite emergency power is available, consisting of two separate, redundant diesel generators. The licensee notes that redundant channel wiring associated with these emergency electrical sources is physically separated. In addition, should the emergency diesel generator be unavailable, power can be backfed to the Millstone Unit 2 buses from Millstone Unit 1.

2.2.7 Instrumentation

The licensee indicated that instrumentation is available to provide indication of the following parameters after a fire:

a. Pressurizer level
b. Pressurizer pressure
c. RCS hot leg temperature
d. RCS cold leg temperature
e. Refueling water storage tank (RWST) level
f. Steam generator level
g. Steam generator pressure
h. Condensate storage tank level
i. Boric acid tank (BAT) level
j. Nuclear instrumentation
k. AFW pump turbine speed
l. AFW pump flow

2.2.8 Bottle-Up Panel (BUP)

The licensee has installed an isolation panel immediately outside the control room in separate fire area A-3 (the East 480V Switchgear room). This panel (the BUP) contains switches which may be manually actuated to remove all control power from the MSIV's, PORV's, ADV's and SG blowdown valves. In the event of a control room fire, the operators actuate these switches, thereby preventing these valves from operating as a result of hot shorts in the cables within the control room. Thus, the RCS and SG's are isolated, thereby preventing loss of coolant from the RCS and SG's.

The cables to the BUP passing through fire area F-1 are wrapped with a material serving as a fire barrier having a 3-hour rating with the exception of those cables passing through the control room. The wall between the control room and area A-3 has a 3-hour rating except for the door which has a 1½-hour rating. This barrier has been found acceptable since its rating is greater than the duration of the maximum anticipated fire.

2.2.9 Fire Shutdown Panel (FSP)

The licensee stated that the FSP contains the controls and instrumentation necessary to maintain the plant in the hot shutdown condition in the event of a fire in the control room. The FSP is located in the 4160 switchgear room (in combined fire area F2) separate from the control room. An operator will use the turbine-driven AFW pump to supply feedwater to SG2 and to provide water to RCS loop 2 by means of charging pump B or C as needed from the FSP.

The instrumentation available at the FSP provides the following indications:

(1) SG2 Level
(2) SG2 Pressure
(3) Pressurizer Level
(4) Pressurizer Pressure
(5) RCS loop 2 cold leg temperature
(6) RCS loop 2 hot leg temperature
(7) CST level

The licensee stated that a determination had been made previously to have the FSP act as the major control point in the event of a fire in several fire areas in the Auxiliary Building in addition to the control room. These areas, which included the Cable Vault and East Penetration Area were combined into one fire area, F-1. Access to the FSP is by key carried by the operators.

2.2.10 Associated Circuits

a. Common Bus Concern

The licensee stated that a review has been made of the trip characteristics of primary and secondary electrical devices which protect power sources for post fire safe shutdown in order to verify proper coordination. The review identified several areas of incorrect coordination. The licensee reviewed these areas and determined that they have no effect on the capability of the plant to shutdown after a fire because operators can return an affected bus to service by manually tripping the breaker for the damaged circuit and by closing the main breaker. Equipment on the affected bus is assumed to be lost until the bus is returned to service.

b. Common Enclosure Concern

The licensee considered equipment and associated cables within a fire area to be subject to fire induced failures unless otherwise justified. In the case of a fire in the area containing the BUP

(Fire Area A-3), it was assumed that the cables within the panels and the associated circuits were within a single fire area. Thus, a fire in fire area A-3 was assumed to have the potential for damaging the BUP and the associated circuits. However, shutdown may be effected from the control room and other independent areas in the event of a fire in area A-3.

c. Spurious Signals

The licensee intends to preclude adverse spurious actions by the following methods:

1) Isolation prior to a fire is to be accomplished by opening of designated circuit breakers for the following equipment:

- Loop 2 Steam Supply Isolation Valve to the AFW Pump Turbine
- MSIV Bypass MOVs MS-65A and B

2) Isolation of control circuits in the event of a fire is to be accomplished by transfer or isolation switches for the following equipment:

- Charging Pump B and C,
- Auxiliary Spray Valve,
- Charging Line to Loop 2A Valve,
- Charging Pump Header Discharge Valve,
- Atmospheric Dump Valves,
- Blowdown Isolation Valves,
- MSIV's,
- SG 2 Auxiliary Feedwater Reg. Valve,
- Power Operated Relief Valves (PORVs),
- Steam Admission Valve to AFW Pump Turbine,
- Auxiliary Feedpump Turbine Governor,
- Regenerative HX to Letdown HX Isolation Valve.

3) In some instances, spurious signals are cleared by opening circuit breakers for DC power in the fire area.

4) Where spurious operation has occurred, procedures are established to defeat the maloperation of equipment by opening respective circuit breakers and manually operating the valves.

2.2.11 Hi-Lo Pressure Interfaces

a) Letdown line

The letdown line contains three motor-operated valves in series. These valves fail closed on loss of power. Simultaneous hot shorts on the three valves in series would be required to cause

the downstream portion of the line to be open to RCS pressure. This is highly unlikely and is not considered credible. In addition, the line contains passive pressure reducing features.

b) Pressurizer Vents

The pressurizer is vented through two parallel two-inch vent lines each containing two solenoid-operated valves which fail closed on loss of power. The operators will deenergize the dc power to these valves in the event of a fire prior to loss of significant amounts of reactor coolant.

c) Reactor Head Vents

The discussion in paragraph b, immediately above, also applies to the reactor head vents.

d) PORV's

Fires in several areas can affect the operation of the PORV's and associated block valves. In the event of fires in areas A-5 or A-6, hot shorts can be prevented or cleared by throwing the bottle-up panel switches. In the event of a fire in combined fire areas F-1 and F-2 and in fire area C-1, the operators are required to throw the bottle-up panel switches once a fire has started in order to eliminate hot shorts in the PORV and block valve control circuits, thereby preventing these valves from opening, thus helping to maintain RCS inventory.

In fire area A-3, which contains the bottle-up panel, PORV cables may be affected by hot shorts. In this case, the positive cables in the bottle-up panel or associated conduits are deenergized in the control room to prevent the occurrence of hot shorts which could result in opening a PORV.

e) Shutdown Cooling (SDC) System

The SDC suction line, common to both LPSI pumps, contains two closed motor-operated valves and one closed manual valve. The manual valve is not affected by a fire, thereby precluding a hot short from causing a high/low pressure interface concern. The four LPSI discharge lines each have a check valve as do the two LPSI pump discharge lines, thus preventing backflow from the RCS from damaging the SDC system.

f) Sample System

The primary sample system consists of a series of 3/8 inch lines. Each sample connection may be isolated by means of two normally open manual valves and one normally closed air-operated

valve (AOV). The sample points include the pressurizer steam space, the pressurizer surge line and RCS loop 1 hot leg. There is also an air-operated valve common to all three sample points which can serve to shut off all the sample points in the event one or more of the AOV's fails to isolate one or more sample points.

