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Docket No. 50-255

SEP 01 1978

Consumers Power Company
ATTN: Mr. David Bixel
Nuclear Licensing Administrator
212 West Michigan Avenue
Jackson, Michigan 49201

Gentlemen:

The Commission has issued the enclosed Amendment No. 42 to Provisional Operating License No. DPR-20 for the Palisades Plant. This amendment adds a license condition relating to the completion of facility modifications to improve the fire protection program in response to your submittal dated March 31, 1977, as supplemented by letters dated September 29, 1977, December 15, 1977, May 15, 1978, June 19, 1978, June 29, 1978, June 30, 1978, July 28, 1978, and July 31, 1978.

Following implementation of the modifications of fire protection systems resulting from this review, the Technical Specifications will be modified to incorporate the limiting conditions for operation and surveillance requirements for these modifications.

Copies of our Safety Evaluation and the Notice of Issuance also are enclosed.

Sincerely,

Original signed by
Dennis L. Ziemann

Dennis L. Ziemann, Chief
Operating Reactors Branch #2
Division of Operating Reactors

Enclosures:
1. Amendment No. 42 to License No. DPR-20
2. Safety Evaluation
3. Notice

cc w/enclosures:
See next page

Construct 1
CCP

OFFICE	DOR:ORB #2	DOR:ORB #2	DOR:ORB #1	DOR:PSB	OELD	DOR:ORB #2
SURNAME	HSmith	RDSilver:ah	TWambach	RFerguson	B. Smith	DLZiemann
DATE	8/8/78	8/8/78	8/8/78	8/9/78	8/29/78	9/1/78

NRC FORM 318 (9-76) NRCM 0240 ☆ U.S. GOVERNMENT PRINTING OFFICE: 1976 — 626-624

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

September 1, 1978

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Agency
Federal Activities Branch
Region V Office
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230 South Dearborn Street
Chicago, Illinois 60604

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7/28/78-7/31/78

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

CONSUMERS POWER COMPANY

DOCKET NO. 50-255

PALISADES PLANT

AMENDMENT TO PROVISIONAL OPERATING LICENSE

Amendment No. 42
License No. DPR-20

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Consumers Power Company (the licensee) dated March 31, 1977, as supplemented by letters dated September 29, 1977, December 15, 1977, May 15, 1978, June 19, 1978, June 29, 1978, June 30, 1978, July 28, 1978, and July 31, 1978, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

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

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, Provisional Operating License No. DPR-20 is hereby amended by adding paragraph 3.E to read as follows:

   E. The licensee may proceed with and is required to complete the modifications identified in Paragraphs 3.1.1 through 3.1.23 of the NRC's Fire Protection Safety Evaluation (SE) on the facility dated September 1, 1978. These modifications shall be completed as specified in Table 3.1 of the SE in accordance with the schedule contained therein. In addition, the licensee shall submit the additional information identified in Table 3.2 of this SE in accordance with the schedule contained therein. In the event these dates for submittal cannot be met, the licensee shall submit a report, explaining the circumstances, together with a revised schedule.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Dennis L. Ziemann

Dennis L. Ziemann, Chief
Operating Reactors Branch #2
Division of Operating Reactors

Date of Issuance: September 1, 1978

FIRE PROTECTION

SAFETY EVALUATION REPORT

BY THE

OFFICE OF NUCLEAR REACTOR REGULATION

U.S. NUCLEAR REGULATORY COMMISSION

IN THE MATTER OF

CONSUMERS POWER COMPANY

PALISADES PLANT

DOCKET NO. 50-255

Date: September 1, 1978

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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 reflect the recommendations in NUREG-0050. These guidelines are contained in the following documents:

- "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," 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.

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

- "Supplementary Guidance on Information Needed for Fire Protection Program Evaluation," September 30, 1976.

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

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

- "Manpower Requirements for Operating Reactors," memo from E. Case to V. Stello, R. Boyd, 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 was based on the fire protection review team's site visit of May 9-12, 1978 and the licensee's proposed program for fire protection as described in the following docketed information:

(1) The Palisades Safety Analysis Report;

(2) "Fire Protection Program Evaluation," dated March 31, 1977, and revision dated September 29, 1977;

(3) The licensee's responses dated December 15, 1977, May 15, 1978, June 19, 1978, June 29, 1978, June 30, 1978, July 28, 1978 and July 31, 1978 to requests for additional information and staff positions.

Our review has been limited to the aspects of fire protection related to the protection of the public from the standpoint of radiological 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 the release of radioactive material.

This report summarizes the results of our evaluation of the fire protection program at Consumers Power Company's Palisades Plant. The chronology of our evaluation is summarized in Appendix A of this report.

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.
>
> "Noncombustible 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 General Design Criterion 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 General Design Criterion 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;

(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 in 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, REQUIREMENTS, AND INCOMPLETE ITEMS

3.1 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. Such proposed modifications are summarized below. The sections of this report which discuss the modifications are noted in parentheses following each item. Further detail is contained in the licensee submittals. All modifications will be completed in accordance with the scheduled dates given in Table 3.1. 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 to assure that the design is acceptable prior to actual implementation of these modifications. The balance of the other modifications have been described in an acceptable level of detail.

3.1.1 Sprinklers*

The existing sprinkler system in switchgear room 1-D will be extended to provide coverage of cable trays above the switchgear and coverage of cable trays added during a previous plant modification (5.3).

A new sprinkler system will be added to the condensate pump and pit area in the turbine building (5.15).

A new sprinkler system will be added to the compactor area in the auxiliary building (4.14).

A new sprinkler system will be added to the service water pump area (5.5).

3.1.2 Detectors

Fire detection devices will be added to the control room and adjacent offices (5.1), cable spreading room (5.2), switchgear rooms (5.3), cable penetration rooms (5.12), refueling and spent fuel pool area (5.11), reactor containment building (5.13), engineered safeguards panel area and adjacent stairwell (5.14), corridors at 590' level (5.8), component cooling pump room (5.10), safeguards area (5.9), the charging pump room (5.8), battery rooms (5.7), and auxiliary feedwater pump room (5.6).

