FIRE PROTECTION

SAFETY EVALUATION REPORT

BY THE

OFFICE OF NUCLEAR REACTOR REGULATION

U.S. NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF

NIAGARA MOHAWK POWER COMPANY

NINE MILE POINT-UNIT 1

DOCKET NO. 50-220

50-220
Ltr 7-26-79
7908220373

TABLE OF CONTENTS

1.0 INTRODUCTION

Following a fire at the Browns Ferry Nuclear Station in March, 1975, the Nuclear Regulatory Commission initiated an evaluation of the need for improving the fire protection programs at all licensed nuclear power plants. As part of this continuing evaluation, the NRC, in February 1976, published a report by a special review group entitled, "Recommendations Related to Browns Ferry Fire," NUREG-0050. This report recommended that improvements in the areas of fire prevention and fire control be made in most existing facilities and that consideration be given to design features that would increase the ability of nuclear facilities to withstand fires without the loss of important functions. To implement the report's recommendations, the NRC initiated a program for reevaluation of the fire protection programs at all licensed nuclear power stations and for a comprehensive review of all new license applications.

The NRC issued new guidelines for fire protection programs in nuclear power plants which effect the recommendations in NUREG-0050. These guidelines are contained in the following documents:

a. "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plant," NUREG-75/087, Section 9.5.1, "Fire Protection," May 1976, which includes "Guidelines for Fire Protection for Nuclear Power Plants" (BTP APCSB 9.5-1), May 1, 1976.

b. "Guidelines for Fire Protection for Nuclear Power Plants" (Appendix A to BTP APCB 9.5-1), August 23, 1976.

c. "Supplementary Guidance on Information Needed for Fire Protection Program Evaluation," October 21, 1976.

d. "Sample Technical Specifications," May 12, 1977.

e. "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance," June 14, 1977.

f. "Manpower Requirements for Operating Reactors," memo from E. G. Case to R. Boyd, V. Stello, and R. Mattson dated May 11, 1978.

All licensees were requested to: (1) compare their fire protection programs with the new guidelines; and (2) analyze the consequences of a postulated fire in each plant area.

We have reviewed the licensee's analyses and have visited the plant to examine the relationship of safety-related components, systems and structures with both combustibles and the associated fire detection and suppression systems. Our review has been limited to the aspects of fire protection within the NRC's jurisdiction, i.e., those aspects related to the protection of public health and safety. We have not considered aspects of fire protection associated with life safety of onsite personnel and with property protection unless they impact the health and safety of the public due to potential release of radioactive material.

This report summarizes the status of our evaluation of the fire protection program at the Niagara Mohawk Power Corporation's Nine Mile Point Unit 1 Nuclear Power Plant.

2.0 FIRE PROTECTION GUIDELINES

2.1 General Design Criterion 3 - "Fire Protection"

The Commission's basic criterion for fire protection is set forth in General Design Criterion 3, Appendix A to 10 CFR Part 50, which states:

> "Structures, systems and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."
>
> "Noncombustibles and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and the control room."
>
> "Fire detection and protection systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems and components important to safety."
>
> "Fire fighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems and components."

2.2 Supplementary Guidance

Guidance on the implementation of GDC-3 for existing nuclear power plants has been provided by the NRC staff in "Appendix A" of Branch Technical Position 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants."

Appendix A provides for a comprehensive program assuring a substantial level of fire protection, beyond minimums that might be deemed to satisfy GDC-3.

The overall objectives of the fire protection program embodied in BTP 9.5-1 and Appendix A, are to:

(1) reduce the likelihood of occurrence of fires;

(2) promptly detect and extinguish fires if they occur;

12

(3) maintain the capability to safely shut down the plant if fires occur; and

(4) prevent the release of a significant amount of radioactive material if fires occur.

We have used the guidance of Appendix A as appropriate in our review. We have evaluated alternatives proposed by the licensee to various specific aspects of Appendix A using the overall objectives outlined above to assure that these objectives are met for the actual relationship of combustibles, safety-related equipment and fire protection features of the facility.

3.0 SUMMARY OF MODIFICATIONS

The licensee plans to make certain plant modifications to improve the fire protection program as a result of both his and the staff's evaluations. The proposed modifications are summarized below. The implementation schedule for these modifications is in Table 3.1. The licensee has agreed to this schedule. The sections of this report, which discuss the modifications are noted in parentheses.

Certain items listed below are marked with an asterisk to indicate that the NRC staff will require additional information in the form of design details, test results, or acceptance criteria to assure that the design is acceptable prior to the actual implementation of these modifications. The balance of the other modifications has been described in an acceptable level of detail.

*3.1.1 Fire Detection Systems (4.2)(4.4,4)

Fire detectors (early warning ionization type smoke detectors) will be provided over all trays carrying safety-related cable including the following areas:

(1) Reactor Building (5.1), Elevations 198, 237, 261, 281, 298, 318 and 340

(2) Control Building, Control Room (5.2.3)

(3) Diesel Generator Building (5.3), Elevations 250 and 261

(4) Turbine Building (5.4), Elevations 250, 261, 277, 291, 300, 320 and 333

(5) Screen and Pump House (5.5)

(6) Waste Building (5.6)

(7) Off-Gas Building (5.7)

*3.1.2 Sprinkler Systems (4.3.1.5)

Sprinkler systems will be provided for cable tray concentrations in excess of two deep, for all trays in the turbine building basement and where localized concentrations of vertical or horizontal cables occurred, including the following areas:

(1) Reactor Building (5.1), Elevations 237, 261 and 318

(2) Control Building Control Room (5.2.3) and Cable Spreading Room (4.3.1.5 and 5.2.1.6)

(3) Diesel Generator Building (5.3.1), Elevation 250

(4) Turbine Building (5.4), Elevation 250 (east and west basements), 261 (where safety-related equipment is installed), 277 and 300

(5) Waste Building (5.6)

(6) Off-Gas Building (5.7)

(7) Administration Building (5.8)

3.1.3 Fire Stops and Penetration Seals (4,9,3) (4,9,4)

Suitable fire stops and/or penetration seals will be provided for electrical cable runs in the following areas:

(1) Reactor Building (5.1), All Elevations

(2) Control Building (5.2), Elevation 250

(3) Diesel Generator Building (5.3), All Elevations

(4) Turbine Building Floor, Elevation 250 (5.4.1); floor, elevation 261 (5.4.4); elevation 277; and elevation 291

3.1.4 Fire and Heat Barriers (4,11)(5,4,7,6)(5,4,9,6)

Fire or heat barriers will be provided in the following areas:

(1) Reactor Building, Elevations 281 (5.1.4) and 298 (5.1.5)

(2) Diesel Generator Building, Elevation 250: the area under the diesels will be separated from cable runs (5.3.1)

(3) Turbine Building (5.4), Elevation 250 and 261 (turbine oil reservoir and turbine oil storage room), 277, 291 and 300

(4) Waste Building (5.6.1), At elevation 251

(5) Ventillation duct penetrations and fire dampers (4.9.2)

3.1.5 Fire Doors (4.9.1)

Upgraded fire doors will be provided in the following areas:

Elevation	Room	New Door Rating
250	Cable Room	Two "A" doors
261	Auxiliary Control Room	"A" door
261	Waste Building	Two "B" doors
261	Baler Room	"A" door
261	Screen Pump House	"A" door

3.1.6 Reactor Building Modifications

The following additional modification will be provided in the Reactor Building:

(1) At elevation 237, a fire hose standpipe (5.1.2)

3.1.7 Control Building Modifications

The following additional modifications will be provided in the Control Building:

(1) In the auxiliary control room the manual CO_2 system will be changed to automatic initiation by smoke detection (5.2.2)

(2) The control room HVAC system will be supplemented with a 100% fresh air and exhaust system (5.2.2)

(3) The false ceiling in the control room will be modified to assure a flame spread rating of no greater than 25 (5.2.3)

(4) An Emergency Shutdown Panel will be provided to affect safe shutdown of the reactor independent of the control and auxiliary cable spreading rooms (5.2.3).

3.1.8 Diesel Generator Building Modifications (5.3.2.6)

The following additional modifications will be provided in the Diesel Generator Building:

(1) At elevation 250, the No. 103 diesel generator output cable will be rerouted. Also, the cross-tie between redundant fuel lines will be removed and a new one installed outside of the building (5.3.1)

*(2) In each diesel generator room, fire protection will be provided for exposed structural steel (5.3.2 and 5.3.3)

(3) Electrical supervision will be provided for the three doors between the diesel generator rooms and the power board rooms. (4.9.1)

3.1.9 Turbine Building Modifications (5.4.3.6)

The following additional modifications will be provided in the Turbine Building:

(1) In the west basement, the offsite power cable for powerboard no. 103 will be rerouted away from the powerboard no. 102 cables (5.4.2)

(2) At floor elevation 261, the chemical storage area has been relocated, the floor cleaning machines removed, oil drains from the service air compressor have been "hard piped" and an "oil less" air compressor ordered (5.4.4) (Completed)

(3) In the turbine oil reservoir area, the portable oil centrifuge was relocated and its hose penetration was closed (5.4.5) (Completed)

(4) At elevation 300, 3 hour rated UL fire dampers will be installed in the oil storage tank room (5.4.10)

(5) Install a deluge system to protect the south and west walls adjacent to the station transformers to assure protection from transformer fires (5.4.7, 5.9.6)

3.1.10 Waste Building Modifications

The following additional modifications will be provided in the Waste Building:

(1) Waste oil storage drums will be removed from elevation 261; they will instead be stored outside of the plant. Also, a fire cut-off from the Waste Building proper will be installed at the truck port (5.6.1)

3.1.11 General Modifications/Administrative Changes

The following additional modifications and/or administrative changes are applicable to the plant, in general:

(1) Additional training will be provided to fire brigade leaders

(2) Pre-plans for fighting fires in safety-related/hazard areas will be completed

(3) Three 5200 CFM fire service type explosion-proof smoke ejectors and suitable ducting will be purchased (Completed)

(4) Storage of clean-up rags in safety-related areas will be controlled (Completed)

(5) Door frames which do not meet the criteria of UL-63 will be replaced with frames that do meet criteria. Louvers will be replaced in battery room doors. (4.9.1)

(6) One hose house will be provided for every two hydrants containing equipment essentially duplicating that at present hose houses (4.3.1.3 and 5.9.6)

(7) Local alarms will be provided in areas having automatic detection systems (4.2)

(8) Six additional hose stations will be installed to assure hose coverage for all safety related areas. (4.3.1.4)

(9) Modifications to existing ventillating systems will be made for smoke removal (4,4,1)

(10) Eight hour (rated) battery lights will be installed in stairwells and other access and egress routes. (4.6) Stairwells will be enclosed and fire doors will be provided. (4.2)

Table 3.1

Completion Dates for Proposed Modifications

	Modifications	Completion Date
3.1.1	Fire Detection Systems	1981 Refueling
3.1.2	Sprinkler Systems	January 1, 1981
3.1.3	Fire Stops Penetration Seals	September 1, 1980 1981 Refueling
3.1.4	Fire and Heat Barriers	January 1, 1981
3.1.5	Fire Doors	January 1, 1981
3.1.6	Reactor Building Modifications	1981 Refueling
3.1.7	Control Building Modifications Safe Shutdown Panel	1981 Refueling 1981 Refueling
3.1.8	Building Modifications Diesel Generator	June 1981 1981 Refueling
3.1.9	Turbine Building Modifications	1981 Refueling
3.1.10	Waste Building Modifications	January 1, 1981
3.1.11	General Modifications Administrative Changes	June 1981 September 1, 1979
3.1.12	Diesel Fire Pump	September 1, 1979

4.0 EVALUATION OF PLANT FEATURES

4.1 Safe Shutdown Systems

There are several arrangements of safe shutdown systems which are capable of shutting down the reactor and cooling the core during and subsequent to a fire. The exact arrangement available in a fire situation will depend upon the effects of the fire on such systems, their power supplies and control stations. The licensee will install a safe shutdown panel, outside the control room, to effect safe shutdown considering a loss of the control room and loss of offsite power. Monitoring for emergency condenser and reactor pressure vessel level will be included.