In the event of a fire in combined area F-1 and F-2, these valves would be subject to hot shorts. However, tripping Z-1 and Z-2 power to panel C-7 would isolate the sample points.

2.2.12 High Impedance Faults

The licensee conducted a circuit coordination study which did not address the affect of multiple high impedance faults. The licensee stated that, the continuance of limited fault currents over a period of time is unlikely as a fire would continue to degrade the cable insulation leading to higher currents. In most cases, breaker or fuse rating is a small fraction of bolted fault current and 2 to 3 times the normal current. Therefore, impedance faults resulting in individual fault currents below the breaker trip point would be difficult to achieve. In addition, cables are contained in grounded metal raceways and are near conductors of opposite polarity or different phase. Thus, it is more likely that faults will occur with raceway or nearby conductors causing the current to grow rapidly so as to trip the breaker rather than a local fault developing in the insulation which causes a small fault current to develop.

Despite the above, however, the licensee has considered the capability to recover from potential high impedance faults. The licensee stated that guidance is provided to the operators to enable them to bring back required circuits by manually tripping unnecessary loads and closing the main breaker.

2.2.13 Transfer Switches

In the event of a fire in the control room which requires evacuation of personnel, power is transferred to the Fire Shutdown Panel (FSP) located in the Z-2 4160V switchgear room. The FSP may also be used in the event of a fire elsewhere in combined fire area F-1 containing the control room. The FSP is powered by a separate, dedicated power supply. Cables for this and other systems operated by the FSP are protected by 3-hour barriers when passing through fire area F-1.

2.2.14 Ventilation Systems

The licensee evaluated the need for ventilation system operation in the event of a fire. The licensee determined the plant equipment needed for shutdown after a fire in a given area, the ventilation

requirements for each system, and the availability of such ventilation. Where ventilation was not available, the licensee calculated the maximum ambient temperature in each area without ventilation and concluded, in those cases, that the equipment required for post-fire safe shutdown would not be adversely affected by the resulting temperatures.

The licensee indicated that the following areas and/or equipment were under evaluation:

Z-1 4160 Volt Switchgear,
Z-2 4160 Volt Switchgear,
Z-1 480 Volt Load Center,
Z-2 480 Volt Load Center,
Z-1 DC Equipment Room,
Z-2 DC Equipment Room,
"A" Diesel Generator Room,
"B" Diesel Generator Room
Control Room, and
A & B LPSI Pump Rooms

The staff requested that the licensee investigate the following areas to determine whether necessary equipment would remain operable in the event ventilation was not available:

1. Closed Cooling Water Pump Area
2. HPSI Room
3. Charging Pump Area
4. 480 Volt MCC B-61
5. Z-1 Battery Room
6. Z-2 Battery Room
7. Cable Vault (Spreading Room)
8. Air Handling Units
9. Ventilation Equipment Room
10. DC Switchgear Room
11. Motor Driven AFW Room
12. Turbine Driven AFW Room
13. Cable Vault West
14. Cable Vault East
15. Intake Structure

In areas where ventilation was expected to be unavailable after a fire, the licensee calculated the expected temperature and reported the results of such calculations. In almost all cases, the temperatures in the unventilated areas were lower than the limit specified by the licensee with the exception of the Z-2 DC equipment room, the turbine driven AFW pump room, and the cable vault east. The licensee ascertained that the only safety related electrical component in the TD AFW pump room is the steam admission valve

(SV 419) with the limitorque operator. The valve fails open and once open the valve no longer needs to be operated. In the other two areas, the licensee showed that the slightly elevated temperature will have a negligible effect upon operation of the equipment in the room.

The licensee concluded that environmental conditions within these areas would be within satisfactory bounds to assure operability of required post-fire shutdown equipment.

2.2.15 Procedures for Shutdown

The licensee has prepared a series of procedures to deal with shutdown in the event of a fire in the various fire areas. The procedures for each area are divided into two parts, one part for hot standby and one for cold shutdown. Specific post-fire procedures for hot standby have not been prepared for fire areas A-14, A-15, A-18, T-5 and the yard. Procedures have not been prepared for cold shutdown for fire area T-5 and for the yard. The licensee noted that the operators will utilize normal shutdown procedures in some of these areas while shutdown is not affected by a fire in the remaining areas.

Each procedure contains several sections. The first is entitled "Objective" which discusses the purpose for which the procedure was written. This is followed by a section entitled "Entry Conditions" which describes the initial conditions to be expected in the event of a fire in that specific area. Then there is a "Precautions" section which details the precautions to be taken in carrying out the tasks required to bring the plant to the condition for which the procedure has been written. Next, a section entitled "Operator Actions" details the actions to be carried out to bring the plant to the desired state.

2.2.16 Number of Operators Specified for Shutdown

The licensee noted that a normal shift includes seven operators. In the event of a fire, three of these operators would be assisted by two from Millstone Unit 1 to form the fire brigade. Two control room operators, assisted by two plant equipment operators would form the team necessary for operation of equipment required for shutdown after a fire.

2.2.17 Fire Shutdown Panel Testing

The licensee noted that the controls and instrumentation on the Fire Shutdown Panel are tested periodically. There are twelve surveillance procedures used to test the FSP instrumentation with a periodicity of approximately one year. Testing of most controls is planned for each refueling shutdown.

2.2.18 Diesel Fuel Supply

The fuel supply for the emergency diesel generators (EDGs) is contained onsite in two supply tanks (one for each EDG) and one main storage tank. One supply tank has sufficient fuel to operate one diesel generator for seven days in the event of a fire. Additional fuel can be provided from neighboring areas, as necessary, in the event the onsite supply needs replenishment.

2.2.19 Cold Shutdown Repairs

The licensee stated that spare parts required for cold shutdown repairs following postulated fire damage in fire area A-2, A-3, A-12 and A-13 (all contained within combined fire area F-1 with the exception of separate fire area A-3) are available on site. In addition, the licensee stated that procedures had been completed for equipment repair in these areas.

2.2.20 72-Hour Cold Shutdown Capability

Section III.L of Appendix R requires that cold shutdown be achieved within 72 hours following a fire in those areas which require an alternate shutdown capability. These areas are discussed below. The licensee indicated that for a fire in these areas, the shutdown cooling system can be made operable and cold shutdown attained within 72 hours. The staff confirmed this capability in a previous inspection of Millstone Unit 2 (Inspection Report No. 50-336/87-16).

2.3. Alternate Shutdown

The fire areas requiring alternate shutdown are the following:

1. Combined fire area F-1
2. Combined fire area F-2
3. Combined fire area F-3
4. Fire area A-5
5. Fire area A-6
6. Fire area A-3
7. Fire area T-2
8. Fire area C-1
9. Fire area I-1

A detailed discussion of shutdown after a fire for the above fire areas is provided below:

2.3.1 Combined Area F-1

(Fire areas A-1, A-2, A-4, A-8, A-11, A-12, A-13, and A-16)

Fuel Handling Area, Maintenance Shop Areas, Enclosure Building, HVAC Area, Cable Vault, Coolant Tanks Area, Boric Acid Recovery (EL. 5'

-0") Area, Reactor Building Closed Cooling Water Pump Area 1, Spent Resin Shipping Area and East Penetrations Area.