3.1.3 Cable Penetration Seals

Cable trays or stacks of cable trays that penetrate fire walls, floors, and ceilings will be sealed where these are not already sealed (4.9.1).

3.1.4 Conduit and Ductwork Penetrations and Unprotected Openings

Conduit penetrations of fire walls, floors, and ceilings, which are not already sealed, will be sealed both between the conduit and the concrete and between the cable and the conduit (4.9.1).

Ventilation ductwork penetrations of fire walls, floors, and ceilings will be sealed between the duct and the concrete (4.9.3).

Unprotected openings in fire walls, floors, and ceilings will be filled with concrete or sealed to a rating equivalent to the required rating of the fire barrier (4.9.2).

3.1.5 Fire Barriers*

Fire shields or fire barriers will be added in the cable spreading room (5.10), switchgear room 1-C (5.3), the safeguards area (5.9), and in the charging pump room (5.8).

3.1.6 Rerouting of Power and Control Circuits

Certain power and control cables associated with the following systems and equipment will be rerouted away from cabling of redundant equipment and systems: diesel generator 1-2 and associated 2.4 kV switchgear 1-D (5.3); 2.4 kV switchgear 1-C (5.2); charging pumps (5.8); service water pump (5.3); and plant emergency instrumentation (5.1, 5.2).

3.1.7 Fire Doors

The doorways from the diesel generator rooms into the common vestibule will be provided with three-hour fire-rated doors. These doorways will also be provided with sills to prevent spread of oil into the redundant diesel generator room (5.4).

A three-hour fire door and fire dampers will be installed to separate the control room from the stairwell leading to the switchgear room 1-D (5.1).

3.1.8 Fire Enclosure

New day tanks for the diesel driven fire pumps will be provided out of the service and fire water pump room in a newly constructed 3-hour rated building (5.5).

3.1.9 Fire Dampers

Fire dampers will be added to ventilation duct penetrations of fire walls, floors, and ceilings to prevent spread of fire to adjacent areas via the ventilation system (4.9.3).

3.1.10 Cable Fire Stops*

Fire stops will be added to cable trays in the reactor containment building to prevent the spread of fire between redundant divisions (5.13).

3.1.11 Independent Shutdown Path*

In addition to the modifications listed in 3.1.6, modifications will be made to provide alternate shutdown capability isolated from the effects

of fire damage in the control room, cable spreading room, engineered safeguards panel room with adjacent stairwell, and the corridor between the charging pump room and switchgear room 1-C (4.10).

3.1.12 Emergency Lighting

Fixed battery packs for access lighting to safety-related areas required for safe shutdown and for access to fight fires will be provided (4.6).

3.1.13 Battery Room Loss of Ventilation

Loss of battery room ventilation flow detection will be provided to alarm in the control room (5.7).

3.1.14 Equipment Removal

The temporary building and small transformers outside the diesel generator ventilation air intake will be removed (5.16).

3.1.15 Reactor Coolant Pump Oil Collection System*

An oil collection system with a level alarm will be installed at each reactor coolant pump to collect and contain any leakage or spills from the lift pump, drain and fill plugs, oil level sight glasses, external oil coolers, flanged connections in oil lines, and upper and lower oil reservoirs (5.13).

3.1.16 Portable Smoke Removal

A portable smoke removal capability for fire brigade use consisting of fan units will be provided (4.4.1).

3.1.17 Charging Pump Curb

A curb will be installed in the charging pump area between the "A" charging pump and the other charging pumps to prevent the spread of an oil fire (5.8).

3.1.18 Fire Brigade Equipment

a. A fire equipment storage room will be provided for the storage of fire brigade equipment.

b. Turnout coats and helmets will be provided for the fire brigade.

c. Hand held lamps will be provided for fire brigade use.

3.1.19 Yard Area Hydrant Equipment

a. Hydrants 3 and 5 are designated as safety related and will be raised to provide door clearance. The hose houses will also be repaired.

b. One 2-1/2-inch hydrant gate valve will be provided at each safety-related yard hydrant.

c. Sufficient 2-1/2-inch hose and a 2-1/2-inch x 1-1/2-inch x 1-1/2-inch gated wye such that not more than 100 feet of 1-1/2-inch hose is necessary to reach safety-related areas will be provided at hydrants that may serve safety-related areas.

d. The fence will be moved at the post indicator valve which is presently obstructed by the fence.

3.1.20 Hose Stations in the Reactor Containment Building

Hose stations will be provided in the reactor containment building to suppress cable insulation fires or fires in residual oil in the collection pans of the oil collection system (5.13).

3.1.21 Supervision of Fire Door

The fire door separating the cable spreading room from switchgear room 1-D will be provided with fusible link actuated closure devices.

3.1.22 Fire Hose

An additional length of fire hose will be provided at the hose station serving the safeguards area (5.9).

3.1.23 Breathing Air Supply

The licensee will provide a breathing air bottle refill capability to supply the fire brigade and operating personnel for six hours (4.4.3).

3.2 Incomplete Items

In addition to the licensee's proposed modifications, several incomplete items remain, as discussed below. The licensee will complete the evaluations necessary to resolve these items in accordance with the schedule contained in Table 3.2. This schedule has been established such that should these evaluations identify the need for additional modifications, they can be implemented on a schedule consistent with completion of the modifications identified in Section 3.1. We will address the resolution of these incomplete items in a supplement to this report.

3.2.1 Cable Penetration Fire Stop Qualification

Test data for qualifying fire stop designs will be provided for existing, modified and new fire stops (4.9.1).

3.2.2 Administrative Controls

A detailed fire plan will be provided describing how staff guidelines on fire protection administrative controls will be met (6.0).

3.2.3 Technical Specifications

Technical specifications will be established for components upon which primary reliance is placed to achieve safe shutdown in a fire situation and which are presently not required by technical specifications.

3.2.4 Fire Brigade

The staffing and training of the fire brigade is still under review. The licensee will be providing further bases for the proposed fire brigade based upon potential fire scenarios (6.0).