During or subsequent to a fire, a safe shutdown could be achieved using safety-related equipment such as: the reactor protection system, high pressure coolant injection system, emergency condenser system, shutdown cooling system, containment spray raw water system, depressurization system and core spray system. Supporting systems and equipment such as the emergency diesel generators, emergency batteries and a portion of the emergency service water system would also be required.

4.2 Fire Detection and Signaling Systems

The plant has a protective signaling system which transmits various fire alarm and supervisory signals to the control room. In addition to signals from heat or smoke detectors located in selected areas of the plant, the system also transmits alarm and supervisory signals concerning operation or impairment of the fire pumps, carbon dioxide system, air foam system water spray, deluge and automatic sprinkler systems and closing of some valves in the fire protection water system.

The signaling system is provided with backup power in the event of a loss of off-site power by a connection to the emergency power supply system.

Ionization type smoke detectors or rate compensation type heat detectors have been provided in selected areas of the plant. The licensee will install additional smoke detectors so that detectors are provided over all trays containing safety-related cables.

The five recirculating pump motor-generator sets on the 261 foot elevation of the turbine building auxiliary equipment area each contain a considerable quantity of oil. The nature and arrangement of heat detectors over these motor-generator sets, and the ventilating systems in the area will likely result in very slow detection of all but very large fires in this area. Therefore, the licensee has proposed to install early warning smoke detectors. The installed local application carbon dioxide extinguishing system at each motor-generator set may not, under such circumstances, provide prompt fire suppression. In lieu of providing a curb around each motor-generator set to contain potential oil leaks and spills as the staff requested, the licensee has proposed to install a level sensor in the fluid coupling of each motor-generator set, to alarm in the control room on low oil level.

For other areas of the plant, the licensee will conduct tests and/or perform studies to verify that, in areas of the plant containing or exposing safety-related equipment, detectors are located or will be installed to detect fires quickly enough to preserve the safe shutdown of the plant, given the anticipated manual or automatic response to the alarm. Factors considered will include, but not be limited to, ceiling height, ventilation rate and air velocity, location and arrangement of combustibles, and obstructions to air flow.

Alarm, supervisory, and trouble signals are annunciated in the control room visually, and audibly by a common alarm bell which is distinctive from other plant system alarms. The licensee will install local alarms in areas with automatic detection systems.

We find that, subject to implementation of the above described modifications, the fire detection and signaling system satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.3 Fire Control Systems

4.3.1 Water Systems

4.3.1.1 Water Supply

The fire protection water supply for the plant is provided by Lake Ontario, which also serves as the ultimate heat sink.

We find that the water supply satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.3.1.2 Fire Pumps

The water supply is developed by two vertical shaft centrifugal fire pumps, each with a rated output of 2500 gpm at 125 psig. The pumps, which take suction from a common sump (but through separate suction lines), are located in adjacent areas in the screen and pump house. The electric motor driven pump is in an area with several safety-related pumps. A diesel driven pump and its fuel tank and controller are located by themselves in a sprinklered room separated from the motor driven pump by 1-1/2 hour rated walls and a 1-1/2 hour rated door. The diesel fire pump room has a 1-1/2 hour rated separate ceiling which is lower than the roof of the screen and pump house. The licensee has verified that the penetrations of the floor, ceiling, or walls of the room are sealed with materials in a design which has an established fire resistance rating of at least 1-1/2 hours. The ventilation duct penetration will be provided with a 1-1/2 hour rated fire damper.

Recent fire pump test reports appear to indicate that the diesel driven fire pump does not meet the performance requirements outlined in NFPA 20. After correcting the variations in pump speed, the flow from this pump at discharge pressures near the rated head is approximately 10 percent below the typical pump characteristic curve, 15 percent below the manufacturer's certified curve, and 22 percent below the discharge of the electric driven pump. As a general rule of thumb, a maximum decrease of 10 percent in discharge capacity is tolerable over the life of a pump. The licensee will determine the cause(s) for the apparent anomaly in diesel fire pump performance and repair or replace equipment as necessary by September 1979.

A UL listed automatic fire pump controller is co-located with the diesel fire pump. No controller is provided for the 4160 volt electric motor driven pump, because none are manufactured for that voltage. The diesel driven pump can be manually started from the control room or at its controller, but can be manually stopped only at the controller. The motor driven pump can be manually started or stopped only at a circuit breaker adjacent to the pump. Pump running, driver nonavailability, and pump driver trouble signals are annunciated in the control room. Additional annunciation is provided at the diesel fire pump controller. The diesel fire pump controller is powered by the station batteries. The licensee will arrange the diesel engine to start automatically on loss of air to the controller.

Both pumps are arranged to start automatically if the pressure in the loop yard main falls below 100 psig. A separate pressure switch to start each pump is provided. The diesel engine has an air starter consisting of two receiver tanks and associated equipment. Each tank is capable of three starts at 30°F without refilling. Power for the electric motor driven fire pump is supplied from the normal AC system. Sufficient fuel to operate the diesel driven fire pump for eight hours is stored in a 275 gallon day tank next to the engine.

Two 30 gpm automatic electric driven centrifugal jockey pumps located in the same area as the motor driven fire pump, maintain about 130 psig in the fire water system yard loop. These pumps also supply water to the seal water system.

We find that, subject to the implementation of the above described actions, the fire pumps satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.3.1.3 Fire Water Piping System

Through a 12 inch overhead line, the separate 10 inch discharge line from each pump supplies the 8 and 10 inch fire service water loop main, part of which is run overhead through the turbine building. Two connections to the Unit 2 fire service water system, with appropriate valves, provide the necessary alternative flow paths to assure availability of water to the Unit 1 fire service water system in the event of a single failure in the Unit 1 piping.

All yard fire hydrants, automatic and manual water suppression systems, and interior hose stations are supplied by the loop main. Exterior post indicator valves and interior OSY valves subdivide the loop into a number of sections so that a single section could be isolated without impairing the entire system. However, there are locations where the isolation of a single section could impair the availability of both automatic sprinklers and the backup hose stations in areas containing or exposing safety-related equipment. The licensee has proposed to modify a portion of the system to preclude the loss of both automatic suppression systems and interior hose stations in areas so protected. We will require the licensee to submit the details of such modifications prior to implementation.

Electrical subdivision is provided for the valve controlling the water supply to the water spray and foam water systems, as noted in Section 4.2 of this report. Post indicator valves on the underground loop main; and fire pump discharge valves, sectionalizing valves inside the plant, and valves controlling the flow of water to standpipes and sprinkler systems are locked open and checked monthly.

Yard fire hydrants have been provided at intervals of 200 to 300 feet around the exterior of the plant, except that protection on the east side is provided by two wall hydrants and one yard hydrant In addition to these two wall hydrants, exterior hydrants supplied by the Unit 2 fire service water main are now available. The lateral to each hydrant is controlled by a key operated (curb) valve. Two hose carts containing hose, nozzles, extinguishers, tools and other fire fighting equipment are provided in lieu of permanent hose houses. One of these hose carts is outside, about 250 feet south of the southwest corner of the turbine building. The other hose cart is inside the turbine building. The licensee has proposed to provide one hose house for every two exterior hydrants, located as recommended in NFPA 24-1977, and essentially duplicating the contents of the present hose carts. Thread on hydrant outlets and hose connections throughout the plant are compatible with those of fire departments which serve the plant.

We find that, subject to the implementation of the above described modifications, the fire water piping system satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.3.1.4 Interior Hose Stations

Interior hose stations equipped with 100 feet of 1-1/2 inch diameter woven jacket-lined hose are provided in all areas of the plant except primary containment. The licensee will provide 1 inch diameter hose stations inside primary containment. "Electrically safe" fire hose nozzles have been provided in areas containing electrical equipment.

The licensee will perform a hose stretch test to assure that all points in safety-related areas, and in other plant areas which contain major fire hazards, can be reached effectively by at least one hose stream with a maximum hose length of 100 feet. Seven additional hose stations will be provided. The licensee has verified that 100 gpm at a minimum residual pressure of 65 psig is available at every hose stations outlet in the plant.

We find that, subject to implementation of the above described modifications, the interior fire hose stations satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.3.1.5 Water Suppression Systems

Wet pipe automatic sprinkler systems have been provided to protect the areas on elevations 250 and 261 feet west of the turbine generator; in the store room and shop area on elevation 261 feet of the administration building; the file area on elevation 250 feet of the administration building; the large and small equipment decontamination rooms and contaminated tool storage room on elevation 261 feet of the turbine building; the waste material baler room and low level storage area on elevation 261 feet of the radwaste building; the diesel fire pump room on elevation 261 feet in the screen and pump house; and the oil storage room on elevation 261 feet near the stack.

A dry pipe automatic sprinkler system is provided in the reactor building track bay. Automatic water spray systems have been provided to protect the oil-filled transformers located outside of the turbine building, the hydrogen storage rack, and the turbine generator.

The main control valves for the turbine generator sprinkler and water spray systems are motor-operated with remote position indication and operation in the control room and backup manual operators. Valve motor operators are powered from the station batteries. Control valves for the remaining water spray systems are electrically supervised. Control valves for other sprinkler systems are locked open and checked monthly. Water flow in these systems is alarmed and annunciated in the control room.

The licensee has generally proposed to install additional automatic sprinkler systems to protect stacks of more than two trays of safety-related cables, in addition to all trays in the turbine building where the effectiveness of manual fire fighting could be hampered by smoke. Automatic sprinkler protection will also be installed at localized concentrations of electrical cables. Automatic sprinkler protection of potential fire exposures to safety-related trays will also be provided. Concentrations of safety-related cable over power boards will be sprayed with a flame retardant material in lieu of installing automatic sprinklers to preclude water damage to the power boards. A sprinkler system will be installed in

the cable spreading room as a backup to the existing CO_2 system. Additional sprinkler systems will also be provided as delineated in Section 5 of this report.

We will require the licensee to provide the design details of the proposed sprinkler protection for cable trays prior to implementation, including the design basis for water discharge density and sprinkler head spacing, location, and temperature rating.

We find that, subject to implementation of the above discussed modifications, the water suppression system satisfies the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.3.1.6 Foam Systems

Five foam water sprinkler systems are installed to protect the floor area beneath the turbine generator. In addition, seven foam water standpipes supplying a total of twenty hose stations are provided on elevations 261 feet, 277 feet, 291 feet, and 300 feet of the turbine building. These hose stations are co-located with plain water standpipes.

Foam concentrate is stored in two redundant 600 gallon storage tanks in the foam room on elevation 261 feet adjacent to the turbine building. Redundant pumps supply foam concentrate from these tanks to the foam water sprinkler systems. One pump is AC powered, the other is DC powered from the station batteries. Opening of one of the motor operated valves for these sprinkler systems actuates the pumps. Automatic actuation of the motor operated valves will be provided by the installed detection systems in the areas protected.

Similar, but smaller, redundant pumps supply foam concentrate from the same tanks to the foam water standpipe system, which is automatically maintained at 140 to 160 psig by one of these pumps. The systems have been designed to meet the requirements of NFPA 16.

We find that the foam suppression system conforms to the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.3.1.7 Effects of Suppression Systems on Safety Systems

Fixed fire suppression systems have not been installed where their operation or failure could cause unacceptable damage to safety-related equipment. In general, curbs, drains, and equipment pedestals limit the potential for flooding damage to equipment. Open doorways will be used in certain areas without drains to remove water used for fire fighting.