In the event of a fire in the control room (contained within fire area A-1) or in other parts of combined fire area F-1, the operators move to the Fire Shutdown Panel (FSP) which is in a separate fire area (combined fire area F-2) in order to control shutdown of the plant. The operators close the MSIV's, PORV's, ADV's and SG blowdown valves by means of the kill switches at the bottle-up panel (BUP) immediately outside the control room in separate fire area A-3 in order to maintain primary and secondary system fluid inventories. The BUP switches are used to prevent "hot shorts" which could cause any of these valves to open.

A fire in area F-1 could cause loss of the control/instrument cables to all three service water (SW) pumps, and loss of power cables to all three RBCCW pumps. In addition, the RBCCW pump motors may become damaged requiring replacement of one motor and one power cable. Once the BUP switches have been thrown, the operators proceed to trip all DC power except that needed for the FSP and vital AC panel VA-20. Thereafter, the operators proceed to transfer operation to the FSP. Vital AC panel VA-20 receives power from the DC power supply by means of an inverter which converts the DC to AC.

The licensee identified these and other necessary actions in an "Activity Matrix." The Activity Matrix identifies the activities required after a worst case fire in chronological order, and includes the objective and reason for each activity, the location and any abnormal route necessary for accomplishment of the activity, the time constraints required for each activity, and any communication or special consideration reqired for completion of the specified activity.

In area F-1, the hypothetical worst case fire could result in inoperability of all three SW pumps, as noted above. This would, in turn, result in inoperability of both emergency diesel generators (EDG's) because of the inability to cool the EDG water jackets by means of the service water system. Considering the loss of offsite power in conjunction with the fire, AC power would not be directly available to Unit 2. In such a case, power may be backfed from Millstone Unit 1 to Millstone Unit 2 via bus 24F to buses 24D and 24E.

After the fire starts the turbine driven (TD) AFW pump is used to attain and maintain a hot standby condition. RCS water flows through SG 2 by natural circulation where it is cooled. Power is not needed as long as the plant remains in a hot standby condition and does not require use of the charging pump or other AC powered equipment. AC power is provided, as necessary, by the Unit 1 backfeed for the charging pump,

the shutdown cooling (LPSI) pump, and necessary supporting systems which include the RBCCW system and service water system (SWS). Restoration of AC power may be delayed for as long as four hours.

A worst case fire in combined fire area F-1 may result in damage to all three RBCCW pumps (noted above), requiring replacement of an RBCCW pump motor and cable (from bus 24E or 24D to the pump motor). Replacement of a shutdown cooling pump (LPSI) power cable may also be required.

The licensee intends to use charging pump C when AC power becomes available (pump B may be used if aligned to Z-2 power after backfeed) to maintain the reactor coolant level and to add boron to the RCS to control reactivity. Most of the boron will normally be added during the cooldown process. The boron concentration in the RCS will be determined by withdrawing samples from the RCS. When samples are not available the plant operators will calculate the RCS boron concentration.

The licensee's activity matrix for fire area F-1 shows a delay of as much as 4 hours in providing AC power to Unit 2 via the backfeed from Unit 1. This results in an equivalent delay in unavailability of a charging pump for use in maintaining RCS inventory. In addition, the licensee indicated that the RBCCW and SW systems are needed only to support the shutdown cooling, therefore, replacement of an RBCCW pump motor and power cable is delayed in the activity matrix until needed for SDC system initiation - well along in the post-fire shutdown process. No consideration is shown for any need to initiate an RBCCW train for RCP seal cooling.

The licensee provided information to show that injection of water into the RCS by a charging pump is not required for the first four hours after a fire. This is based upon an analysis conducted by the licensee in which a loss of water from the RCS at a rate of 15 gpm was assumed. This leak rate is in excess of that allowed by the technical specifications (10 gpm identified leakage, 1 gpm unidentified leakage) because it also included 1 gpm leakage for each RCP seal. The analysis assumed that decay heat would be removed by use of SG2 with feedwater supplied by means of the AFW TD pump. The steam generated by this process is assumed to pass into the atmosphere through the SG safety valves. The licensee noted that sufficient RCS inventory is available to permit operation in this mode for at least 3½ hours. The staff finds the time delay for RCS makeup of 4 hours acceptable based upon the conservatism in the assumption of an RCS coolant loss of 15 gpm in lieu of the technical specification limit of 11 gpm.

The licensee also provided information relating to the integrity of the RCP seals in the event of a loss of cooling. In two separate events, seal cooling which is effected by means of the RBCCW system,

was lost for 6 hours on RCP B and for 9 hours on RCP D without unacceptable degradation since the pumps were operated satisfactorily thereafter for approximately three months. The seals were subsequently examined and replaced during the next refueling period.

The staff is evaluating RCP seal integrity on a generic basis under Generic Issue 23. Pending resolution of this generic issue, the staff considers the licensee's proposed delay in instituting RCP seal cooling for as long a period as necessary to initiate SDC operation for cold shutdown to be acceptable. The licensee will be required to effect RCP seal cooling in accordance with the resolution of GI 23 once that issue is resolved. Therefore, the staff finds the licensee's plan for plant shutdown after a fire in area F-1 to be acceptable.

2.3.2 Combined Fire Area F-2

(Fire Areas A-7, A-17, and T-3)

West Penetrations Area, MCC B61, and Z-2 Switchgear Room and Cable Vault

In the event of a fire in fire area F-2, shutdown would be effected by means of equipment in fire area F-1.

A fire in area F-2 is assumed to cause loss of electric driven AFW pump 9B and the turbine driven AFW pump. AFW motor driven pump 9A would be used to cool the reactor. Several valves could fail open including the atmospheric dump valve (ADV) for the SG 2 train, the MSIV on both SG trains, one PORV, and the SG blowdown valves. These are closed by removing power at the bottle-up panels. Some instrumentation fails but the following instrumentation is available in the control room:

(a) one pressurizer level channel
(b) two pressurizer pressure channels
(c) two reactor system cold leg temperature channels
(d) two hot leg temperature channels
(e) three RWST level channels
(f) two SG 1 level channels
(g) two SG 2 level channels
(h) two SG 1 pressure channels
(i) two SG 2 pressure channels
(j) a local gauge for CST level
(k) two wide range nuclear instrument channels

Support equipment includes service water pump 5A (pump 5B may be used if bus 24E is powered from bus 24C), LPSI pump 42A, charging pump 18A (pump 18B may be used if powered from MCC B-51), and RBCCW pump 11a.

The licensee indicated that initiation of charging pump operation may be delayed for as long as 4 hours. This is acceptable as noted above in Section 2.3.1. In addition, the licensee plans to use the RBCCW system only as part of the SDC system; therefore, it would not be available for RCP seal cooling during the early post-fire period in the hot standby mode. The staff finds this to be acceptable as discussed in Section 2.3.1, above. Therefore, the staff finds the licensee's plan for plant shutdown after a fire in area F-2 to be acceptable.