3.2.5 Nonapproved Components

We are continuing to review the adequacy of various components in the fire detection system which are not approved by a recognized testing laboratory (4.2).

TABLE 3.1

Implementation Dates for Proposed Modifications

3.1.1	Sprinklers**	February 1980
3.1.2	Detectors**	February 1980
3.1.3	Cable Penetration Seals	*
3.1.4	Conduit Penetrations	*
3.1.5	Fire Barriers	*
3.1.6	Rerouting of Power and Control Circuits	October 1980
3.1.7	Fire Door and Sill	December 1978
3.1.8	Fire Enclosure	December 1979
3.1.9	Fire and Backdraft Dampers	*
3.1.10	Cable Fire Stops	*
3.1.11	Independent Shutdown Path	October 1980
3.1.12	Emergency Lighting	March 1980
3.1.13	Battery Room Loss of Ventilation	March 1980
3.1.14	Equipment Removal	December 1978
3.1.15	Reactor Coolant Pump Oil Collection System	October 1980
3.1.16	Portable Smoke Removal	March 1979
3.1.17	Charging Pump Curb	*
3.1.18	Fire Brigade Equipment	March 1979
3.1.19	Yard Area Hydrant Equipment	March 1979
3.1.20	Hose Stations in the Reactor Containment Building	October 1980
3.1.21	Supervision of Fire Door	December 1978
3.1.22	Fire Hose	March 1979
3.1.23	Breathing Air Supply	March 1979

*End of 1979 refueling outage.

**Proposed technical specifications for this equipment are to be submitted at least 90 days prior to the implementation date.

TABLE 3.2

Licensee Submittal Dates for Open Items

3.2.1	Cable Penetration Fire Stop Qualification	October 1, 1978
3.2.2	Administrative Controls	October 1, 1978
3.2.3	Technical Specifications	October 1, 1978
3.2.4	Fire Brigade	September 15, 1978
3.2.5	Nonapproved Components	September 15, 1978

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. To preclude a single event from affecting redundant systems, these systems are separated into two safety divisions, either of which would be capable of achieving safe shutdown.

During or subsequent to a fire, safe shutdown could be achieved using equipment such as: the reactor trip system; charging pumps; auxiliary feedwater system; service water system; low pressure injection system; and certain instrumentation. Supporting systems and equipment would also be required such as the emergency diesel generators, the engineered safety features batteries, and various valves to align required equipment and isolate systems not required.

We have evaluated the separation between the various systems which can be used for safe shutdown to determine that they are either adequately separated or that adequate fire protection is provided such that a fire will not cause the loss of capability to perform the safe shutdown function. The adequacy of separation of safe shutdown equipment and of the fire protection provided are discussed in other sections of this report.

4.2 Fire Detection and Signaling Systems

The plant has a protective signaling system which transmits alarms from water sprinkler and water spray system actuation and fire pump operation to the control room. The system is provided with an emergency power supply. Most components are approved by a recognized testing laboratory. We are continuing to review the application of nonapproved components and will address the adequacy of these in a supplement to this report. New circuits will be electrically supervised. Certain existing circuits are not electrically supervised. These are found acceptable based upon the increased testing frequency required by the Technical Specifications.

The licensee has proposed to install smoke detection devices in several safety-related areas containing significant combustibles. Specific areas where detectors will be added are identified in Section 5.0 of this report.

We find that, subject to implementation of the proposed modifications, those parts of the fire detection and signaling system that use approved components meet the objectives identified in Section 2.2 of this report and is, therefore, acceptable. We will address the adequacy of that part of the fire detection and signaling system that uses nonapproved components in a supplement to this report.

4.3 Fire Control Systems

4.3.1 Water Systems

4.3.1.1 Water Supply

The fire protection water supply is provided by three fire pumps which take suction directly from the intake structure suction basin. The suction basin is supplied by Lake Michigan.

The fire water supply has adequate capacity for fighting fires and conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

4.3.1.2 Fire Pumps

There are three 1500 gpm vertical turbine fire water pumps and a small capacity jockey pump, all rated at 125 psi net pressure. Two of the fire pumps are diesel driven, and the third pump is electric motor driven. The three fire pumps are considered redundant, each being capable of supplying the largest design flows. The day tanks for the two diesel driven pumps are located in the pump room. Power for the motor driven pump may be provided by one of the emergency diesel generators. The power supply to the pump extends from the auxiliary building via cables which are embedded in the turbine building floor.

The fire pumps are operated automatically, based on the fire water system pressure. The pumps can also be started manually from the control room.

The fire pumps are located in the intake structure in a common room. A fire resulting from an oil spill from the diesel fuel oil day tanks, or from fuel line or transfer pump failures may result in loss of all fire pumps, as well as service water pumps. To preclude such an event, the licensee has proposed to relocate the fuel oil day tanks outside of the intake structure in their own enclosure and to provide sprinkler protection in this area.

We find that, upon implementation of the above described modifications, the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable.

4.3.1.3 Fire Water Piping System

One diesel fire pump and the motor driven fire pump supply water through common piping to the yard loop. The other diesel fire pump supplies water through a separate connection to the loop, and valving is provided so that a single break in discharge piping or the yard loop will not remove all fire pumps from service.

All yard fire hydrants, fixed water suppression systems, and interior hose lines are supplied by the fire water system through underground yard mains and headers inside buildings. Sectionalizing valves are provided to allow isolation of various sections of the system for maintenance such that isolation of any section will not cause loss of suppression water to both hose stations and automatic systems serving an area.

A program has been established to provide tamper-proof seals for control of required fire protection valves, and to verify that the valves remain open with periodic inspections.

Yard fire hydrants have been provided at approximately 200-250 ft. intervals around the exterior of the plant. Auxiliary gate valves are provided on only two of the hydrant laterals, with the result that a portion of the fire water loop would have to be removed from service if a fire hydrant has to be isolated for maintenance. However, as noted above, sectionalizing valves are provided such that isolation would not cause loss of suppression water to any plant area.