There are no safety-related systems interlocked with fire fighting systems.

The tops of safety-related power boards will be sealed as protection from water due to automatic sprinkler systems.

We find that the protection provided to protect safety systems from the effects of suppression system operation or fire water damage satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.3.2 Gas Fire-Suppression Systems

Total flooding carbon dioxide suppression systems are provided for the lube oil tank room, power board rooms #102 and 103, generator exciter, turbine generator oil tank, diesel generators 102 and 103, cable spreading room and auxiliary control room.

Local application systems are provided for the motor-generator sets and turbine generator bearings. Ionization type smoke detectors in the cable spreading room and auxiliary control room, and rate compensation type heat detectors in each of the other protected areas alarm in the control room in case of fire. Manual actuation only is provided for systems protecting the generator exciter, turbine generator bearings, and turbine generator oil tank. The auxiliary control room system is maintained in an "alarm only" status, and must be manually actuated. The licensee will restore this system to fully automatic operation. Carbon dioxide hose reels are provided at fourteen locations in the turbine building.

The amount of carbon dioxide discharged into a particular area is generally controlled by a timer. No timer is provided for the manually actuated systems and discharge continues as long as the control switch is on, except for the auxiliary control room. A ten ton low pressure storage tank supplies the fixed systems

and the carbon dioxide hose reel stations in the turbine building. The same tank also provides carbon dioxide via separate piping to purge the main generator hydrogen system. A positive mechanical interlock in the tank prevents the level of carbon dioxide from being reduced below the minimum required for two complete discharges of carbon dioxide into the largest area protected by this supply. The licensee intends to remove this interlock to make additional CO_2 available to extinguish a generator fire. A low-level annunciator is installed and administrative instructions issued to assure the minimum supply required by the technical specifications for fire suppression is available.

Interlocks are provided to close dampers or doors, or shut down local ventilation systems, in areas protected by carbon dioxide suppression systems.

High and low pressure conditions in the carbon dioxide storage tank are alarmed and annunciated in the control room. Detectors in any area protected by carbon dioxide systems are also annunciated in the control room, as described in Section 4.2 of this report.

In the event of a total loss of DC control power, the master control valves on the carbon dioxide system will fail "open". Individual systems could then be actuated by manually opening the appropriate selector valve.

We find that, subject to implementation of the above described modification, the design of gas fire-suppression systems satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.3.3 Portable Fire Extinguishers

Hand-portable and wheeled type extinguishers are provided throughout the plant in accordance with the provisions of NFPA 10. (Three types of extinguishers are provided depending on the intended fire fighting use. Dry chemical extinguishers using "Purple K powder" are provided in 150-pound wheeled and 20-pound hand-portable sizes. Carbon dioxide extinguishers are provided in 5 and 15-pound hand-portable sizes. Pressurized water extinguishers are provided in the 2-1/2 gallon size.)

We find that the type and distribution of portable fire extinguishers satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.4 Ventilation Systems and Breathing Equipment

4.4.1 Smoke Removal

Ventilation systems are provided for all interior plant areas, but these systems are not designed specifically for smoke removal. Nevertheless, the installed air handling systems are capable of exhausting limited volumes of smoke, generally directed to the outside. Major exceptions include the turbine building basement from which air diffuses to the upper floors of the turbine building, cable spreading room which has no ventilation system, the main and auxiliary control rooms which are provided with supply air only, the screen house and diesel generator rooms which have roof vents only, and the #102 and 103 emergency switchgear rooms.

The licensee has proposed various modifications to existing ventilating systems to handle smoke removal and preclude smoke spread to safety-related areas. The modifications will include: (1) a fresh air input and exhaust system designed to evacuate smoke during a control room or auxiliary control room fire; (2) the smoke removal fan for the control room system will also be capable of ejecting smoke from the cable spreading room; (3) roof-mounted heat and smoke vents for the turbine building; and, (4) utilization of existing ductwork with some modifications for air and smoke exhaust and additional ground-level intakes to supplement supply air for the turbine building basement. In addition, three 5200 CFM fire service type smoke ejectors with flexible ducting will be provided for exigent situations. The licensee has verified that the failure or inadvertent operation of these systems will not violate the controlled area boundaries of the plant.

The licensee monitors smoke and gases exhausted from the stack to determine if releases to the environment are within the permissable limits of the plant Technical Specifications.

We find that, subject to implementation of the proposed modifications, the smoke removal systems satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.4.2 Filters

Charcoal filters are installed in the emergency ventilating systems for the reactor building and the control room. The licensee will provide detectors and a manual actuated dry pipe sprinkler system to protect the charcoal filters in each system.

The charcoal columns in the offgas system in the turbine building are provided with temperature sensors. The licensee has indicated that a fire will be detected by these sensors and annunciated in the control room, following which the columns would be isolated to extinguish the fire. The licensee will verify that a fire in these columns would not impair the ability to isolate them, and that isolation of these columns will not result in an excessive release of radioactivity from some other part of the plant.

We find that, subject to the implementation of the above modifications, the protection for the filters satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.4.3 Breathing Equipment

The plant has a total of thirty-eight sets of breathing equipment with an additional fifty-two spare bottles, each rated at one half hour. A new breathing air compressor will be installed on elevation 261 feet of the administration building extension by about August 1979. At that time, the licensee will have the capability to supply breathing air to ten men for at least six hours at the rate of three (one half hour rated) bottles per man per hour.

We find that breathing equipment satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.4.4 Battery Room Ventilation

Continuous ventilation, at a rate in excess of the rate of generation of hydrogen, is necessary to prevent dangerous concentrations of hydrogen from accumulating in station battery rooms. Ventilatio

air is supplied through a louvered opening in the door to each room, and exhausted through a duct connected to the turbine building exhaust system. The licensee will install smoke detectors and an alarm for loss of battery room ventilation in each room.

We find that, subject to implementation of the above described modifications, protection against hydrogen accumulation in battery rooms satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.5 Floor Drains

The licensee has performed an analysis of standing water damage to safety-related equipment. The conclusion indicated that the combination of floor drains, floor sumps and ponding capability is sufficient to prevent damage to safety-related equipment resulting from expected fire suppression. In one area, the diesel generator building, where there is a potential for fuel oil to spread between the redundant diesel generator rooms through the common floor drain system, the licensee is in the process of routing these drains directly to a 4000 gallon drain tank outside of the building.

We find that the floor drains for fire fighting activities satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.6 Lighting Systems

Emergency lighting is supplied by the AC lighting system backed up by diesel generators and station batteries. Additional 8 hour rated battery pack lights will be installed in stairwells and other access and egress routes. Portable hand lights are also available.

We find that emergency lighting satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.7 Communication Systems

A voice-powered emergency communication system is installed in the plant. The head sets for the system will be placed in the fire protection cabinet to assure their availability. Two-way radios are also available for use of the fire fighting teams. Fixed repeaters are not presently installed or needed according to the licensee.

We find that the communication systems satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.8 Electrical Cables

Non-combustible materials are used for cable tray construction. Automatic water sprinkler systems will be installed on safety-related cable trays which are stacked more than two trays deep. Detection will be provided for all safety-related cable trays. Interior fire hoses are provided in the vicinity of all cable trays. Safety-related equipment in the vicinity of such cable trays have protection or will be provided protection if damage may occur from sprinkler operation. The use of fire retardant materials are proposed for areas where safety-related cables pass over or near power boards. Fire retardant materials will be also used to provide separation of cable runs and eliminate cable tray fire continuity. Fire breaks have been proposed for certain cable runs to prevent the continuity of cable fires.

Originally installed cable construction does not comply with the requirements of the IEEE 383 flame test. Therefore, detection will be provided for all safety-related cable trays and sprinklers will be provided for heavy concentrations of cable trays. Cable trays and conduit are used only for cables. Cables in the control room are kept to a minimum necessary for operation. Cables entering the control room terminate there. Cables are not installed in floor trenches or culverts.

We find that, subject to the implementation of the above discussed modifications, the electrical cables satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.9 Fire Barrier Penetrations

Fire barriers are penetrated by doorways, ventilation ducts, electrical cables, conduit and piping. The means of preventing a fire from crossing a fire barrier through these various penetrations is discussed below.

4.9.1 Doorways

Fire barriers separating various fire areas are penetrated by numercus doorways, most of which have a 1-1/2 or 3 hour rating. The remaining doorways are provided with nonrated doors, some of which the licensee has proposed to replace with 3 or 1-1/2 hour rated fire doors as appropriate, except for the battery rooms. The licensee has evaluated the battery room doors and determined that the construction of the doors would provide an acceptable resistance of a 1 ½ hour rating to fire propagation across the doors once the louvers have been replaced with fire rated louvers.

During the site visit, the staff observed unlabelled fire door frames in certain doorways, and unlabelled transoms in the doorways to the battery control rooms. The licensee plans to replace these unlabelled frames with labelled fire door frames, or to demonstrate that the installed frames are designed, constructed and installed in accordance with the applicable provisions of Underwriters Laboratories Standard 63. The licensee has determined that the unlabelled transoms have an equivalent three hour rating. During the site visit the staff also observed that nonlabelled ventilation intake louvers were installed in the doors to the adjacent station battery rooms. Fire door louvers provided in the doors to the battery rooms (or other areas containing or exposing safety-related equipment) will be appropriately rated, labelled, fusible link operated fire door louvers.

Fire doors to vital areas in the plant are locked closed and alarm in the control room when opened. The three inner fire doors between the diesel generator rooms and adjacent power board rooms are not supervised. Therefore, we will require these three doors to be electrically supervised. Doors in stairwells will be arranged to be self-closing so that the door will close itself after having been opened.

We find that, subject to implementation of the above described modifications, protection for door penetrations of fire barriers satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.9.2 Ventilation Duct Penetrations

Fire dampers are installed in selected ventilation system penetraions of the fire barriers in various parts of the plant. The major known exceptions are penetrations of the perimeters of the turbine building basement, the waste disposal building, and the control room. The licensee will verify that labelled fire dampers are installed in all ventilating system penetrations of all fire barriers which separate safety-related areas from each other or from areas presenting a significant fire hazard. In ventilation ducts that pass through rated fire barriers, the licensee will provide fire dampers with established fire ratings sufficient to deter fires with the combustible loading in the given area. The fire dampers will be actuated by fusible links or smoke detectors. All fire dampers will have ratings of three hours, unless the licensee justifies a rating of 1-1/2 hours.

During the site visit, the staff observed that the fire dampers installed in the auxiliary control room ventilation system ducts were inside the room. Fire dampers are required to be installed at the point where the ducts in which they are provided pass through the fire barrier. The licensee will install fire dampers in the ventilating system ducts for the auxiliary control room, and any other areas where fire dampers are required or provided, in the duct at the point where the duct passes through the fire barrier.

We find that, subject to implementation of the above described modifications, protection of ventilation duct penetrations satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.9.3 Electrical Cable Penetrations

Electrical cable penetrations in fire barriers are generally sealed with a variety of materials and designs, the fire resistance ratings of which have not been determined by any test method acceptable to the staff. The licensee will determine the ratings of existing designs in accordance with IEEE Standard 634-1978. This test method meets the staff requirements for tests of electrical cable penetrations, except that it does not provide a pressure differential across the barrier equivalent to the maximum expected in the plant. There may be cable penetrations through fire barriers in the plant, across which pressure differentials exist. The fire resistance ratings of these penetrations will be determined with such pressure differentials applied during the fire test, if practical.

The licensee plans to provide rated seals on all cable penetrations in the plant commensurate with the barrier rating.

We find that, subject to implementation of the above described modifications, protection for electrical cable penetrations of fire barriers satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.9.4 Piping Penetrations

Piping penetrations through fire barriers, except for those in the reactor building, are generally not sealed. The licensee has not indicated the fire resistance rating of those penetrations which are sealed.