2.3.3 Combined Fire Area F-3

(Fire Area T-1, T-5A, and Unit 1 Fire Area T-9)
Turbine Hall, Electric Auxiliary Feedpump Pit, and Service Building

The potential exists for a fire in area F-3 to damage the power cables and control/instrument cables for all three service water pumps, and to damage both electric motor driven AFW pumps. Loss of the service water pumps would, in turn, result in loss of both emergency diesel generators because of the inability to cool the diesel water jackets. Under the assumption of loss of offsite power, AC power for Unit 2 is provided by backfeed from Unit 1 to the Unit 2 Z-1 train. The turbine driven AFW pump would be used to cool the plant to hot standby and then to initiate the cooldown process. Power backfeed requires that the fire be out in combined area F-3 so that the 4160V switchgear rooms, which are inaccessible during a fire, can be entered to realign breakers to permit backfeed.

In a letter dated February 29, 1988, the licensee requested an exemption from the requirement of Appendix R (Section III.G.2) which specifies a minimum separation of 20 feet for redundant train components in the absence of separating fire barriers for the two AFW discharge valves (2FW43A and B) because they are separated by only 15 feet. The licensee provided justification for the existing configuration which showed both valves could not fail in a single fire. The staff found the licensee's basis for such conclusion acceptable and granted the exemption in a previous safety evaluation, dated April 15, 1986.

The licensee noted that the CST contains sufficient water for 10 hours of operation of the AFW system. After this period the licensee proposes to use the firewater system to provide additional water for the AFW system. The licensee also plans to use the backfeed power provided to Unit 2 Z-1 power train for charging and for cold shutdown by powering the SDC system and the associated SW and RBCCW pumps. Since cables to all SW pumps could be lost from a fire in this area, cables to SW pump 5A (or pump 5B if it is aligned to the Z-1 power bus) must be replaced. One of the three RBCCW pumps and one of the three charging pumps will be available following a fire in area F-3 once power is restored.

The licensee's activity matrix for fire area F-3 shows that power backfeed from Unit 1 may take as long as 4 hours. This will delay reestablishing RCS inventory by means of a charging pump for that period. This delay is found to be satisfactory as discussed previously in section 2.3.1, above. The licensee also proposes a delay in repair of one SW train and in initiation of an RBCCW train until they are required for shutdown cooling (cold shutdown). This delay is also acceptable as discussed in Section 2.3.1, above. Therefore, the staff finds the licensee's plan for shutdown after a fire in fire area F-3 to be acceptable.

2.3.4 Fire Area A-5

Z-1 DC Equipment and Battery Room "A"

In the event of a fire in area A-5, the potential exists for the Z-1 emergency diesel generator and electrical distribution system to be lost. When this is coupled with postulated loss of offsite power, the Z-2 electrical distribution system remains to provide necessary shutdown functions. Some valves as noted below, require manual action in order that safe shutdown may be properly effected:

	Valve	Action Required
1)	PORV (2-RC-402) opens spuriously	Deenergize power at bottle-up panel to close valve
2)	SDC Suction Isolation Valve (2-SI-651) - closed	Valve must be opened manually to initiate SDC system operation
3)	LPSI Miniflow Line Valves (2-SI-659 and 2-SI-660) fail open	At least one of the valves must be closed (both are in series) to optimize SDC flow through heat exchanger
(4)	Valve on Charging Line to Loop 2A (2-CH-518) - fails open	Valve must be closed to allow auxiliary spray to function in parallel train

The activity matrix for fire area A-5 shows that charging pump operation is to be initiated within a period of 4 hours after the start of a fire, and the RBCCW and SW systems are to be initiated only when the SDC system is put into operation (after the RCS temperature is lowered to 300°F). The staff finds the licensee's plan to effect shutdown in the event of a fire in area A-5 to be acceptable, as discussed previously.

2.3.5 Fire Area A-6

Z-2 DC Equipment and Battery Room "B"

A fire in area A-6 may cause loss of the Z-2 emergency diesel generator and the Z-2 electrical distribution system. In the absence of offsite power, safe shutdown is accomplished by utilizing the Z-1 emergency diesel and Z-1 electrical distribution system. Some valves may require manual operation in order to attain cold shutdown. PORV RC-404 must be closed at the bottle-up panel in order to prevent loss of primary coolant.

The licensee confirmed the initiation of charging within 4 hours for fire area A-6. The SW and RBCCW systems are initiated when the SDC system is required. The staff finds the licensee's plan to effect safe shutdown in the event of a fire in area A-6 to be acceptable, as discussed previously.

2.3.6 Fire Area A-3

East 480V Switchgear Room

The licensee states that a fire in Area A-3 has the potential to damage the 480V switchgear for the Z-2 train and the feeder cable from the "A" emergency diesel to the Z-1 train. Coordination problems with the 480V Z-2 switchgear could also cause loss of the Z-2 4160V switchgear.

Thus, in the event of loss of offsite power, normal emergency AC power would not be available to shutdown the plant. The turbine driven AFW pump would be used to attain and maintain hot standby. AC power will be provided by backfeed from Unit 1 to the Unit 2 Z-1 4160V switchgear, or by tripping the 480V loadcenter feeder breaker and reclosing the diesel feeder breaker from the control room to return the Z-2 4160V bus to service. Power can then be fed back to the Z-1 system through bus 24G. After 8 hours, the DC-3 battery charger is aligned to the Z-2 battery in order to prevent discharge of the battery. Before initiating operation of the SDC system, it may be necessary to run a repair cable from the 4160V switchgear to the available LPSI pump. As discussed previously, it may take as long as 4 hours to provide backfeed power from Unit 1 to Unit 2 while the RBCCW and SW systems are started for SDC operation. As discussed previously, the staff finds the licensee's plan to effect safe shutdown in the event of a fire in area A-3 to be acceptable.

2.3.7 Fire Area T-2

West 480V Switchgear Room

Fire Area T-2 contains the Z-1 480V switchgear and the Remote Shutdown Panel (RSP). The RSP contains controls for some required shutdown

systems which cannot be isolated from those in the control room. Therefore, hot standby is maintained by using the FSP to control the turbine driven AFW pump which provides feedwater to SG 2 to cool the RCS. The feedwater level in SG 2 can be controlled by means of feedwater discharge valve, 2-FW-43A either from the control room or by means of the hand wheel on the discharge valve. SG 1 can also be used for cooling the RCS with the water level in SG 1 controlled by the auxiliary feedwater bypass valve, 2-FW-56A. Charging pump 18C will be available for use at the FSP or charging pump 18B may be used by connection to the Z-2 power source. In order to maintain the RCS inventory, the operators will close the PORV's at the bottle-up panel to prevent spurious signals which may cause them to open. Initiation of the RBCCW and SW systems is delayed until required for shutdown cooling. Therefore, the staff finds the licensee's plan to effect shutdown after a fire in area T-2 to be acceptable as discussed previously.