Hose houses have been provided at all of the yard hydrants. The licensee has proposed to provide hose houses protecting safety-related areas with sufficient hose to reach all points of the safety-related area, with 2-1/2-inch hose and not more than 100 feet of 1-1/2-inch hose.

Several hydrant hose houses were slightly buried in sand, which precludes opening doors to attach fire hose to the enclosed hydrant. The licensee has proposed to raise the hose houses and hydrants serving safety-related areas. Hydrant hose threads are compatible with the local fire department. We find that, subject to implementation of the above described modifications, the fire water piping system satisfies the objectives detailed in Section 2.2 of this report and is, therefore, acceptable.

4.3.1.4 Interior Hose Stations

Interior hose stations equipped with 1-1/2 inch fire hose have been provided throughout the plant except in containment. The licensee has proposed to provide hose stations inside containment to be supplied by the existing service water system.

Sufficient hose stations are provided so that all areas containing or exposing safety-related systems will be within effective fire fighting range of at least one hose station using not more than 100 ft. of 1-1/2 inch fire hose, with the exception of one safeguards area. This area could be reached using an additional length of hose. With this extra length, 90 gpm at 70 psi will be available at the nozzle, which is considered adequate. The licensee has proposed to provide the additional length. Some other hose stations with less than 100 feet of hose do not have sufficient hose available to reach all of the area served; the licensee has proposed to provide additional hose for these hose stations, not to exceed 100 feet of fire hose.

The nozzles on the interior hose lines are of the proper type for electrical equipment.

We find that, subject to implementation of the modifications described above, the interior hose stations conform to the provisions of Appendix A to BTP 9.5-1 and are, therefore, acceptable.

4.3.1.5 Sprinkler Systems

Wet pipe automatic sprinklers provide area coverage over those portions of the turbine building ground floor and intermediate levels which contain the turbine oil piping systems and oil reservoirs and storage tanks. Additionally, automatic wet pipe sprinklers are provided in the two switchgear rooms, the cable spreading room, diesel generator rooms, and the two electrical penetration areas outside of containment.

Automatic water spray systems are installed on the oil-filled transformers in the yard area. The water spray systems are actuated by pneumatic rate-of-rise type detection systems.

Sprinkler and water spray systems are designed according to applicable NFPA Standards.

We find that the sprinkler systems conform to the provisions of Appendix A to BTP 9.5-1 and are, therefore, acceptable.

4.3.1.6 Foam

The plant does not use fire fighting foam equipment or systems; however, adequate suppression capability is provided by other means as discussed in this report. Appendix A to BTP 9.5-1 does not require use of foam in the plant.

4.3.1.7 Effects of Water Suppression Systems on Safety Systems

In areas protected by sprinklers and water spray systems, floor drains have been sized to remove fire protection water. Transformers and 480 V vital load centers are mounted on pedestals. In most other areas, water would drain out doors or through grating to lower elevations so that standing water would not affect safety-related equipment. In addition, valves are available to isolate sections of the fire water piping inside buildings to preclude the buildup of water and thus prevent equipment from being incapacitated due to flooding.

In the fire hazards analysis, the licensee has evaluated the effects of failure or inadvertent operation of fire suppression systems for each area and found that such failure or inadvertent operation would not incapacitate safety-related systems or components. The staff has reviewed this and agrees with the conclusion. Electrical cabinets are further protected in that they are designed to be drip-proof and are sealed on top to prevent water intrusion.

We find that the protection provided safety systems from the effects of suppression system failure or actuation satisfies the objectives of Section 2.2 of this report and is, therefore, acceptable.

4.3.2 Gas Fire Suppression Systems

This plant does not utilize gaseous type fire suppression systems; however, adequate suppression capability is provided by other means as discussed

in this report. BTP 9.5-1, Appendix A, does not require use of gas suppression systems.

4.3.3 Portable Fire Extinguishers

Portable fire extinguishers have been distributed throughout the plant in accordance with NFPA guidelines. These consist of water and dry chemical extinguishers, including a water type for the control room.

We find that the portable fire extinguishing capability conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

4.4 Ventilation Systems and Breathing Equipment

4.4.1 Smoke Removal

Manually controlled emergency exhaust ventilation is provided for the cable spreading room, switchgear rooms, and control room. The diesel generator rooms have natural ventilation for smoke removal. The other areas of the plant do not have fixed exhaust systems designed specifically for smoke removal. The normal air handling systems in most areas might be used for smoke removal; however, their effectiveness may be limited by several factors. The capacity and configuration of the normal air handling systems may be unsuitable for effective smoke removal. The fans and other equipment in the air handling systems are not designed to withstand high temperatures, and can be rendered inoperative by the heat from a significant fire. Heat-operated dampers in fire barriers may close automatically, precluding smoke removal. To aid in manual smoke removal activities, the licensee has proposed to provide portable smoke ejectors and portable ductwork of the type used for public fire fighting and found acceptable by the staff for use in nuclear power facilities.

Subject to implementation of this modification, we find that the smoke removal capability satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.4.2 Filters

No fire detection or automatic fire suppression is provided on the charcoal filters. Filter units are, however, contained in substantial metal housings. Charcoal filters are not located in areas containing safe shutdown equipment. We find that the protection provided filter units satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.4.3 Breathing Equipment

Twelve self-contained breathing appliances have been provided, along with several bottles and a cascade system to replenish empty air bottles; however, the cascade system has a capacity to only supply ten air masks for three hours. The licensee has proposed to provide a 6-hour air bottle refill capability for the fire brigade and operators.

We find that, subject to implementation of the above described modification, the portable breathing equipment conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

4.5 Floor Drains

Floor drains are provided in areas protected by fixed water suppression systems. Backflow prevention devices are provided in the floor drains of the diesel generator rooms and auxiliary feedwater pump room to prevent spread of fire and flammable liquids between these areas through the drain system. The floor drains in the intake structure drain directly into the intake basin below and have no connections to drain systems of other areas. We find that the protection provided to prevent the spread of fire through the floor drain system satisfies the objectives of Section 2.2 of this report and is, therefore, acceptable.