The licensee will test proposed piping penetrations in accordance with applicable sections of IEEE Standard 634-1978, "Cable Penetration Fire Stop Qualification Test", although this test method is not designed for piping penetrations. The licensee will install piping penetrations with fire resistance ratings equal to the barriers they penetrate. The licensee plans to seal all piping penetrations between safety-related areas, and between safety-related and nonsafety-related areas.

We find that, subject to implementation of the above described modifications, protection for piping penetrations of fire barriers satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.10 Separation Criteria

Separation criteria are not based upon Regulatory Guide 1.75. However, in most instances cable separation meets or exceeds the guidelines of that document for the Turbine and Reactor Buildings.

Separation of redundant circuits is achieved in the Turbine Building by routing cables on the East or West side of the building. Further separation is provided by locating trays above or below floor elevation 261 feet. Any one of the following groups of Turbine Building cable trays ensures safe shutdown of the plant.

1. Cable Trays above Elevation 261 feet, or
2. Cable Trays below Elevation 261 feet, or
3. Cable Trays above and below Elevation 261 feet on the East side, or
4. Cable Trays above and below Elevation 261 feet on the West side.

Separation of redundant circuits in the Reactor Building is achieved by routing cables on the East or the West side of the building. If either the east cable tray or the west cable tray systems are operable, the reactor can be safely shutdown.

The licensee will provide appropriate fire barriers and other protective measures to insure integrity of the cable tray separation system in the event of a fire, as described in paragraph 4.8.

We find that, subject to the implementation of the above described modifications, separation criteria satisfy the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.11 Fire Barriers

Fire areas are enclosed by floors, walls, and ceilings which have three hour fire resistance ratings. However, there are plant areas in which the failure of exposed structural steel supporting these fire barriers could impair the safe shutdown capability of the plant. These areas include the turbine building, diesel generator rooms, and others. The licensee will provide protection of the exposed structural steel in the diesel generator rooms and any other area where the failure of such steel could jeopardize the safe shutdown capability of the plant.

We find that, subject to implementation of the above described modification, the design of fire barriers satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.12 Access and Egress

Three stairwells will be enclosed to provide escape and access routes for fire fighting activities. The southeast stairwell in the Reactor Building and the northwest and southeast stairwells in the Turbine Building will be enclosed. Fire doors for each elevation will be provided. The use of the remaining stairwells in other plant buildings will be established by fire plan practice in drills.

We find that, subject to the implementation of the modifications described above, access and egress satisfies the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.13 Toxic and Corrosive Combustion Products

The products of combustion of many polymers are toxic to humans and corrosive to metals. Prompt fire detection and extinguishment are relied upon to reduce the quantity of such products during a fire. Means of smoke removal, as discussed in Section 4.4.1, are provided as an aid in fire fighting access. Members of the fire brigade will be provided with, and trained in the use of, emergency breathing apparatus for fighting fires involving such materials.

We find that, subject to implementation of the modifications described elsewhere in this report, the precautions taken to reduce the effects of toxic and corrosive products satisfies the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.14 Nonsafety-Related Areas

We have evaluated the separation by distance or by fire barriers of nonsafety-related areas to determine that, subject to implementation of modifications described elsewhere in this report, fires in such areas will not adversely effect the ability to safely shutdown the plant. Nonsafety-related areas which potentially pose a fire hazard to safe shutdown equipment are addressed in Section 5.0 of this report.

We have also evaluated the effects of fires in radwaste areas in terms of radioactive releases, and have determined that fires in such areas will not result in unacceptable consequences.

5.0 EVALUATION OF SPECIFIC PLANT AREAS

The licensee has performed a fire hazard analysis of the facility to determine the fire loading of various plant areas, to identify the consequences of fires in safety-related and adjoining nonsafety-related areas, and to evaluate the adequacy of existing and proposed fire protection systems. We have evaluated the assumptions, methodology, and conclusions of the fire hazard analysis in detail. The results of the fire hazard analysis, other docketed information and site visit observations were used in the staff's evaluation of specific plant areas to assure that the objectives stated in Section 2.2 were met. The staff's evaluation of specific areas is discussed in the following subsections.

5.1 Reactor Building

The following evaluation is applicable to the Unit 1 Reactor Building.

5.1.1 Floor (Elevation 198 Feet)

5.1.1.1 Safety-Related Equipment

Redundant containment spray pumps and core spray pumps are located in this area, in separate rooms.

5.1.1.2 Combustibles

Electrical insulation and oil for pump motors.

5.1.1.3 Consequences if No Fire Suppression

Since the pump motors are widely separated an unmitigated fire at one motor would not affect the other motors.

5.1.1.4 Fire Protection System

Fire suppression is provided by interior hose stations.

5.1.1.5 Adequacy of Fire Protection

At present, inadequate: unsealed cable penetrations would permit heat and smoke to spread outside the fire area, and the cable itself might propagate the fire. Also, lack of automatic detection would allow the fire to continue unnecessarily. Interior hose stations are satisfactory for suppression of fires in the pump cubicals.

5.1.1.6 Modifications

The licensee will provide fire detection and will provide suitable fire stops for vertical cable runs at floor penetrations in the reactor building.

We find that, subject to the implementation of the above-described modifications, the fire protection for this area satisfies the objectives identified in Secion 2.2 of this report and is, therefore, acceptable.

5.1.2 Floor (Elevation 237 Feet)

5.1.2.1 Safety-Related Equipment

Core spray topping pumps, control rod drive pumps, miscellaneous valves and cable trays are located in this area.

5.1.2.2 Combustibles

Electrical insulation and oil for pump motors, P.V.C. jacketing on cables in cable trays and some clothing in change room.

5.1.2.3 Consequences if No Fire Suppression

Overall fire load for the floor is low but an unmitigated fire could result in the loss of safety-related equipment and cables.

5.1.2.4 Fire Protection System

Fire suppression is provided by hose stations.

5.1.2.5 Adequacy of Fire Protection

At present, inadequate: unsealed cable penetrations would permit heat and smoke to spread outside the fire area, and the cable itself might propagate the fire. Also, lack of automatic detection would allow the fire to continue unnecessarily.

5.1.2.6 Modifications

Detection for cable concentrations and safety-related motor installations will be provided. Sprinkler protection for heavy cable concentration areas at wall penetrations will be provided. Cable penetrations through the floor will be sealed. Detection and a fire hose standpipe will be provided inside of the primary containment to be used during refueling.

We find that, subject to the implementation of the above-described modifications, the fire protection for this area satisfies the objective identified in Section 2.2 of this report and is, therefore, acceptable.

5.1.3 Floor (Elevation 261 Feet)

5.1.3.1 Safety-Related Equipment

Powerboards and shutdown cooling pumps and valves and cable trays are located in this area.

5.1.3.2 Combustibles

Electrical insulation for motors, P.V.C. jacketing on cables, some wood, gas (in tanks) and plastic in storage area, and resin in the precoat tank.

5.1.3.3 Consequences if No Fire Suppression

Overall fire load for the floor is low, but an unmitigated fire could result in the loss of redundant safety-related equipment and cables.

5.1.3.4 Fire Protection System

Fire protection is provided by hose stations and dry automatic sprinkler protection (in the trackbay area).

5.1.3.5 Adequacy of Fire Protection

At present, inadequate: cables could propagate fire in powerboards and, a lack of automatic detection, could allow a fire to continue unnecessarily.

5.1.3.6 Modifications

Detection for cable concentrations and safety-related powerboards will be installed. A fire retardant material will be placed over all safety-related cable trays that pass over or near powerboards. Sprinklers will be provided for general tool storage and safety-related cable concentrations. Fire retardant material will also be placed on cables as a fire break in the cable trays to prevent the spread of fire.

We find that, subject to the implementation of the above-described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.1.4 Floor (Elevation 281 Feet)

5.1.4.1 Safety-Related Equipment

Powerboards and filter pumps and panel are located in this area.

5.1.4.2 Combustibles

Safety-related cable trays with P.V.C. jacketed cables, powerboard insulation on the north and west walls. Localized fire loading within the area.

5.1.4.3 Consequences if No Fire Suppression

Overall fire load for the floor is low, but an unmitigated fire could result in the loss of redundant safety-related equipment and cables.

5.1.4.4 Fire Protection System

Fire protection is provided by hose stations.

5.1.4.5 Adequacy of Fire Protection

At present, inadequate: cables could propagate fires in powerboards, and a lack of automatic detection could allow a fire to continue unnecessarily.

5.1.4.6 Modifications

Detection for cable concentrations and safety-related powerboards will be installed. A fire retardant material will be placed over all safety-related cable trays that pass over or near powerboards. A barrier will be used to separate powerboard 155 from powerboard 17 to assure that a fire in one board will not spread to the other. Fire retardant materials will be used as a fire break in cable trays to prevent the spread of fire.

We find that, subject to the implementation of the above-described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.1.5 Floor (Elevation 298 Feet)

5.1.5.1 Safety-Related Equipment

Emergency cooling valves, and liquid-poison pumps and valves are located in this area.

5.1.5.2 Combustibles

Electrical insulation and oil (small quantity: approximately one gallon).

5.1.5.3 Consequences if No Fire Suppression

Overall fire load for the floor is low, but an unmitigated fire could result in the loss of redundant liquid poison pumps.

5.1.5.4 Fire Protection System

Fire protection is provided by hose stations.

5.1.5.5 Adequacy of Fire Protection

At present, inadequate: a fire involving one of the liquid poison pumps could affect the adjacent pump.

5.1.5.6 Modifications

Detection near the safety-related equipment will be provided. Also, a radiant heat barrier will be installed between the liquid-poison pumps to prevent fire damage to both pumps.

We find that, subject to the implementation of the above-described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.1.6 Floor (Elevation 318 Feet)

5.1.6.1 Safety-Related Equipment

Containment spray valves are located in this area.

5.1.6.2 Combustibles

Electrical insulation and oil (for motors) and some plastic and wood (transient outage storage).

5.1.6.3 Consequences if No Fire Suppression

Overall fire load for the floor is low, but an unmitigated fire could result in the loss of redundant safety-related equipment.

5.1.6.4 Fire Protection System

Fire protection is provided by hose stations.

5.1.6.5 Adequacy of Fire Protection

At present, inadequate for transient material storage area, since a fire in this material could affect safety-related equipment and cables.

5.1.6.6 Modifications

Detection near the safety-related equipment will be installed. Also, sprinklers will be provided for the transient outage equipment storage area.

We find that, subject to the implementation of the above-described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.1.7 Floor (Elevation 340 Feet)

5.1.7.1 Safety-Related Equipment

There is no safety-related equipment which is used to shut down the reactor in this area.

5.1.7.2 Combustibles

Fire hazards are present during refueling and generally represent a transient fire load of small consequence.

5.1.7.3 Consequences if No Fire Suppression

The consequences of no fire suppression in this area would not result in the release of radioactive material to the environment in excess of 10 CFR 20 limits.

5.1.7.4 Fire Protection System

Fire protection is provided by hose stations.

5.1.7.5 Adequacy of Fire Protection

Generally satisfactory; however, detection should be provided to limit the spread of fire in the equipment storage area.

5.1.7.6 Modifications

Fire hazards will be handled by administrative procedure. Detection will be provided for the equipment storage area in the northeast corner of the building at elevation 340'.

We find that, subject to the implementation of the above-described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.2 Control Building

The following evaluation is applicable to the Unit 1 Control Building.

5.2.1 Cable Room (Elevation 250 Feet)

5.2.1.1 Safety-Related Equipment

Safety-related cable trays are located in this area.

5.2.1.2 Combustibles

Electrical insulation (P.V.C. jackets) on cables in cable trays.