2.8.8 Fire Area C-1

Containment

Fire Area C-1 contains the valves that serve as interfaces between the RCS and systems designed for low pressure (high-lo pressure interfaces). Specific means of protection for these interfaces in the event of a fire is discussed in Section 2.2.11, above. In the event of a fire in Area C-1, the operator is instructed first to operate the "kill" switches at the bottle-up panel to remove power from the PORV's, thus preventing their spurious operation and loss of primary coolant. The operator then trips all DC power except that required for diesel generator operation, 4160V and 480V breaker control and turbine driven AFW pump control. The AFW pump is used to maintain the plant in hot shutdown and then to cooldown the plant to 300°F. The SDC system is used to cool the plant from this point to cold shutdown. The operations to ensure shutdown are conducted from the control room once RCS isolation is assured, except for those valves requiring manual isolation. Again, the activity matrix for this fire area indicates that the RBCCW and SW systems will be used once shutdown cooling conditions are attained. The staff finds this acceptable as discussed previously. Therefore, the staff finds the licensee's plan to effect shutdown after a fire in area C-1 to be acceptable.

2.3.9 Fire Area I-1

Intake Structure

A fire in Area I-1 could cause loss of all the service water pumps which would result in loss of the emergency diesel generator and associated AC power if loss of offsite power is postulated. For this case, the turbine driven AFW pump will be used to maintain hot

shutdown. Power required to operate a charging pump (18C) will be provided by backfeed from Unit 1 to the Z-2 train. SDC system pumps on the Z-2 power train will be used for cold shutdown. Prior to shifting RCS cooling operation from the AFW turbine driven pump, it will be necessary to replace one SW pump motor and SW pump motor cable before the RCS temperature reaches 300°F. Once that has been done cooldown may proceed by means of an RBCCW pump (11C), an SDC pump (42B) and an SW pump (5C). Therefore, the staff finds the licensee's plan to effect safe shutdown after a fire in area I-1 to be acceptable, as discussed previously.

3.0 Conclusions

The staff has reviewed the licensee's plans for shutdown after a fire and has concluded that the general plan (Section 2.1) and specifics of that plan (Section 2.2) are acceptable. The staff has also reviewed the licensee's detailed plans for alternate shutdown in areas F-1, F-2, F-3, A-5, A-6, A-3, T-2, C-1, and I-1 and has concluded that they are consistent with the criteria of Sections III.G.3 and III.L of Appendix R and are, therefore, acceptable.

4.0 Exemptions

The licensee requested a number of exemptions from the post-fire safe shutdown criteria of Appendix R. Eight exemptions were granted by the staff in a letter to the licensee dated April 15, 1986. Subsequently, the licensee modified seven of the eight granted exemptions in the updated compliance review of May 29, 1987. These modifications and their effect on the safe shutdown capability are discussed below. For completeness, the exemption which was not changed is also included in the discussion.

4.1 Fire Area A-13 (A-1B)*, included in combined fire area F-1; RBCCW Pump Area

*Area enclosed in parentheses indicates old fire area designation as proposed and discussed in staff SER of April 15, 1986.

Proposed Modifications:

Provide a 1-hour fire rated enclosure for charging pump cables (train B and B-swing) and install a marinite board around the train A RBCCW pump and motor as a radiant energy shield in lieu of replacing the motor.

The above modifications were proposed by the licensee instead of providing an automatic suppression system. The staff, in the SER dated April 15, 1986 approved the exemption on the basis of the proposed modifications. Subsequently, the licensee noted in the updated compliance review of May 29, 1987 that 3-hour protection was

afforded the cables for the charging pumps. This eliminates the need for an exemption for charging pumps B and B-swing since the 3 hour protection complies with the requirements of Section III.G.2.a of Appendix R.

The licensee also chose not to erect the marinite shield around the RBCCW pump and motor thus invalidating the original exemption. Therefore, a RBCCW pump will no longer be available without repair or replacement of the pump motor. As noted previously, the staff has concluded that the licensee's justification that an RBCCW pump is not needed for hot shutdown is satisfactory based on their evaluation of acceptable RCP seal integrity without cooling. Therefore, the proposed cold shutdown repair/replacement of the RBCCW pump motor and the proposed elimination of the marinite shield are acceptable, and in accordance with the criteria of Section III.G.1.b of Appendix R.

In addition, the licensee wrote repair procedures and has provided spare cables for the LPSI (SDC) pumps in lieu of providing a wet pipe sprinkler system between the LPSI cable trays. This invalidates the previously granted exemption. The licensee's action limits the LPSI cable repair and subsequent use of the pump to the cold shutdown phase. The staff finds this to be acceptable since a LPSI pump is required only for shutdown cooling in cold shutdown.

Based on the foregoing, the staff concludes that an exemption is no longer needed from the rquirements of Appendix R for fire area A-13.

4.2 Fire Area A-12 (A-14) included in combined fire area F-1, Boric Acid Pumps - Spent Fuel Pool Heat Exchangers.

Proposed Modifications:

1. Charging pump A and A (swing) cables which run parallel to the diesel B cables in this area will be rerouted outside the fire area.

2. The vertical run (from ceiling to floor) of charging pump A and A (swing) cables remaining in the area will be enclosed in a 1-hour fire barrier. A marinite board radiant energy shield will also be installed around this cable run.

The proposed modifications, together with the existing fire protection were found to be acceptable by the staff in the April 15, 1986 SER as an exemption from the requirement for an area wide automatic fire suppression system. However, in lieu of the proposed modifications, the licensee rerouted the power cables for the B (swing) charging pump outside of the fire area. This invalidates the original exemption and eliminates the need for any further exemption for fire area A-12 since

the rerouting meets Appendix R, Section III.G.2 separation criteria and makes the B (swing) charging pump available throughout the post-fire shutdown period in the event of a fire in this area.

4.3 Fire Area A-2 (A-24), included in combined fire area F-1, Boric Acid Batch Tank and Chemical Addition Tank Areas.

Proposed Modifications:

1. Reroute Diesel B cables which run along the hallway in close proximity to Diesel A cables outside this fire area.

2. Install a water curtain in the west end of fire area A-24 to segregate remaining Train B cables and motor control center from Train A cables.

3. Enclose Train B cables which pass through the water curtain in a 1-hour barrier.

4. Provide sprinkler protection for the Train B cables which pass through the water curtain.

The licensee proposed the above modifications in lieu of providing an area wide suppression system. This exemption was found to be acceptable by the staff in the April 15, 1986 SER.

The licensee subsequently reported the following relating to the proposed modifications:

(1) The Diesel B cables were not rerouted; instead, the licensee chose to rely upon backfeed from Unit 1 for AC power (this resolves modification 1, above).

(2) The automatic water curtain was installed as a water spray on the environmental enclosure for MCC B61, resolving modification 2, above.