4.6 Lighting Systems

In addition to the normal AC lighting, there are separate DC and AC emergency lighting systems provided in certain areas of the plant. An analysis by the licensee indicates that a fire would not cause loss of both normal and emergency lighting in areas providing access to safe shutdown systems, with the possible exception of a cable spreading room fire where all lighting systems may be affected. We have reviewed this analysis and agree with its conclusions. To provide adequate lighting for a cable spreading room fire, the licensee has proposed to provide fixed battery pack lights in access areas to safety-related areas required for safe shutdown and for access to fight fires.

Portable hand lanterns are provided for fire brigade personnel.

We find that, subject to implementation of the above described modification, the lighting conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

4.7 Communication Systems

Normal and emergency communications within the plant are provided by a telephone and paging system with stations located in each area of the plant.

Portable radios are also provided in each emergency kit for use by fire brigade personnel should the fixed communications be lost in a fire or inconvenient to the fire situation. These may be used in all areas of the plant.

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

4.8 Electrical Cable Combustibility

Although IEEE 383 was not in existence at the time the Palisades electrical cabling was purchased and installed, the cable was specified to meet the vertical flame tests in accordance with IPCEA standard S-19-81. While such tests as well as the IEEE 383 tests provide a measure of comparability of fire retardance between various types of cables, they cannot be considered as indicative of their behavior when found in the configurations in the plant. In this review, cable insulation has been considered as combustible material. We find that retest to the IEEE 383 procedures and criteria would not provide information that would alter our recommendations or conclusions. Accordingly, we find the electrical cables used at the Palisades plant 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 Electrical Cable, Conduit and Piping Penetrations

Cable tray penetrations of walls are generally packed wth ceramic fibre packing, covered with ceramic board, and coated with flame retardant coating. Where cable tray penetrations have not been sealed with this type firestop, the licensee has proposed to seal the firestop with silicone foam or the existing type firestop and to provide test data to demonstrate the adequacy of the firestop design to prevent the propagation of fire.

The licensee has proposed to seal the space between the cable and the conduit wall and between the conduit and firewall at penetrations to a rating equivalent to that required of the barrier. Many piping penetrations are sealed with steel plates across the opening. The licensee has proposed to similarly seal any piping penetrations of fire barriers which are not presently sealed.

We find that upon implementation of the above described modifications, the protection provided for conduit, and piping penetrations satisfies the objectives of Section 2.2 of this report and is, therefore, acceptable. We will address the adequacy of cable firestop design in a supplement to this report.

4.9.2 Fire Doors, Hatches, and Openings

Many doorway penetrations of fire barriers are protected with three-hour fire-rated doors, some of which are alarmed for security purposes. Doorways critical to assuring safe shutdown capability are either electrically supervised or locked, with the exception of the doorway between the cable spreading room and switchgear room 1-D. The licensee has proposed to provide a fire sensitive closure device on this door. Doorways were found acceptable provided that there was a low fire load in the areas on either

side of the door. Certain doors to the diesel generator rooms and control room did not meet this criterion. The two diesel generator rooms have 1-1/2 hour fire doors to a common vestibule. The licensee has proposed to provide three-hour fire-rated doors between the vestibule and the diesel generator rooms and a three-hour fire-rated door in the control room doorway to the stairwell which is open to one switchgear room.

All hatches are of concrete type construction in safety-related areas and do not require upgrading.

Several unprotected openings exist in fire barriers. The licensee has proposed to seal these to a rating equivalent to that required of the fire barrier.

We find that, subject to implementation of these modifications, the doorway and hatch penetrations and unprotected openings of fire barriers will conform to the provisions of Appendix A to BTP 9.5-1 and are, therefore, acceptable.

4.9.3 Ventilation Duct Penetrations

Fire dampers have been provided at some locations where ventilation ducts penetrate fire barriers. Where required by combustible loading in the area to prevent a postulated fire from spreading to adjacent areas via ventilation ductwork, the licensee has proposed to upgrade ventilation duct penetrations with dampers having fire ratings equivalent to that required of fire barriers.

Ventilation ductwork penetrations of firewalls, floors, and ceilings will also be sealed between the duct and concrete.

Additionally, to minimize the spread of fire between certain critical fire areas via the ventilation system, the licensee has proposed to provide fire dampers in normal supply and return air ducts for the viewing gallery off the control room, the switchgear room at elevation 607 feet, and the cable spreading room.

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

4.10 Separation Criteria

The licensee has stated that the separation of the reactor protection system and engineered safety systems is accomplished by the following criteria:

> "All circuits designated as belonging to a channel or system are to be run in separate raceway systems. The raceway system includes conduit, trays, wall and floor penetrations, containment penetration,

panel wire troughs, etc. In general, the circuit isolation and separation requirements will be met by the use of physically separate raceways which can afford fire and missile protection. The raceway systems will be so arranged that a single failure cannot affect both channels of a power or control circuit. In designing the raceway system for "channelled" circuits and in the routing of these circuits, consideration should be given to the type of hazards that could be present in regard to potential fire, size and type of missiles that may be generated by the equipment in the area. Physical separation (distance) is the most reliable method of providing the circuit separation and isolation. Should raceways be run near one another, then either a fire barrier and/or missile shield should be provided between the raceway systems.

The following channel designations are being utilized for the Palisades Plant:

Left	Right
Channel 1	Channel 2
Channel 3	Channel 4
System 1	System 2
System 3	System 4

Following is a description of the separation requirements by channel designation:

Left Channel

Circuit designated as "Left" must be routed in trays and conduits separate from circuit designated as "Right" or "Channel 2" or "Channel 4".

"Left" channel circuits may be run in non-Class 1 building above ground if there exists a redundant "Right" circuit. Typical of a non-Class 1 structure is the turbine building. The "Left" circuits may be routed with non-redundant circuits or circuits designated as a "System" circuit or with "Channel 1 or 3" circuits.