5.2.1.3 Consequences if No Fire Suppression

An unmitigated fire could result in the loss of redundant systems required for safe shutdown.

5.2.1.4 Fire Protection System

The area has CO_2 automatic protection initiated by smoke detection in the room. Manual hose stations are installed in the vicinity.

5.2.1.5 Adequacy of Fire Protection

At present, inadequate: the CO_2 system may not be capable of suppressing a fire in this area. Ventilation is inadequate to remove smoke produced by burning cable insulation.

5.2.1.6 Modifications

A sprinkler system will be installed in the room as a backup to the CO_2 system. All penetrations will be sealed. Doors will be replaced with "A" label fire doors. The HVAC system will be expanded to include smoke removal capability.

We find that, subject to the implementation of the above-described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

9c

5.2.2 Auxiliary Control Room and Computer Room (Elevation 250 Feet)

5.2.2.1 Safety-Related Equipment

The auxiliary control room contains equipment necessary for station operation and for safe reactor shutdown.

5.2.2.2 Combustibles

Electrical cable insulation, electrical wiring within the control boards, and paper (in the computer room).

5.2.2.3 Consequences if No Fire Suppression

An unmitigated fire in the auxiliary control room has the potential for damaging significant amounts of redundant safety-related equipment and cabling.

5.2.2.4 Fire Protection Systems

The area has a manually actuated CO_2 system and interior hose stations are installed in the vicinity of these rooms.

5.2.2.5 Adequacy of Fire Protection

The present situation is unacceptable since a fire in this area could prevent occupancy of the control room proper, destroy redundant cabling and seriously inhibit safe shutdown of the reactor.

5.2.2.6 Modifications

The manual CO_2 system will be changed to automatic initiation by smoke detection. The room will be sealed to provide enclosure for the CO_2 and ventilation will be tripped before CO_2 initiation.

The existing HVAC system will be enhanced with a 100% fresh air input and exhaust system, including new supply and exhaust ducts, a smoke exhaust fan, and additional dampers. (The new system will be designed for emergency use to remove smoke.) One fire door, presently "B" labeled, will be replaced with one "A" labeled. The licensee has also proposed to provide an emergency shutdown panel to be independent of this area (i.e., see 5.2.3).

We find that, subject to the implementation of the above-described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.2.3 Control Room (Elevation 277 Feet)

5.2.3.1 Safety-Related Equipment

The control room contains equipment necessary for station operation and for safe reactor shutdown, including operating indicators, controls and alarms.

5.2.3.2 Combustibles

Electrical cable insulation, electrical wiring within the control boards, floor covering, a false ceiling, and some paper (procedures).

5.2.3.3 Consequences if No Fire Suppression

An unmitigated fire in the control room has the potential for damaging significant amounts of redundant safety-related equipment.

5.2.3.4 Fire Protection System

Manual hose stations are provided in the vicinity. Portable extinguishers are available, including portable 15 pound CO_2 extinguishers at the entrances to walk in panels.

5.2.3.5 Adequacy of Fire Protection

At present, inadequate: unmitigated fire could inhibit capability to shutdown the plant from the control room. Lack of detection could allow fire to propagate unnecessarily in redundant cables in control cabinets.

5.2.3.6 Modifications

Smoke detection will be installed in the control cabinets and above the ceiling.

An emergency shutdown panel will be provided outside the control room for principal control of equipment with sufficient monitoring information, including emergency condensor and reactor pressure vessel fluid levels, to effect safe shutdown of the reactor.

The false ceiling will be replaced with one having flame spread and smoke development ratings of no greater than 25.

We find that, subject to the implementation of the above-described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.3 Diesel Generator Building

The following evaluation is applicable to the Unit 1 Diesel Generator Building.

5.3.1 Floor (Elevation 250 Feet: Under Powerboard Rooms and Diesel Generators)

5.3.1.1 Safety-Related Equipment

Diesel generator output cables from both diesel generators are located in this area.

5.3.1.2 Combustibles

Cable insulation and diesel fuel oil, via an oil leak from diesel generators or the fuel supply.

5.3.1.3 Consequences if No Fire Suppression

A single fire could damage the output cables from both emergency diesel generators.

5.3.1.4 Fire Protection System

Manual hose stations are installed near the area.

5.3.1.5 Adequacy of Fire Protection

At present, inadequate: an unmitigated fire could damage output cables from both diesel generators.

5.3.1.6 Modifications

The licensee has proposed to:

-- Provide 3-hour rated fire barrier below the diesel generator rooms to separate the redundant fuel oil lines and to contain fuel oil spills.

-- Provide curbs to contain oil spillage inside each room.

-- Relocate the output cables from diesel generator 103.

-- Provide rated fire barriers and doors to separate the area directly below the diesel generator rooms and the power board rooms from adjoining areas.

-- Remove the cross tie between the diesel generator fuel oil lines to prevent a fire in one area from disabling both diesels, and provide a new cross tie outside the building.

-- Install smoke detectors in the area below both diesel generator rooms.

-- Install automatic sprinklers in the areas below both diesel generator rooms.

We find that, subject to the implementation of the above-described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.3.2 Diesel Generator Rooms (Elevation 261 Feet)

5.3.2.1 Safety-Related Equipment

Diesel generators No. 102 and 103 are located in separate rooms in this area, as well as associated controls and auxiliary equipment and safety-related cables for other systems in the plant. Electrical cables for diesel generator 102 fuel oil system and several other safety systems are run through diesel generator room 103.

5.3.2.2 Combustibles

About 400 gallons of diesel fuel oil in a day tank, about 350 gallons of lube oil, and a considerable quantity of electrical cable insulation are in each of the two diesel generator rooms.

5.3.2.3 Consequences If No Fire Suppression

The diesel generator rooms are separated from each other and from other areas of the plant by 3-hour rated fire barriers, except that electrical cable penetrations from these rooms to the basement level are not sealed. The basement area beneath these rooms is not subdivided, nor is it separated from the rest of the basement level. In addition, structural steel in the diesel generator rooms is not protected against fire damage. The electrical cables in diesel generator room 103 are covered with a flame retardant coating, and further enclosed in a missile shield as protection against a diesel generator explosion.

An unmitigated fire involving the diesel fuel oil in one of the diesel generator rooms would be likely to disable the particular diesel generator, and could damage the structural steel supports for the walls and roof. Some of the structural steel is common to the roofs of both diesel generator rooms. Therefore, a large fire in one diesel generator room could disable both diesel generators.

Such a fire in diesel generator room 103 would also expose certain electrical cables serving diesel generator 102.

However, the flame retardant coating and the heavy steel missile shield may provide some protection. In addition, a fire or other high temperature condition originating in or near the redundant electrical cables in this room might affect both diesel generators.

The sills at the doorways of the diesel generator rooms are probably adequate to contain the total contents of one of the diesel generator day tanks, with or without the room drains functioning. Fuel oil leaking through the unsealed floor penetrations to the basement level or a pipe break in the the basement level below the diesel generators, could result in a fire involving cables and fuel oil piping from both diesel generators, and other cables in the turbine building basement. There is also a potential for fuel oil to spread between the redundant diesel generator rooms through the common floor drain system.

The licensee has a satisfactory method of shutting off the supply of fuel oil to the day tank in each diesel generator room. The arrangement of level sensors in the fuel oil day tanks will provide an alarm in the control room when about 175 gallons is left in either of the tanks. Leaks of more than about 7 gpm while the diesel generator is running would eventually draw the level of the day tank down far enough so that a low-low level alarm would be annunciated in the control room; smaller leaks would not draw the level down and would not, therefore, result in a signal.

5.3.2.4 Fire Protection Systems

Each diesel generator room is provided with a total flooding carbon dioxide extinguishing system, automatically actuated by rate compensation type heat detectors. Operation of the carbon dioxide system in either diesel generator room is arranged to automatically close the motor operated door to the exterior, and shut down the ceiling exhaust fans.

Portable fire extinguishers are located in each diesel generator room, and nearby all of these areas. Interior hose stations are located in each diesel generator room.

5.3.2.5 Adequacy of Fire Protection

The fire protection is not adequate to prevent possible damage to redundant safety-related cables or equipment. Unsealed cable penetrations would permit heat and smoke from a fire to spread outside the fire area, and the cable itself might propagate the fire directly. These same penetrations could serve as pathways for diesel fuel oil spilled in the diesel generator rooms. The floor drain system could allow combustible liquids to spread from one diesel generator room to the other.

The collapse of unprotected structural steel could damage both redundant diesel generators.

The automatic carbon dioxide extinguishing system should be effective in suppressing a fuel oil fire. However, if the exterior door did not close or if the ventilating system fans did not stop, the carbon dioxide might be dissipated without extinguishing the fire. In addition, operation of the ventilating system may preclude timely fire detection in these rooms.

5.3.2.6 Modifications

The licensee has proposed to:

-- Protect the exposed structural steel in each diesel generator room.

-- Provide electrical cable penetration seals with fire resistance ratings required by the fire hazards analysis.

-- Provide early warning detection.

-- Modify the floor drain system to eliminate this potential pathway for the spread of combustible liquids between redundant diesel generator rooms.

In addition, the licensee has agreed to:

-- Relocate control cables for the 102 diesel generator outside diesel generator room 103.

-- Electrically supervise the door between the diesel generator rooms and between the power board rooms so that an alarm sounds in a constantly attended location when one of the doors is open.

-- Verify by analysis or test demonstration that the installed and proposed fire detection devices in the diesel generator rooms will be effective under all operating conditions which may exist in these rooms.

With the above modifications, we find that the fire protection of this area satisfies the objectives of Section 2.2 of this report and is, therefore, acceptable.

5.3.3 Powerboard Rooms (Elevation 261 Feet)

5.3.3.1 Safety-Related Equipment

Powerboard Nos.102 and 103 are located in this area.

5.3.3.2 Combustibles

Insulation on the wires inside the powerboard and on the cables within the room.

5.3.3.3 Consequences if No Fire Suppression

An unmitigated fire in a powerboard room could result in the loss of one onsite power source.

5.3.3.4 Fire Protection System

Interior hose stations are installed adjacent to the area. Fixed automatic CO_2 systems are installed in each room which are initiated by heat detection in the rooms.

5.3.3.5 Adequacy of Fire Protection

The lack of early warning detection could allow a fire to propagate unnecessarily.

5.3.3.6 Modifications

Smoke detection will be provided. Fire retardant materials will be employed to cover safety-related cable trays in the room and floor penetrations. Adequately rated and designed penetration seals will be provided between the powerboard and the 250 foot elevation.

We find that, subject to the implementation of the above-described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.4 Turbine Building

The following evaluation is applicable to the Unit 1 Turbine Building.

5.4.1 Floor (Elevation 250 Feet)

Electrical cables for numerous safety-related systems are located in this area.

5.4.1.2 Combustibles

The combustibles in this area consist mainly of electrical cable insulation, miscellaneous ordinary combustibles, and several offgas system charcoal columns. A rupture of the turbine oil system could release as much as 9,000 gallons of lube oil into this area. Oil drained from the service air compressor on elevation 261 feet is carried to a metal drum on elevation 250 feet by flexible tubing.

5.4.1.3 Consequences If No Fire Suppression

Three fire zones generally separated from each other by 3 hour rated fire barriers have been designated on this level by the licensee. Zone T1 is the area generally west and south of the turbine generator, and Zone T2 the area east of the turbine generator, and Zone T3 the area directly beneath the turbine generator. Zones T1 and T2 are not physically separated from each other by fire barriers and doors. Fire barriers separating these areas from adjacent areas of the plant are generally incomplete.