(3) The B train cables which would have passed through the automatic water curtain were either rerouted or were wrapped in a barrier providing 3-hour protection from a fire in lieu of a 1-hour wrap. The automatic water curtain was installed to protect MCC B 61 and to segregate some B train cables which do not pass through the water curtain. Finally, some of the B train cables designed to pass through the water curtain were rerouted; those passing through were wrapped with a 3-hour barrier in lieu of a 1-hour barrier plus sprinkler protection (this resolves modification 3 and 4, above). Therefore, area A-24 complies with the requirements of Section III.G.2 of Appendix R and does not require an exemption from this standard.

The change noted in item (1) above in not rerouting the diesel cables, invalidates the exemption for Diesel B and assumes that emergency diesel power will not be available during the post-fire period in this area. The concept of power feedback from Unit 1 to Unit 2 as a substitute for emergency AC power was found acceptable by the staff in the April 15, 1986 SER. Further details relating to the implementation of the backfeed method are discussed above in Section 2.3.1 for combined fire area F-1 which contains this fire area.

The change noted in item (2) above indicates that an exemption is no longer necessary for those cables being rerouted and for those wrapped with a 3-hour barrier since they comply with the requirements of Section III.G.2 of Appendix R.

4.4 Fire Area A-4 (A-40), included in combined Fire Area F-1 - Cable Vault

Proposed Modifications:

(1) Extend automatic wet-piped sprinkler system to include diesel power cables Train A.

(2) Provide passive, 1-hour fire barriers between redundant trains of safe shutdown cables at the cross over points.

The staff in the April 15, 1986 SER approved the above exemption on the basis of the proposed modifications.

In the updated compliance review of May 29, 1987, the licensee stated that none of these modifications were required. Instead the licensee stated that backfeed of AC power from Unit 1, utilization of the fire shutdown panel and fire protection of selected cables by 3-hour barriers eliminated the need for these modifications. This change invalidates the exemption relating to the diesel since the licensee will now rely on power provided by means of backfeed from Unit 1 which was previously approved as noted above.

The provision of 3-hour barriers for wrapping of selected cables eliminates the need for an exemption for these cables since a 3 hour barrier complies with the provisions of Appendix R, Section III.G.2.

4.5 Fire Area A-1 (A-42) included in combined fire area F-1 - Main Control Room

Proposed Modifications:

1. A transfer scheme utilizing a Wiedmuller Test Block (or equivalent) will be installed to isolate required instrumentation from the control room and redirect the instrumentation signals to the new remote Fire Shutdown Panel.

2. Disconnecting devices for the pressurizer PORVs, main steam isolation valves, atmospheric dump valves, and SG blowdown valves control circuitry will be installed to assure closure of these valves during a control room fire.

3. The Millstone Unit 1 - Millstone Unit 2, 4-kV cross-feed bus will be modified to facilitate the alignment of Unit 1 emergency AC power to the Unit 2 emergency buses.

4. Manual/air operated valves to provide RCS level and pressure control for cold shutdown will be installed in the charging and auxiliary spray flow paths.

5. The pressurizer and reactor head vent control circuits will be modified to protect against hot shorts in the event of control room fires.

6. A remote Fire Shutdown Panel (FSP) will be installed in Fire Zone T8.

7. Procedures to assure the following will be developed:

   a. Capability to achieve safe shutdown with the loss of equipment in any one of the two control room fire zones.

   b. Spurious operation of affected equipment can be compensated for using alternate systems and manual actions.

   c. Actions being taken outside the control room are achievable considerating a fire in the control room, time needed to accomplish the function, and manpower required.

In the April 15, 1986 SER, the staff approved an exemption from the requirements of Sections III.G.2, III.G.3 and III.L of Appendix R for the control room based upon the existing fire protection and the implementation of the proposed modifications.

In the May 29, 1987 Compliance Review, the licensee revised the previous approach to safe shutdown which was based upon the assumption of loss of some panels in the control room to a loss of all panels. Under this assumption, the licensee will rely on use of the Fire Shutdown Panel (FSP), installed in Fire Area T-3 (included in combined Fire Area F-2) for safe shutdown after a control room fire in accordance with Sections III.G.3 and III.L of Appendix R. The licensee also installed the bottle-up panel outside of the control room to ensure reactor coolant system and SG isolation so as to maintain RCS and SG coolant inventories. The FSP will utilize the AC power backfeed from Unit 1 to power certain required shutdown equipment. These changes invalidate the original exemption and eliminate the need for an exemption for this area since the licensee intends to utilize the FSP and the power backfeed from Unit 1 which satisfies the criteria of Appendix R, Section III.G.3 and III.L.

4.6 Fire Area I-1 (I-1), Intake Building

Proposed Modifications:

1. Enclose/wrap all cabling/conduit associated with service water pump train "A" with a 1 hour rated fire barrier.

2. Provide dike/curbing around Service Water Pump A.

3. Install an automatic water curtain spray system around Service Water Pump A.

The staff in the SER dated April 15, 1986 found the licensee's request for an exemption from the requirements of Section III.G.2 of Appendix R to be acceptable on the basis of the proposed modifications.

The licensee in the updated compliance review of May 29, 1987 stated that none of the proposed modifications had been accomplished. Rather, the licensee will rely on backfeed of AC power from Unit 1 for provision of power to Unit 2 in lieu of providing a Unit 2 SW pump to cool a Unit 2 emergency diesel generator.

The licensee noted that one SW pump motor and power cable would need to be replaced in order to have one SW train operable. Since such a repair is not postulated as being necessary during the hot standby period, the motor replacement is accomplished for cold shutdown and, therefore, the SW system is unavailable during hot standby. As discussed previously, this is acceptable and meets the requirements of Appendix R. The exemption, therefore, is no longer needed.

4.7 Fire Area A-18 (A-9), Charging Pump Room

Proposed Modifications:

1. Install a curb/dike in front of each charging pump cubicle.

2. Provide a 1 hour fire rated enclosure for the A and B train charging pump cable trains.

The staff previously found the above modifications acceptable to permit an exemption from the need to provide an area-wide automatic fire suppression system.

The licensee stated in the updated Appendix R "compliance review" dated May 29, 1987 that a 3-hour wrap had been provided for both charging pump cable trains and that the curbs had been installed. The staff finds that the 3-hour barrier conforms with the requirements of Section III.G.2 of Appendix R thus making two charging pumps (A and B) available for use throughout the post-fire period in this fire area. The earlier exemption is, therefore, no longer necessary.

4.8 T5B (T9), Auxiliary Feed Pump Pit

Proposed Modifications:

None

The licensee noted that the steam driven AFW pump is completely separated from the two motor driven AFW pumps by a 12-inch thick concrete wall. The only opening in the wall contains a heavy steel, submarine type door which is not fire-rated. The licensee requested an exemption from the requirements of Section III.G of Appendix R on this basis of the door design. The staff concluded that the closed watertight door provided equivalent protection against damage to redundant AFW pumps on both sides of the wall in the event of a fire on either side and, therefore, granted the exemption. No changes were made by the licensee so the exemption remains in effect for fire area T5B.