Right Channel

Circuit designated as a "Right" must be routed in trays and conduits separate from circuits designated as "Left", "Channel 1" or "Channel 3". The circuit may not be routed in a non-Class 1 structure. The circuits may be run with non-redundant circuits or with "Channel 2 or 4" circuits or with any "system" circuit.

Channel 1

Circuit designated as "Channel 1" must be routed in raceways separate from "Channel 2 and 4" circuits and separate from "Right" circuits.

They can be routed in same raceways as "Channel 3" circuits but circuits must be separated by a barrier between them. Channel 1 circuits may be run in non-Class 1 structures if there are redundant Channel 2 and 4 circuits in a protected routing. A Channel 1 circuit may be run with non-redundant circuits, or "Left" circuits or "System" circuits.

Channel 3

Similar requirements as a "Channel 1" circuit.

Channel 2

Circuit designated as "Channel 2" must be routed in raceways separate from "Channels 1 and 3" circuits and separate from "Left" circuits. They can be routed in the same tray, penetration, etc., as "Channel 4" if a barrier is provided between them. "Channel 2" circuits must not be run in non-Class 1 structures. "Channel 2" circuits may be routed with "Right" and non-redundant circuits or any "System" designated circuits.

Channel 4

Similar requirements as "Channel 2" circuit.

System 1

Circuit designated as "System 1" must be routed separately from "System 2" circuits.

A System 1 circuit may be run with any other like-type circuit; i.e., power, control or instrumentation circuits.

System 2

Similar requirements as a "System 1" circuit.

System 3

Any circuit designated as "System 3" must be routed in separate raceways from "System 4" circuits.

A "System 3" circuit may be routed with any other like-type circuit.

System 4

Similar requirements as "System 3" circuit."

In general, separation between redundant divisions is such that most fires would not cause functional loss of redundant safe shutdown equipment. The separation criteria does not preclude the crossing of such cables nor does

it consider the possibility of heat buildup in a room. However, the licensee has performed a detailed fire hazards analysis for each area of the plant containing safety-related equipment to determine the possible effects of fires on safe plant shutdown. Each of these areas is discussed in more detail in Section 5.0 of this report. In various areas the licensee has proposed to reroute cables, provide thermal barriers, or install fire stops where the existing cable separation was found inadequate to preclude fire damage to redundant safe shutdown equipment. In addition, the licensee has proposed for the cable spreading room, control room, and engineered safeguards panel room with adjacent stairwell and corridor, to provide a capability independent of damage to these areas to safely shut down the plant. The specific areas where additional protection is to be provided are identified in Section 5.0 of this report.

4.11 Fire Barriers

Fire barriers have been provided to separate the turbine building from the auxiliary building, and to isolate the switchgear rooms, cable spreading room, control room, penetration areas, auxiliary feedwater pump area, intake structure, charging pump room, component cooling pump room, safeguards areas, and safeguards panel area from surrounding areas. Based on the type and quantity of combustibles present, the basic fire resistance of the barriers would prevent the spread of fire between fire areas.

Subject to implementation of the modifications identified in Section 5.0 of this report, protection will be adequate to assure that the objectives of Section 2.2 are met. We conclude that the fire barriers meet the objectives of Section 2.2 of this report and are, therefore, acceptable.

4.12 Access and Egress

All safety-related areas and areas containing safe shutdown equipment are reasonably accessible in a fire situation with many areas having two or more entrances. The safe-shutdown areas having only one entrance are the auxiliary feedwater pump room, safeguards areas (A&B), safeguards panel area, charging pump room, and component cooling pump area. Because of the type of combustibles and the light to moderate combustible loading in these areas, a fire would not prevent entrance into these areas to suppress fires which may occur. On this basis, we find that existing access and egress capability is 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 is relied upon to minimize the generation of such products. Additionally, proposals have been made for portable smoke removal equipment and training of the fire brigade in the use of this equipment and in the use of emergency breathing appliances. We find that, subject to implementation of the proposed modifications described in this report and resolution of staff requirements, the potential for development of toxic and corrosive

combustion products satisfies the objectives in Section 2.2 of this report. Accordingly, we find the measures taken to minimize the development of toxic and corrosive combustion products to be acceptable.

4.14 Nonsafety-Related Areas

We have evaluated the separation by distance or by fire barriers of safe shutdown systems from nonsafety-related areas to determine that fires in such areas will not adversely affect the ability to safely shut down the plant. Nonsafety-related areas which potentially pose a fire hazard to safe shutdown equipment are addressed in Section 5.0 of this report.

The licensee has evaluated the effects of fires in radwaste areas and found that no fires would result in releases to plant effluents or the plant environment, with the exception of fires in contaminated wastes. A postulated fire involving significant amounts of low-level radioactive trash in the compactor area could result in some low-level radioactive particulate matter becoming airborne. To preclude such an event, the licensee has proposed to provide an automatic sprinkler system in the compactor area. With this modification the potential for a fire causing release of radioactive material is extremely low, and on this basis we find the fire protection provided for radwaste areas acceptable.

4.15 Instrument Air

Loss of function of the instrument air system will not prevent safe shutdown of the plant.

5.0 EVALUATION OF SPECIFIC PLANT AREAS

The licensee has performed a fire hazards 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. The results of the fire hazards analysis, other docketed information and site visit observations were used in the staff's evaluation of specific plant areas. The staff's evaluation of specific areas is discussed in the following sections.

5.1 Control Room

5.1.1 Safety-Related Equipment

The control room contains safety-related control cabinets and consoles including all the systems required for normal plant shutdown. The cables related to these systems penetrate the floor directly into control panels and consoles.

5.1.2 Combustibles

The combustibles in the area consist mainly of electrical wiring insulation contained within the cabinets and a small amount of ordinary combustibles such as paper.

5.1.3 Consequences if No Suppression

An unmitigated fire in one of the control panels would probably be limited to one panel involving only one division of safe shutdown equipment due to the low combustible loading and the physical separation and barriers provided. In the event a larger fire should occur, limited shutdown capability presently exists outside and independent of the control room from which the shutdown actions could be accomplished. Manual operation of valves to operate the auxiliary feedwater system may be required, and instrumentation for safe shutdown may not be available for such a fire.