An unmitigated fire in Zone T3 would not be expected to affect adjacent fire zones on this level. An unmitigated fire in Zone T1 could involve electrical cables of redundant safety-related divisions in Zone T2, and vice versa. An unmitigated fire in Zone T2 could also involve safety-related cables in the area beneath the emergency diesel generator building or the adjacent power board rooms. Heat and smoke from fires in any part of this elevation could propagate to upper levels in the turbine building through numerous open stairs or ventilating system ducts.

A fire in the part of Zone T2 containing redundant offsite power feeds to the power board rooms could cause the loss of all offsite power.

5C

5.4.1.4 Fire Protection Systems

The storage area in Zone T1 at the west end of the turbine generator is protected by an automatic sprinkler system. The floor beneath the turbine generator is protected by five automatic foam-water sprinkler systems. Portable extinguishers and interior hose stations are provided throughout this level.

5.4.1.5 Adequacy of Fire Protection

The automatic suppression systems should be effective in controlling fires which start in the protected areas. Manual suppression of fires in other parts of this area should be adequate to limit damage, but the lack of automatic detection and complete fire barriers may permit redundant safety-related systems to be affected. Damage to safety-related cables and equipment in other areas may occur because of openings in existing fire barriers.

5.4.1.6 Modifications

The licensee has proposed to:

- Install automatic detection systems and automatic suppression systems to protect safety-related cables in trays.
- Install fire barriers and fire doors to complete the separation between Zones T1 and T2.
- Enclose the stairs in Zones T1 and T2 from this level to the 261 foot elevation.
- Install fire doors in the fire barriers between Zone T2 and the area beneath the diesel generator and the power board rooms.
- Install fire detection systems in two parts of Zone T3.
- Install fire dampers in the ventilation system ducts serving this area of the plant.

- o Reroute the offsite power cable for power board No. 103 from the area containing power board No. 102 cables.

- o Verify that safe shutdown can be achieved and maintained in event of a fire in any part of this area, assuming the simultaneous loss of off-site power.

With the above modifications, we find that the fire protection of this area satisfies the objectives of Section 2.2 of this report and is, therefore, acceptable.

5.4.2 Battery Board Rooms (Elevation 261 Feet)

5.4.2.1 Safety-Related Equipment

Power boards and associated cables are in each room.

5.4.2.2 Combustibles

Power board and cable insulation are the principal combustible materials in these rooms.

5.4.2.3 Consequences If No Fire Suppression

An unmitigated fire in either of these rooms would damage installed equipment and cables. Non-rated cable penetrations from each room to battery rooms above could provide a means for the spread of fire to adjacent areas. The licensee's fire hazard analysis has concluded that it will be possible to achieve and maintain safe shutdown in the event of a fire in either room, using equipment and cables located elsewhere. The door to each of these battery board rooms has not yet been shown to have adequate fire resistance to prevent a fire in the surrounding turbine generator area from damaging the contents of both battery board rooms.

5.4.2.4 Fire Protection Systems

Portable fire extinguishers and interior hose stations are available in nearby areas.

5.4.2.5 Adequacy of Fire Protection

Manual fire fighting equipment should be adequate to control or suppress a fire in or near these rooms, but the lack of automatic detection would permit a fire to continue unnecessarily.

5.4.2.6 Modifications

The licensee will:

- o Install automatic detection systems in these rooms.
- o Install rated cable penetration seals commesurate with fire barrier rating.

We find that, subject to implementation of the above described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.4.3 Remainder of Floor (Elevation 261 Feet)

5.4.3.1 Safety-Related Equipment

Electrical cables for various safety-related systems and equipment including reactor feedwater and feedwater booster pumps, closed loop cooling pumps, various associated valves, and power boards 11 and 12 are on this level of the turbine building. Most of these items of safety-related equipment are located within about 20 feet of their redundant counterparts.

5.4.3.2 Combustibles

Electrical cable insulation, lubricating oil mainly in five recirculating pump motor generator sets, and various transient combustibles (i.e., includes delivery trucks in track bay) are in this area. A chemical storage area on this level is adjacent to safety-related cable trays.

5.4.3.3 Consequences If No Fire Suppression

Two principal fire zones generally separated from each other by 3 hour rated fire barriers have been designated on this level. Zone T3 is the area containing the turbine generator and the remainder of this level. Several areas within Zone T3 are further enclosed by 3 hour rated barriers.

A major fire involving the turbine generator would cause considerable damage to it and the area in which it is located, including the upper levels of the building. Collapse of the exposed structural steel framed roof is possible. The major fire in Zone T3, such as in the motor generator sets, could damage large amounts of safety-related cables and equipment, including some redundant systems. The licensee's fire hazards analysis concludes that safe shutdown could be achieved and maintained using equipment and cables independent of these areas in event of fire.

5.4.3.4 Fire Protection Systems

Automatic sprinkler systems are provided in the decontamination area, the oil storage room, and at the wood storage area adjacent to the west end of the turbine generator area. Manual foam water sprinkler systems are provided to protect the turbine generator area. An automatic actuated carbon dioxide system is provided for the motor generator sets. Alarm is provided by rate compensation type heat detectors located above these hazards. Portable fire extinguishers, carbon dioxide hose reels, interior hose stations, and foam water hose stations are provided for manual fire fighting.

Presently, a single failure in the fire protection water system in this area could disable both fixed suppression systems and backup interior hose stations in some locations.

5.4.3.5 Adequacy of Fire Protection

The installed automatic and manual suppression systems should be capable of controlling or extinguishing postulated fires, except that automatic detection of a fire at the motor generator sets may be delayed as discussed in Section 4.2 of this report. Subsequent

(6d)

carbon dioxide fire suppression efforts may not be successful. An oil leak from the motor generator sets could spread a considerable distance due to the lack of curbs in this area. Manual fire fighting in other areas should be adequate, although lack of automatic detection will permit fires to continue unnecessarily.

5.4.3.6 Modifications

The licensee will:

- Provide automatic sprinklers and detectors for safety-related cable trays and localized fire hazards including the truckway entrances, storage areas, and the laboratory areas.
- Protect safety-related cables in trays over or near the power boards with flame retardant coatings.
- Seal floor penetrations on this elevation, and enclose stairways.
- Seal wall penetrations at the turbine generator lube oil resevoir.
- Modify the fire protection water system piping in this area to preclude loss of both fixed systems and interior hose protection in the same location by a single failure in the piping system.
- "Hard pipe" the oil drains from the service air compressor and remove the flexible tubing. (An "oil less" compressor is slated to be installed in its place.)
- Move the chemical storage area 6 feet to the south to eliminate the hazard to the safety-related cables, and install a fire suppression system in the new area.
- Install low level sensors in the motor generator set fluid couplings to alarm and annunciate in the control room.
- Provide a radiant heat shield between redundant feedwater pumps.

We find that, subject to implementation of the above described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.4.4 Turbine Oil Reservoir (Elevation 261 Feet)

5.4.4.1 Safety-Related Equipment

There is safety-related cabling in corridors outside the turbine oil reservoir room.

5.4.4.2 Combustibles

Up to 14,000 gallons of lubricating oil (in reservoir) and some residual oil in portable oil centrifuge.

5.4.4.3 Consequences If No Fire Suppression

An unmitigated fire could result in the loss of safety-related cable in the general area.

5.4.4.4 Fire Protection System

A manually actuated CO_2 system is installed inside the reservoir and area foam water sprinklers are provided in the room, with manual foam hose stations and water hose stations in adjacent areas available as backup. Fire detection is installed.

5.4.4.5 Adequacy of Fire Protection

Fire protection provided for this area should preclude a fire inside the room from affecting the safety-related cabling in the outside corridor.

5.4.4.6 Modifications

No modifications are required.

We find that the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.4.5 Lube Oil Storage Room (Elevation 261 Feet)

5.4.5.1 Safety-Related Equipment

There is no safety-related equipment which is used to shutdown the reactor in this area.

5.4.5.2 Combustibles

Up to 1000 gallons of lubricating oil.

5.4.5.3 Consequences If No Fire Suppression

An unmitigated fire probably would not affect any safety-related equipment.

5.4.5.4 Fire Protection System

A sprinkler system is provided. Interior hose stations are available as backup.

5.4.5.5 Adequacy of Fire Protection

Fire protection is considered to be adequate for this area.

5.4.5.6 Modifications

No modifications are required.

We find that the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.4.6 Battery Rooms (Elevation 277 Feet)

5.4.6.1 Safety-Related Equipment

Station batteries and associated cables are located in these redundant adjacent rooms.

5.4.6.2 Combustibles

Electrical cable insulation is the principal combustible in these rooms; hydrogen gas may be generated during battery charging.

5.4.6.3 Consequences If No Fire Suppression

A major fire in one of these rooms could damage installed equipment and cables, but not be expected to affect areas outside the room of fire origin.

5.4.6.4 Fire Protection System

Portable fire extinguishers and interior hose stations are available from nearby areas.

5.4.6.5 Adequacy of Fire Protection

Manual fire fighting equipment should be adequate to control or suppress a fire in one of these rooms, but lack of detection would allow the fire to continue unnecessarily.

5.4.6.6 Modifications

The licensee will install fire detectors and an alarm for loss of ventilation in each room. In addition, the licensee will:

- Replace the louver installed in the doors to these rooms with a rated fire door louver.
- Verify that rated fire dampers are installed in the room exhaust ducts at the point where the ducts pass through the ceiling of each battery room.

We find that, subject to implementation of the above described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.4.7 Remainder of Floor (Elevation 277 Feet)

5.4.7.1 Safety-Related Equipment

Power board 101 and electrical cables are the major safety-related items in this area.

5.4.7.2 Combustibles

Safety-related cables in cable trays are spread along the west, east and south walls. The power board is a localized fire hazard. The station transformers are outside of the west and south walls behind non-fire rated walls. The hydrogen seal oil unit is located on the west side of the turbine generator.

5.4.7.3 Consequences If No Fire Suppression

Two principal fire zones generally separated from each other by 3 hour rated fire barriers have been designated on this level. Zone T3 contains the turbine generator, moisture separators, and the remainder of this level. (The battery rooms within Zone T3 have been previously discussed.)

A major fire in Zone T3 could cause considerable damage to the turbine generator, and to upper levels of the building. Collapse of the exposed structural steel framed roof is possible. A major fire in Zone T4 could cause damage to safety-related cables or equipment, including the redundant station battery rooms. The outside walls near the south and west corner of the turbine generator building do not have a fire resistance rating, and may be incapable of preventing a major fire in the outside transformers from causing damage in this area. The licensee's fire hazard analysis concludes that safe shutdown could be achieved and maintained using equipment and cables independent of these areas.

5.4.7.4 Fire Protection Systems

Seven manually activated sprinkler systems and five foam water sprinkler systems have been installed to protect the turbine generator and the immediate vicinity, including the hydrogen seal oil unit. Portable extinguishers, carbon dioxide hose reels, and interior hose stations are provided for manual fire fighting. In addition, foam water hose stations are also provided around the turbine generator and in the southwest portion of this level.

5.4.7.5 Adequacy of Fire Protection

The installed manually activated suppression systems should be capable of controlling or extinguishing postulated fires. Manual fire fighting in other areas should be adequate, although lack of detection will permit fires to continue unnecessarily.

5.4.7.6 Modifications

The licensee will:

- o Install automatic sprinklers and automatic detection to protect heavy concentrations of safety-related cables.
- o Provide a deluge sprinkler to protect the west and south walls near the transformers to assure protection from transformer fires.
- o Apply flame retardant materials in the safety-related cables in trays over or near power boards.
- o Enclose the hydrogen seal oil unit and associated piping in a 3 hour rated fire barrier, or provide other suitable protection.

We find that, subject to implementation of the above described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.4.8 Floor (Elevation 291 Feet)

5.4.8.1 Safety-Related Equipment

Feedwater pump nos. 11 and 12 HPCI valves, and D. C. valve board no. 12 are located in this area, as well as some safety-related cables.