Dated:

Principal Contributor: N. H. Wagner

Attachment:
Table 1

TABLE 1

MILLSTONE POINT UNIT NO. 2
FIRE AREA INDEX

FIRE AREA NUMBER	DESCRIPTION
COMBINED FIRE AREA F-1	
A-1	Control Room & Computer Room
A-2	Fuel Handling, Maintenance Shop Areas, Enclosure Building, HVAC Area, and Sample Area (El. 14'-6")
A-4	Cable Vault
A-8	New Computer Room
A-11	Coolant Tanks Area
A-12	Boric Acid Recovery (El. (-)5'-0")
A-13	Reactor Building Closed Cooling Water Pumps and Spent Resin Shipping Areas
A-16	East Penetrations Area
COMBINED FIRE AREA F-2	
A-7	MCC B61 Enclosure
A-17	West Penetrations Area
T-3	Z-2 Switchgear Room and Cable Vault
COMBINED FIRE AREA F-3	
T-1	Turbine Hall
T-5A	Electric Auxiliary Feedpump Pit
Unit 1 Fire Area T-9	Service Building
FIRE AREA NUMBER	DESCRIPTION
A-3	East 480 V Switchgear Room
A-5	Z-1 DC Equipment & Battery Rooms "A"

A-6	Z-2 DC Equipment & Battery Room "B"
A-9	"A" Diesel Generator Room
A-10	"B" Diesel Generator Room
A-14	"A" Safety Injection Pump Room
A-15	"B" Safety Injection Pump Room
A-18	Charging Pump Cubicles
T-2	West 480 V Switchgear Room
T-4	Z-1 Switchgear Room and Cable Vault
T-5B	Turbine Driven Auxiliary Feedpump Pit
C-1	Containment
I-1	Intake Structure
Yard	4 Separate Areas of the Plant Yard

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
NORTHEAST NUCLEAR ENERGY COMPANY, ET AL	)	Docket No. 50-336
	)	
Millstone Nuclear Power Station, Unit No. 2	)	

REVOCATION OF EXEMPTION

I.

The Northeast Nuclear Energy Company, et al. (the licensee), is the holder of Facility Operating License No. DPR-65 which authorizes operation of the Millstone Nuclear Power Station, Unit No. 2, at a steady state power level not in excess of 2700 megawatts thermal. The facility is a pressurized water reactor located at the licensee's site in the town of Waterford, Connecticut. The license provides, among other things, that it is subject to all rules, regulations and orders of the Nuclear Regulatory Commission (the Commission) now or hereafter in effect.

II.

On November 19, 1980, the Commission published a revised Section 10 CFR 50.48 and a new Appendix R to 10 CFR Part 50 regarding fire protection features of nuclear power plants (45 FR 76602). The revised Section 50.48 and

Appendix R became effective on February 17, 1981. Section III of Appendix R contains 15 subsections, lettered A through O, each of which specifies requirements for a particular aspect of the fire protection features at a nuclear power plant. On April 15, 1986, the Commission granted exemption to the requirements of two of these 15 subsections, III.G and III.L. Subsection III.G.2 requires that one train of cables and equipment necessary to achieve and maintain safe shutdown be maintained free of fire damage by one of the following means:

a. Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier;

b. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area; or

c. Enclosure of cables and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area. Subsection III.G.3 and III.L of Appendix R also requires that the alternate shutdown capability be independent from the specific fire area.

The exemptions specify that a complete area-wide automatic fire suppression would not be required for the Closed Cooling Water Pump Area, the Boric Acid Pumps, Spent Fuel Pool Heat Exchanger Area, the Boric Acid Batch Tank-Chemical Addition Tank Area, the Cable Vault, the Main Control Room, the Intake Building, and the Charging Pump Room. Other specific exemptions to the deviations from the requirements of Appendix R were permitted as noted in Section IV. All of the Exemptions, except that related to the auxiliary feedwater pumps located in the Auxiliary Feed Pump Pit, are the subject of this Revocation of Exemption.

III.

By letter dated May 29, 1987, as supplemented by letter dated April 22, 1988, the licensee provided an updated evaluation of the plant's compliance with the requirements of 10 CFR 50, Appendix R. In that submittal, the licensee elected to review the fire protection afforded the plant on a fire area basis and proposed modifications and analyses that precluded the need for Exemption in seven of the eight areas where Exemption was previously granted.

The acceptability of the revocation of exemption for each of the seven areas is addressed below. Details are contained in the NRC staff's related Safety Evaluation (SE).

The fire areas related to the seven revocations of exemptions are:

1. Closed Cooling Water Pump Area (new area - A-13, old area - A-1B)
2. Boric Acid Pumps-Spent Fuel Pool Heat Exchangers (new area - A-12, old area - A-14)
3. Boric Acid Batch Tank-Chemical Addition Tank Area (new area - A-2, old area - A-24) (Partially revoked, certain areas retained)
4. Cable Vault (new area - A-4, old area - A-10)
5. Main Control Room (new area - A-1, old area - A-42)
6. Intake Building (new area - I-1, old area - I-1)
7. Charging Pump Room (new area - A-18, old area - A-9)

IV.

Revocation of Exemption 1 - Closed Cooling Water Pump Area

(Fire Area A-13)

The exemption allowed the licensee to eliminate the need for automatic fire suppression in the Closed Cooling Water Pump Area as would be required by Section III.G of Appendix R.

The licensee noted in the updated compliance review of May 29, 1987, that 3-hour protection was afforded the cables for the charging pumps. This eliminates the need for an exemption for charging pumps B and B-swing since the 3-hour cable protection complies with the requirements of Section III.G.2.a of Appendix R.

The licensee also chose not to erect a marinate shield around the Train A Reactor Building Closed Cooling Water (RBCCW) pump and motor as required by the exemption. Therefore, the RBCCW Pump will no longer be available during hot standby and must be repaired or replaced for cold shutdown. The staff has concluded that the RBCCW pump is not needed for hot shutdown based on the licensee's evaluation of acceptable Reactor Coolant Pump (RCP) seal integrity without cooling (see Section 2.3.1). Therefore, the fire protection as related to the RBCCW pumps meets the criteria of Section III.G.1.b of Appendix R. However, the licensee will be required to effect RCP seal cooling in accordance with the resolution of Generic Issue 23 once that issue is resolve.

Based on the forgoing, the exemption is no longer needed from the requirements of Appendix R for fire area A-13.

Revocation of Exemption 2 - Boric Acid Pumps - Spent Fuel Pool Heat Exchangers (Fire Area A-12)

The exemption of the requirement for an area-wide fire suppression system was granted based on the rerouting of the power cables for Charging Pump A and A (swing) outside the fire area and the enclosure of the vertical run of Charging Pump A and A (swing) cables in a 1-hour barrier together with the installation of a marinate board radiant energy shield around the vertical cables.