5.1.4 Fire Protection Systems

No smoke detection is provided in the cabinets or control room. Manual hose stations and portable water extinguishers provide the fire extinguishment capability.

5.1.5 Adequacy of Fire Protection

Manual extinguishment capability is adequate to control and suppress fires in this area although control of the feedwater system and use of shutdown instrumentation may still be lost. The lack of fire detection capability in cabinets and consoles may allow a fire to proceed undetected and involve safe shutdown equipment unnecessarily and may result in the need to abandon the control room for remote shutdown.

5.1.6 Modifications and Recommendations

The licensee has proposed to provide a capability to achieve safe shutdown to include the required instrumentation and centralized controls which will be independent of the control room and which will not be affected by a fire in the control room. In addition, the licensee has proposed to install smoke detectors in walk-in cabinets, at ceiling level to cover panels in certain areas, and in the adjacent office areas. The licensee has also proposed to install a three-hour fire door and fire damper in openings in the stairwell between the control room and switchgear room 1-D. We find that, subject to implementation of these modifications, fire protection for the control room conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

5.2 Cable Spreading Room

5.2.1 Safety-Related Equipment

This area contains 480 V transformers and switchgear, and cables for power, instrumentation and control for vital and non-vital systems and other equipment related to safety-related AC and DC power supplies.

5.2.2 Combustibles

The significant combustible in this area consists of a large quantity of cable in open cable trays stacked three or four levels deep.

5.2.3 Consequences if No Suppression

An unmitigated fire in this area could cause the loss of all 480 volt AC power and DC control power. This may cause the loss of capability to operate some safe shutdown equipment.

The steam driven auxiliary feedwater pump could be operated independent of the cable spreading room by manual actuation of valves to achieve hot shutdown. However, during a fire situation, operators may be hampered in placing the steam driven system into service due to the number of manual actions required and the location at which action must be taken. Additionally, the steam driven auxiliary feedwater pump may be indefinitely out of service if the motor driven pump is available, as allowed by existing facility technical specifications.

Loss of DC control power would necessitate manual actuation of valves, manual closure of breakers, and manual starting of the diesel generators to safely shut down. However, certain breakers cannot be operated manually because DC power is required to close these breakers.

5.2.4 Fire Protection Systems

Fire detection is provided by flow alarms in the sprinkler system. Fire extinguishment is provided by an automatic sprinkler system backed up by water hose stations and portable extinguishers. Switchgear is protected

against flooding by mounting on curbs. Physical separation and barriers are used to separate redundant divisions of safety-related cables.

5.2.5 Adequacy of Fire Protection

Fire protection for this area is not presently considered adequate to prevent involvement of redundant safe shutdown systems. Fires can become large due to the lack of early detection capability. In some locations additional barriers are needed to prevent redundant cables from being damaged by a fire. Additionally, lower levels of cable trays may be shielded from water extinguishant from the sprinkler system, allowing continuation of the fire.

5.2.6 Modifications and Recommendations

The licensee has proposed to: (1) provide a capability independent of this area for achieving safe shutdown using centralized control and instrumentation; (2) install smoke detectors to detect incipient fires; (3) provide a ladder to enhance manual fire fighting capability; (4) provide barriers to protect cables from a transformer fault; (5) provide fire retardant coatings to close gaps in existing barriers; (6) seal cable penetrations on both sides; and (7) reroute various cables associated with switchgear 1-C. Manual suppression capability will be adequate to suppress fires in lower trays that may be shielded from sprinkler system water. We find that, subject to implementation of these modifications, fire protection for the cable spreading room conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

5.3 Switchgear Rooms

5.3.1 Safety-Related Equipment

There are two redundant 2.4 kV switchgear rooms. Each room contains the switchgear to one of the redundant divisions of safe shutdown equipment and the associated cables. A tunnel which contains cabling of one safety division leads from switchgear room 1-D to the associated penetration area.

5.3.2 Combustibles

The combustibles in these rooms consist of a moderate amount of cable in open cable trays. Switchgear room 1-C also contains piping of propane, hydrogen, and acetylene. However, this piping only passes through switchgear room 1-C and does not service any equipment in this area. Additionally, damage to the piping is unlikely since the piping is routed near the ceiling and there is no rotating machinery in the area to present a missile hazard.

5.3.3 Consequences if No Suppression

An unmitigated fire in switchgear room 1-D could cause extensive damage to and loss of equipment related to one division of redundant safe shutdown systems but would not affect the redundant systems due to the barriers separating the rooms. An unmitigated fire in the other room (switchgear

room 1-C) could cause loss of 480 V power to one division including the motor driven auxiliary feed pump, remote control of both emergency diesel generators and loss of the service water pumps and component cooling water pumps.

5.3.4 Fire Protection Systems

Fire detection is provided by flow alarms actuated by water flow in the sprinkler system. Fire extinguishment capability is provided by an automatic sprinkler systems in portions of the switchgear rooms and the cable tunnel, backed up by water hose stations and portable extinguishers.

5.3.5 Adequacy of Fire Protection

Extensive damage to safety systems cables could occur unnecessarily due to the lack of early detection devices. Sprinkler protection is not provided in some parts of the rooms containing cable trays which would allow fires in some locations to cause extensive damage. Lower level trays may be shielded from suppression water. Due to lack of detector coverage in certain areas, shielding of lower level trays, and minimal cable separation at certain locations, a fire in room 1-C may cause loss of redundant safe shutdown equipment.

5.3.6 Modifications and Recommendations

The licensee has proposed the following modifications for the switchgear rooms:

(1) Add smoke detectors for detection of incipient fires (both rooms),

(2) Provide additional sprinkler heads to the existing system (room 1-D),

(3) Seal cable penetrations with flame retardant (both rooms);

(4) Reroute cables in room 1-C associated with the redundant diesel generator 1-2, the service water pumps, and component cooling water pumps to preclude a fire from causing loss of redundant equipment;

(5) Install dampers in ventilation duct penetrations of fire barriers; and

(6) Provide a fire sensitive closure device on the fire door separating switchgear room 1-D from the cable spreading room.