5.4.8.2 Combustibles

Major combustible materials on this level include lubricating oil, motor and cable insulation, wiring in power boards; welding shop; miscellaneous transient combustibles including cable reels, are also stored here. Charcoal filters for the reactor building emergency ventilating system are located in a separate section of the turbine building at about this elevation.

5.4.8.3 Consequences If No Fire Suppression

A major fire on this elevation would damage the safety-related cables and equipment located here. The licensee's fire hazard analysis has concluded that it will be possible to achieve and maintain safe shutdown in event of a fire in this area, using equipment and cables in other plant areas.

5.4.8.4 Fire Protection Systems

Portable extinguishers, interior hose stations, a carbon dioxide hose reel, and a foam water hose station are available on this elevation for manual fire fighting.

5.4.8.5 Adequacy of Fire Protection

The installed manual fire fighting equipment should be capable of controlling or extinguishing a fire in this area, although the lack of automatic detection will allow the fire to continue unneccessarily.

5.4.8.6 Modifications

The licensee will:

- o Install automatic detectors over power boards, heavy cable concentrations, and localized fire hazards.
- o Apply a flame retardant coating on cables in trays over or near power boards.
- o Install an automatic sprinkler system and detection system to provide protection for the welding area.

- o Enclose stairways in the northwest and southwest corners of the area in a 2 hour rated stair shaft. (Note: These two stairwells will be enclosed throughout the turbine building on each elevation.)

- o Provide detectors and a manual sprinkler system for the charcoal filters.

We find that, subject to implementation of the above described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.4.9 Floor (Elevation 300 Feet)

5.4.9.1 Safety-Related Equipment

There is no safety-related equipment which is used to shutdown the reactor in this area.

5.4.9.2 Combustibles

Electrical insulation (motors), hydrogen, charcoal filters (ventilation equipment), clothing and wood (changing area), wire insulation (power board).

5.4.9.3 Consequences If No Fire Suppression

Overall floor fire loading is moderate, although collapse of the exposed structural steel framed roof is possible. The licensee's fire hazard analysis concludes that safe shutdown could be achieved and maintained using cables and equipment independent of this area in case of fire.

5.4.9.4 Fire Protection Systems

Manually actuated water spray systems are provided to protect the turbine generator area. Rate compensation heat detectors in the protected area alarm and annunciate in the control room.

A total flooding carbon dioxide extinguishing system protects the turbine generator exciter housing, and a local application carbon dioxide extinguishing system protects the turbine generator bearings and associated piping and equipment. Both systems are manually actuated, and rate compensation heat detectors in the protected areas alarm and annunciate in the control room. Ventilation duct dampers in the generator exciter housing shut automatically on discharge of the carbon dioxide system in that area.

Portable extinguishers, interior hose stations, foam water hose stations, and carbon dioxide hose reels are provided at various locations in this area.

5.4.9.5 Adequacy of Fire Protection

The installed suppression systems should be capable of controlling or extinguishing postulated fires in this area. Manual fire fighting equipment should be capable of controlling or extinguishing fires not protected by installed systems, although lack of automatic detection will permit these fires to continue unnecessarily.

5.4.9.6 Modifications

The licensee will:

- Install automatic detection systems for power boards and ventilation equipment.
- Create a general storage area in the southwest corner of elevation 300 feet, enclosed in a rated fire barrier. Automatic detection and sprinkler systems will be installed here.
- Provide smoke detectors and manually actuated sprinkler systems for charcoal filters.
- Enclose two stairways in rated shafts.
- Install roof vents over the turbine generator area.

We find that, subject to implementation of the above described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.4.10 Lube Oil Room (Elevation 305 Feet)

5.4.10.1 Safety-Related Equipment

There is no safety-related equipment which is used to shutdown the reactor in this area.

5.4.10.2 Combustibles

Up to 30,000 gallons of lubricating oil.

5.4.10.3 Consequences If No Fire Suppression

An unmitigated fire in this area should not affect safe shutdown equipment nor result in the release of radioactive material to the environment in excess of 10 CFR 20 limits.

5.4.10.4 Fire Protection System

A total flooding CO_2 system is installed. The walls of the lube oil room have fire resistance ratings of 2 or 3 hours. The floor has a 1-1/2 hour rating.

5.4.10.5 Adequacy of Fire Protection

The installed suppression systems should be capable of controlling or extinguishing postulated fires in this area.

5.4.10.6 Modifications

The licensee will install 3 hour rated fire dampers in the ventilation duct penetrations of the lube oil room.

We find that, subject to implementation of the above described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.4.11 Floor (Elevations 320, 333, 350, and 369 Feet)

5.4.11.1 Safety-Related Equipment

The only safety-related equipment in these areas are the emergency condenser makeup tanks.

5.4.11.2 Combustibles

Motor insulation (ventilation equipment) and some clothing in a change area.

5.4.11.3 Consequences If No Fire Suppression

Overall fire load is low, and an unmitigated fire in the area should not affect safe shutdown equipment nor result in the release of radioactive material to the environment in excess of 10 CFR 20 limits.

5.4.11.4 Fire Protection System

Interior hose stations and portable extinguishers are available.

5.4.11.5 Adequacy of Fire Protection

The existing fire protection equipment should be capable of controlling or extinguishing postulated fires in this area.

5.4.11.6 Modifications

Automatic detection will be provided for localized hazards and the clothing change area. Side wall vents will be provided for smoke and heat removal.

We find that, subject to implementation of the above described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.5 Screen and Pump House

The following evaluation is applicable to the Unit 1 Screen and Pump House.

5.5.1 Floor (Elevation 256 Feet)

5.5.1.1 Safety-Related Equipment

Diesel fire pump, emergency service water pumps, containment spray pumps, electrical fire pump, and diesel generator cooling water pumps are located in this area.

5.5.1.2 Combustibles

Fuel oil, electrical cable insulation, and plastic wire insulation (for power boards).

5.5.1.3 Consequences If No Fire Suppression

An unmitigated fire could result in the loss of redundant equipment required for safe shutdown.

5.5.1.4 Fire Protection System

Interior hose stations and portable extinguishers are available in the area. A sprinkler system is provided for the diesel fire pump room.

5.5.1.5 Adequacy of Fire Protection

Lack of automatic detection could allow a fire to continue unnecessarily.

5.5.1.6 Modifications

Detection will be provided for pump motors in constricted areas in the power board and cable tray area. The door at the 261 foot elevation will be replaced with an "A" label door.

We find that, subject to the implementation of the above described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.6 Waste Building

The following evaluation is applicable to the Unit 1 Waste Building.

5.6.1 Floors (Elevations 225, 247, 261 and 281 Feet)

5.6.1.1 Safety-Related Equipment

There is no safety-related equipment which is used to shutdown the reactor in this area.

5.6.1.2 Combustibles

Paper, wood, vehicles, electrical cable insulation, plastic, and oil (waste oil storage).

5.6.1.3 Consequences If No Fire Suppression

An unmitigated fire could result in low level contamination from loose contaminated solid waste. (Solid waste stored here is periodically encapsulated in steel drums.) No safety-related equipment would be lost and safe shutdown could be achieved.

5.6.1.4 Fire Protection System

An interior hose station is installed in the area. As a result of the hose stretch test, an additional hose station will be added. A sprinkler system is installed for the baler room area and low level storage area.

5.6.1.5 Adequacy of Fire Protection

At present, inadequate: lack of automatic detection could allow a fire to continue unnecessarily and lack of suppression could result in the release of low level contamination.

5.6.1.6 Modifications

Detection will be installed on every floor in areas of identifiable fire hazards. Sprinklers will be installed for the truck loading area and a fire cutoff from the waste building proper will be provided at the truck port. An additional hose station will be added.

Waste oil storage drums will no longer be stored on elevation 261; they will be stored outside of the plant area. Suitable permanent wall penetrations will be provided at elevation 251 in place of the temporary ones now in place.

The existing nonlabelled door at the 261 foot elevation will be replaced with a "B" label door. The bailing room door will be replaced with an "A" label door.

We find that, subject to the implementation of the above described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.7 Off-Gas Building

The following evaluation is applicable to the Unit 1 Off-Gas Building.

5.7.1 Floors (Elevations 229, 232, 247 and 261 Feet)

There is no safety-related equipment which is used to shutdown the reactor in this area.

5.7.1.2 Combustibles

Cable insulation, wire insulation and plastic.

5.7.1.3 Consequences If No Fire Suppression

An unmitigated fire in this area would not result in the release of radioactive material to the environment in excess of 10 CFR 20 limits.

5.7.1.4 Fire Protection System

Interior hose stations and portable extinguishers are available in the area.

5.7.1.5 Adequacy of Fire Protection

Fire protection for this area is satisfactory except lack of detection could allow a fire to continue unnecessarily.

5.7.1.6 Modifications

Generally, detection will be provided on every floor in areas of identifiable fire hazards.

We find that, subject to implementation of the above described modifications, the fire protection for this area satisifes the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.8 Administration Building

The following evaluation is applicable to the Unit 1 Administration Building.

5.8.1 Floors (Elevations 250, 261 and 277 Feet)

There is no safety-related equipment which is used to shutdown the reactor in this area.

5.8.1.2 Combustibles

Paper, cable insulation, wood, clothing and oil.

5.8.1.3 Consequences If No Fire Suppression

An unmitigated fire in this area could not affect safe shutdown equipment nor result in the release of radioactive material to the environment in excess of 10 CFR 20 limits.

5.8.1.4 Fire Protection System

A CO_2 system is installed for the record storage room. Sprinkler systems are installed in shop, store area, and the microfilm process area in the basement. Also detection is provided in the microfilm process area and telephone room.

5.8.1.5 Adequacy of Fire Protection

Fire protection for this area is satisfactory.

5.8.1.6 Modifications

The entire basement of the administration building will be sprinkled to protect records. Also, the administration building is presently being extended. Construction is scheduled to be complete about 1980. A sprinkler system will be installed to protect both the extension and the present building as part of the new construction.

We find that, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.9 Yard Area

5.9.1 Safety-Related Equipment

There is no safety-related equipment in the yard area.

5.9.2 Combustibles

The major combustible materials in the yard area include transformer oil in the transformers outside the southwest corner of the turbine building, hydrogen in storage cylinders at the hydrogen rack outside the reactor building, and miscellaneous ordinary combustibles.

5.9.3 Consequences If No Fire Suppression

An unmitigated fire in the transformer area might cause damage on the 277 foot elevation of the turbine building; the outside wall in this area does not have a fire resistance rating.

5.9.4 Fire Protection System

Automatic water spray systems are provided to protect the transformers and the hydrogen rack. Pneumatic heat actuated devices are installed to detect fires in these areas. Yard hydrants, hose from two hose carts, and portable extinguishers are available for manual fire fighting.

5.9.5 Adequacy of Fire Protection

The installed automatic suppression systems should be adequate to control or extinguish a fire in the protected areas. Protection for the hydrogen rack is designed to prevent an exposure fire at the rack from causing over pressurization of the hydrogen storage cylinders.

Manual fire fighting equipment may not be capable of controlling fires involving the transformers. In addition, lack of hose houses at regular intervals limits the amount of hose and other equipment available for fire fighting.

7c

5.9.6 Modifications

The licensee will:

- Install a deluge system to protect the wall at the 277 foot elevation of the turbine building in the vicinity of the outside transformers. (See Section 5.4.7.6)

- Provide one hose house for every two fire hydrants, especially duplicating the equipment in the present hose carts.