In lieu of the proposed modifications that supported the exemption, the licensee rerouted the power cables for the B (swing) charging pump outside the fire area. This rerouting meets the Appendix R, Section III.G.2 separation criteria and makes the B (swing) charging pump available through the post fire shutdown period in the event of a fire in this area. Thus an exemption is no longer needed from the requirements of Appendix R for fire area A-12.

Partial Revocation of Exemption 3 - Boric Acid Batch Tank and Chemical Addition Tank Areas (Fires Area A-2)

The exemption of the requirement for a total area-wide automatic suppression system was granted based upon rerouting of some Diesel B cables outside the fire area, installing a water curtain in the west end of the fire area to segregate the remaining Train B cables and motor control center from Train A cables the protection of the cables passing through the water curtain with a 1-hour wrap and sprinkler protection.

In lieu of the proposed modifications, the licensee did the following:

(1) Chose to rely on backfeed for AC power and, thus, did not reroute the Train B diesel cables.

(2) Those cables intended to pass through the water curtain were either rerouted or were wrapped in a 3-hour protected fire barrier.

(3) The water curtain was installed as a water spray on MCC B61.

The use of backfeed for AC power eliminated the need for rerouting of Diesel B cables. Therefore, this portion of the exemption in fire area A-2 is no longer needed.

The remaining Train B cables do not require exemption from the requirements of Appendix R since some were rerouted in accordance with Section III.G.1.a of Appendix R or were wrapped with a 3-hour barrier in accordance with the requirements of Section III.G.2.a of Appendix R. Therefore, this portion of the exemption in fire area A-2 is no longer needed.

The water curtain established as a water spray on MCC B61 is a deviation from the requirements of Section III.G of Appendix R. Therefore, this portion of the exemption is retained.

Revocation of Exemption 4 - Cable Vault (Fire Area A-4)

The exemption of the requirement for a complete area-wide automatic fire suppression system and for the separation by a 1-hour fire-rated barrier or by more than 20 feet with no intervening combustible material of certain redundant shutdown cables was granted based on the extension of an automatic wet-piped sprinkler system to include diesel power cables Train A and application of passive 1-hour fire-rated barriers between redundant trains of safe shutdown cables at the crossover points.

In lieu of protecting the diesel power cables, the licensee will depend

upon backfeed of AC power from Unit 1 to Unit 2 for emergency AC power, will utilize the fire shutdown panel and will protect selected cables by 3-hour barriers. This was found acceptable since it complies with the provisions of Appendix R, Section III.G.2. Thus, an exemption is no longer needed from the requirements of Appendix R for Fire Area A-4.

Revocation of Exemption 5 - Main Control Room (Fire Area A-1)

The exemption from the requirement of a complete area-wide fixed fire suppression system, the adequate physical separation between redundant shutdown divisions and a shutdown capability independent of the main control room was based on existing fire protection capability and implementation of modifications that would provide for instrumentation signals to a new remote Fire Shutdown Panel (FSP), disconnect devices to assure closure of certain valves during a control room fire, the capability to align Unit 1 emergency AC power to the Unit 2 emergency buses, manual/air operated valves in the auxiliary spray flow paths to control Reactor Coolant System (RCS) level and pressure control for cold shutdown, protection against hot shorts in the pressurizer and the reactor head vent control circuits in the event of control room fires, a remote FSB in Fire Zone T3 and procedures to assure safe shutdown in the event of fires in and outside of the control room.

In the licensee's May 29, 1987, Updated Fire Hazards Analysis, the licensee revised the previous approach to safe shutdown which was based upon the assumption of loss of some panels in the control room to a loss of all panels. Under this assumption, the licensee will rely on use of the FSP installed in Fire Area T-3

for safe shutdown after a control room fire in accordance with Sections III.G.3 and III.L of Appendix R. The licensee installed a bottle-up panel outside of the control room to assure closure of valves in the RCS and main steam system which could be used to isolate the RCS and the SG coolant inventories. The FSP will utilize the AC power backfeed from Unit 1 to satisfy the criteria of Appendix R, Sections III.G.3 and III.L. Thus, an exemption is no longer needed from the requirements of Appendix R for fire Area A-1.

Revocation of Exemption 6 - Intake Building (Fire Area I-1)

The exemption from the requirement of certain shutdown systems not separated by a 3-hour fire-rated barrier and an area-wide automatic fire suppression system was based upon the modification to provide 1-hour fire-rated barriers for all cabling/conduit associated with service water pump train "A", the modification to provide diking/curbing around Service Water Pump "A" and the installation of an automatic water curtain spray system around Service Water Pump "A."

The licensee reported in the updated Fire Hazards Analysis of May 29, 1987, that none of above modifications were implemented. Rather, the licensee will rely on backfeed of AC power from Unit 1 for provision of power to Unit 2 in lieu of providing a Unit 2 SW pump to cool a Unit 2 Emergency diesel generator. Also, the licensee noted that if a fire did effect the SW pump and cabling for a SW pump, the pump and cabling would be replaced for bringing the plant to cold shutdown. This was found to be acceptable since such a repair was

not postulated as being necessary during the hot standby condition. Therefore, an exemption is no longer needed from the requirements of Appendix R for fire area I-1.

Revocation of Exemption 7 - Charging Pump Room (Fire Area A-18)

The exemption from the requirement for an area-wide automatic fire suppression system and separation of the three charging pumps by a complete 1-hour fire-rated barrier or by a distance of more than 20 feet without intervening combustibles was based on a low fire load in the area, on the modifications providing a 1-hour fire-rated enclosure for A and B train charging pump cable trains and on the installation of a curb/dike in front of each charging pump cubicle.

The licensee reported in the updated Fire Harzards Analysis dated May 29, 1987, that a 3-hour fire-rated barrier in the form of a wrap had been provided for both charging pump cable trains and that the curbs had been installed. The 3-hour fire-rated barrier conforms to the requirements of Sections III.G.2 of Appendix R this making two charging pumps (A and B) available for use throughout the post-fire period in this fire area. Therefore, an exemption is no longer needed from the requirements of Appendix R for fire area A-18.

Accordingly, the Commission has determined that the specific exemptions from 10 CFR 50.48 granted on April 15, 1986, for the Closed Cooling Water Pump Area (Fire Area - A- 13) the Boric Acid Pumps-Spent Fuel Pool Heat Exchangers Area (Fire Area - A- 12), the Cable Vault Area (Fire Area - A-4), the Main Control Room Area (Fire Area - A-1), the Intake Building Area (Fire Area - I-1) and the Charging Pump Room Area (Fire Area - A-18) are hereby revoked. Also, the exemption related to Boric Acid Batch Tank-Chemical Addition Tank Area (Fire Area - A-12), is hereby partially revoked and certain areas as discussed are retained. This revocation provides protection of the public adequate health and safety since it results in compliance by the Licensee with the Commission's regulations.

This revocation of exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Steven A. Varga, Director
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Dated at Rockville, Maryland
this 19th day July, 1990.