We find that, subject to implementation of the above described modifications, the fire protection for this area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

6.0 ADMINISTRATIVE CONTROLS

The administrative controls for fire protection consist of the fire protection organization, the qualifications and training for fire protection personnel, the controls to be exercised over combustibles and ignition sources, plans and procedures for fighting fires in the various plant areas, and the quality assurance provisions for fire protection. The licensee has provided a detailed description of proposed administrative controls. Plans and procedures stipulating the management and staff organization and its qualifications; the fire brigade training program; controls over combustibles and ignition sources and the prefire plans for fighting fires are being developed and implemented. The program and its implementing procedures as provided by letter from the licensee dated February 28, 1977, as supplemented by letter dated July 13, 1977; December 13, 1977; March 22, 1978; October 6, 1978; January 2, 1979; and January 31, 1979, are found acceptable by the staff using items referenced in Sections 1.0(e) and 1.0(f).

We have evaluated the areas at Nine Mile Point Unit 1 to determine the minimum required fire brigade size to cope with fires that may occur, and have determined that a five man brigade is required. This requirement is being incorporated into the Technical Specifications with implementation 90 days after issuance of this report.

All five of the brigade members receive the same instruction and practice, including familiarization with the content of the prefire plans with the exception that two members will not receive fire fighting strategy training because they are under the direction of a trained brigade leader. These two members do receive an acceptable level of training to perform their assigned tasks. Strategy training is only required for brigade leaders and includes decision factors, direction of brigade, problem sessions and coordination of various pieces of equipment.

We find that, subject to implementation of the above described programmatic changes, the fire protection program satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

7.0 TECHNICAL SPECIFICATIONS

The Technical Specifications have previously been modified to incorporate interim Technical Specifications which include limiting conditions for operation and surveillance requirements for existing fire protection systems and administrative controls. The licensee will propose a Technical Specification change to require that at least five individuals with fire protection training be onsite at all times. Following the implementation of the modifications of fire protection systems resulting from this review, the Technical Specifications will be similarly modified to incorporate the limiting conditions of operation and surveillance requirements for these modifications.

8.0. CONCLUSION

The licensee has performed a fire hazards analysis and has proposed certain modifications to improve the fire protection program. Additional modifications have been proposed by the licensee during the course of our review, which are based upon the fire hazards analysis and our onsite evaluation of the fire protection program. These proposed modifications are summarized in Section 3.1. In addition, we have concluded that the licensee should implement certain evaluations or improvements related to the fire protection program. These are summarized in Section 3.2. Significant steps are being taken to provide additional assurance that safe shutdown can be accomplished and the plant can be maintained in a safe condition during and following potential fire situations. Additional evaluation of incomplete items, discussed in the preceding sections, will be necessary before we can conclude that the overall fire protection at the Indian Point-Unit 3 facility will satisfy the provisions of BTP 9.5-1 and Appendix A thereto, which the staff has established for satisfactory long-term fire protection.

We find that the licensee's proposed modifications described herein are acceptable both with respect to the improvements in the fire protection program that they provide and with respect to continued safe operation of the facility, while the remaining items are completed.

In the report of the Special Review Group on the Browns Ferry Fire (NUREG-0050) dated February 1976, consideration of the safety of operation of all operating nuclear power plants pending the completion of our detailed fire protection evaluation was presented. The following quotations from the report summarize the basis for the Special Review Group's conclusion that the operation of the facility need not be restricted for public safety:

> "Fires occur rather frequently; however, fires involving equipment unavailability comparable to the Browns Ferry fire are quite infrequent (see Section 3.3 of [NUREG-0050]). The Review Group believes that steps already taken since March 1975 (see Section 3.3.2) have reduced this frequency significantly."
>
> "Based on its review of the events transpiring before, during and after the Browns Ferry fire, the Review Group concludes that the probability of disruptive fires of the magnitude of the Browns Ferry event is small, and that there is no need to restrict operation of nuclear power plants for public safety. However, it is clear that much can and should be done to reduce even further the likelihood of disabling fires and to improve assurance of rapid extinguishment of fires that occur. Consideration should be given also to features

that would increase further the ability of nuclear facilities to withstand large fires without loss of important functions should such fires occur."

We recognize that the "Risk Assessment Review Group Report to the U.S. Nuclear Regulatory Commission," NUREG/CR-0400 (The Lewis Committee Report), states that this Review Group is unconvinced of the correctness of the WASH-1400 conclusion that fires contribute negligibly to the overall risk of nuclear plant operation. In the Commission's Policy Statement dated January 18, 1979, "NRC Statement on Risk-Assessment and the Reactor Safety Study Report (WASH-1400) in Light of the Risk-Assessment Review Group Report", the Commission indicated on page 3 that it "accepts the Review Group Report's conclusion that absolute values of the risks presented by WASH-1400 should not be used uncritically either in the regulatory process or for public policy purposes and has taken and will continue to take steps to assure that any such use in the past will be corrected as appropriate. In particular, in light of the Review Group conclusions on accident probabilities, the Commission does not regard as reliable the Reactor Safety Study's numerical estimate of the overall risk of reactor accident."

In summary, it is our conclusion that the operation of the facility, pending resolution of the incomplete items and the implementation of all facility modifications, does not present an undue risk to the health and safety of the public based on our concurrence with the Browns Ferry Special Review Group's conclusions identified above, giving due consideration to the Commission Policy Statement, as well as the significant improvements in fire protection already made at the facility since the Browns Ferry fire. These include establishment of administrative controls over combustible materials and use of ignition sources, training and staffing of a fire brigade, and issuance of technical specifications to provide limiting conditions for operation and surveillance requirements for fire protection systems.

We have determined that the license amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and pursuant to 10 CFR 51.5(d)(4) that an environmental impact statement, or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance

of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

9.0 CONSULTANT'S REPORT

Under Contract to Nuclear Regulatory Commission, Brookhaven National Laboratory has provided the services of fire protection consultants who participated in the evaluation of the licensee's fire protection program and in the preparation of the safety evaluation report (SER). Their report "Fire Protection Evaluation - Nine Mile Point Unit 1", dated March , 1979, discusses several matters which have been addressed in the SER. The consultant's report contains recommendations which have, for the most part, been implemented during our evaluation. The consultant's recommendations which we have not adopted, along with our basis, therefore, is as follows:

1. Consultant's Comment: Valve Supervision

"Electrical supervision is provided for the valve controlling the water supply to the water spray and foam water systems, as noted in Section 4.2 of this report. Post indicator valves on the underground loop main, and fire pump discharge valves, sectionalizing valves inside the plant, and valves controlling the flow of water to standpipes and sprinkler systems are locked open and checked monthly. We will require the licensee to provide electrical supervision for all valves in the fire water system."

Staff Response:

The guidelines of Appendix A to BTP 9.5-1 allow electrical supervision, locking, or sealing with tamper-proof seals with periodic inspection as a means of assuring that valves in the fire protection water system are in the correct position. Valves on other systems in the plant are presently under similar administrative control. The plant Technical Specifications require a montly check of all valves in the flow path to fire suppression systems. A review by the staff of Licensee Event Reports for all plants using such periodic checks indicates that valves being in the incorrect position have not been a significant contributor to valve related failures. Additionally, standing water as a result of failure of suppression system piping will not damage safety-related equipment due to curbs, drains, mounting of equipment above floor level, grating and doorways. To date, the staff has not found any data that indicates that electrical valve supervision will significantly improve the availability of fire suppression systems in nuclear power plants.

2. Consultant's Comments: Smoke Removal

"The licensee has proposed various modifications to existing ventilating systems. However . . . (we) have no quantitative basis on which to judge the adequacy of either existing or proposed systems for their intended use as smoke removal systems. We will require the licensee to provide the results of tests or analyses which demonstrate that existing or proposed methods of heat or smoke venting are effective in preventing the spread of heat or smoke to areas not involved in the fire and are capable of exhausting the quantities of smoke and heat generated in postulated fires. We will require the licensee to verify that failure or inadvertent operation of these systems will not violate the controlled area boundaries of the plant."

Staff Response:

The licensee has proposed certain modifications to exhaust smoke in crucial areas such as the control room and turbine building. Additional information and improved equipment would provide some benefit in the design and construction of fixed ventilation systems to be used for smoke removal in future plants. However, a massive plant redesign of current plant ventilation systems is not warranted because portable smoke removal equipment can be used in those plant areas with inadequate fixed smoke removal systems. Portable smoke removal units have been used in fire service for a sufficient length of time so that the limits on their use is well understood.

In plants where smoke removal is dependent on such equipment, smoke removal is not generally initiated until the room atmosphere is cooled sufficiently, by fixed sprinkler operation or manual hose fogging to permit entry by fire fighting personnel. The currently available fire service portable smoke removal units have a sufficiently high temperature capability to remove smoke when the hot gases are cooled enough for fire brigade entry. The manual fire fighting consultants have made their evaluations of the fire fighting capabilities of a number of plants and have recommended use of the portable smoke exhaust systems.

We are requiring the licensee to provide three 5200 CFM fire service type smoke ejectors (with flexible ducting) to supplement the proposed modifications discussed in paragraph 4.4.1. We are also requiring that: (1) the licensee verify that the failure or inadvertent operation of these systems will not violate the controlled area boundaries of the plant; and (2) the licensee develop prefire plans which include the proper use of ventilation equipment in each plant area of concern. (This was addressed during our Administrative Controls review).

Consequently, there will be adequate information available to continue to evaluate plant smoke removal capability. The use of emergency breathing equipment, fire suppression equipment, fire barriers and other fire protection measures are evaluated based on the need for immediate access into an area and the limitations imposed by the currently available portable smoke removal units. These concerns are evaluated on an area basis at each plant by the site review team with due consideration of the advice of the fire fighting consultant(s).

APPENDIX A

CHRONOLOGY

In February 1976 the report by the NRC Special Review Group was issued as NUREG-0050, "Recommendations Related to the Browns Ferry Fire."

On May 3, 1976, Standard Review Plan 9.5.1 "Fire Protection" was sent to Niagara Mohawk Power Company (NMPC) incorporating the various recommendations contained in NUREG-0050.

By letter dated May 11, 1976, Niagara Mohawk Power Company (NMPC) was requested to compare the existing fire protection provisions at their facilities with new NRC guidelines as set forth in Standard Review Plan 9.5.1 "Fire Protection" and to describe (1) the implementation of the guidelines met. (2) the modifications or changes underway to meet the guidelines that will be met in the near future, and (3) the guidelines that will not be met and the basis therefore.

By letter dated September 27, 1976 NMPC was requested to provide the results of a fire hazards analysis and propose Technical Specifications pertaining to fire protection. NMPC was also provided a copy of Appendix A to BTP 9.5-1 which includes acceptable alternatives to the guidelines of SRP 9.5-1.

By letters dated December 2, and December 16, 1976 we provided model Technical Specifications and further guidance, and we requested submittal of fire protection Technical Specifications by the licensee.

By letter dated February 28, 1977, NMPC provided report titled "Nine Mile Point Unit 1 Fire Protection Program" in response to our letters of May 11, September 27, December2 and December 16, 1976

By letter dated June 17, 1977, we provided additional guidance re. fire protection Technical Specifications. NMPC responded July 13, 1977. We issued the Technical Specifications to NMPC on November 23, and NMPC accepted them by their letter of December 13, 1977.

On July 10, 1978, we requested additional information to supplement the NMPC fire hazards analysis, which was forwarded by NMPC letter of October 6, 1978.

Letters describing administrative controls for fire protection were forwarded to NMPC on August 8, 1977 and February 3, 1978.

Appendix A

On October 17-20, 1978, the NRC fire protection review team visited the Nine Mile Point Unit 1 facility. We issued a letter, dated November 27, 1978 requesting additional information and itemizing certain staff concerns and positions. NMPC provided additional information in response to the site visit and this letter, via their letters dated November 17, 1978; January 2, 1979; and January 31, 1979.

On March 6, 1979, the NRC fire protection review team met with NMPC in Syracuse, N.Y. to discuss the NMPC responses prior to issuing this Safety Evaluation Report.