We find that, subject to implementation of these modifications, fire protection for the switchgear rooms conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

5.4 Diesel Generator Rooms

5.4.1 Safety-Related Equipment

The redundant diesel generators are each housed in separate rooms, separated from each other by 3-hour fire-rated walls. The safety-related equipment

in each room is the diesel generator and some electrical equipment associated with the same division of safety equipment as the generator. One of the two diesel generators is necessary for a safe shutdown upon a loss of offsite power.

5.4.2 Combustibles

The significant combustibles in each room are lube oil, diesel fuel and a small amount of electrical cable insulation. The day tank for each diesel is separated from the diesel generator room by a 3-hour rated fire barrier with diking provided to contain the oil.

5.4.3 Consequences if No Suppression

An unmitigated fire in one of the rooms could cause loss of one diesel generator. In the unlikely event of a large spill, both diesel generators could possibly become involved due to the low fire rating of the vestibule doors separating the rooms, and the flow path allowing oil spills to flow to the adjacent area. If both diesel generators were lost, offsite power could be used, if available, to shut down the plant.

5.4.4 Fire Protection Systems

Fire detection is provided by flow alarms activated by water flow in the automatic sprinkler system. Fire extinguishment is provided by an automatic sprinkler system in each room backed up by water hose stations and portable extinguishers.

5.4.5 Adequacy of Fire Protection

Fire protection is adequate to prevent the loss of redundant safe shutdown equipment except for the low rating of the vestibule doors and the flow path between the two rooms for oil spills.

5.4.6 Modifications and Recommendations

The licensee has proposed to: (1) replace the doors between the diesel generator rooms and the vestibule with doors having a 3-hour fire rating, and (2) install a curb at each of these doors to prevent oil from seeping under the door.

We find, subject to implementation of the above described modifications, that fire protection for the diesel generator rooms conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

5.5 Pump Room-Service and Fire Water
5.5.1 Safety-Related Equipment

Safety-related equipment in this area required for safe shutdown are the three service water pumps, only one of which would be required for safe shutdown. Also in this area are the three fire pumps, two diesel driven and one electric motor driven, and the diesel fuel oil transfer pumps.

5.5.2 Combustibles

The significant combustibles in this area are fuel oil and cable insulation. Fuel oil hazards are presented by transfer pumps and oil piping and two 250-gallon diesel day tanks for the diesel fire pumps. Only a moderate amount of nonsafety-related cabling is in the area.

5.5.3 Consequences if No Suppression

An unmitigated fire in this area could potentially damage service water pumps and impair their operation. Decay heat removal capability is available through the auxiliary feedwater and steam relief system. However, without the service water pumps, supply of water to the feedwater pumps would be limited. The fire could also damage fire pumps and cause loss of all suppression water.

5.5.4 Fire Protection Systems

No fire detection devices are provided in this room. Fire suppression capability is only afforded by portable extinguishers in the room, and fire hose extended from a hose station in the turbine building.

5.5.5 Adequacy of Fire Protection

The existing fire protection would not be adequate to promptly detect, control, and suppress fires which may occur in this area and preserve fire water and service water capability.

5.5.6 Modifications and Recommendations

The licensee has proposed to: (1) relocate the fire pump diesel fuel day tanks outside of the buildings in a diked block enclosure, with heaters for cold weather protection; and (2) provide a sprinkler system in the pump room. Per the requirements of NFPA 13, the sprinkler system will provide water flow alarm to indicate sprinkler actuation.

We find that, subject to implementation of the above described modifications, fire protection for the pump room-service and fire water conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

5.6 Auxiliary Feed Pump Room

5.6.1 Safety-Related Equipment

The only equipment in this area are the two safety-related auxiliary feed pumps, one motor driven and one steam turbine driven, and associated valves and piping.

5.6.2 Combustibles

Each pump has a lube oil reservoir; however, there are only three quarts of oil in each pump. Electrical cables are in conduit; there is no other significant combustible in this room.

5.6.3 Consequences if No Suppression

An unmitigated fire may cause sufficient smoke to hinder access to the room until smoke is vented. Due to the low combustible loading in this area, redundant auxiliary feedwater pumps would not be affected and safe shutdown could be achieved.

5.6.4 Fire Protection Systems

No detection devices are provided in this area. Suppression capability is provided by portable extinguishers in the area or by hose stations outside, but accessible to, the area.

5.6.5 Adequacy of Fire Protection

The suppression capability provided would be adequate to control and suppress fires in this area once detected. Lack of detection devices would not allow prompt detection of a fire so that fire fighting activities may be undertaken.

5.6.6 Modifications and Recommendations

The licensee has proposed to provide fire detection devices in the auxiliary feed pump room. We find that, subject to implementation of the above modification, fire protection for the auxiliary feed pump room conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

5.7 Battery Rooms

5.7.1 Safety-Related Equipment

The two redundant safety-related batteries are housed each in its own individual enclosure.

5.7.2 Combustibles

The significant combustibles in the battery room are the plastic battery cases and a small amount of electrical cable insulation. Hydrogen buildup from battery charging is precluded by a continuously operating ventilation system.

5.7.3 Consequences if No Suppression

An unsuppressed fire in one of the battery rooms could cause the loss of one, but not both, of the batteries due to the low fire hazard and the fire barriers between the rooms. There is a possibility though unlikely, that hydrogen could build up on loss of ventilation flow and create an explosive hazard with the potential for damaging both batteries.

5.7.4 Fire Protection Systems

No smoke detection is provided for these rooms. Fire extinguishment is provided by water hose stations located in adjacent areas and by portable extinguishers.

5.7.5 Adequacy of Fire Protection

Considering the limited quantity of combustibles, manual fire protection would be adequate to extinguish fires in these rooms. However, the lack of capability to detect loss of battery room ventilation flow would allow possible explosive conditions to develop, and the lack of fire detectors would not allow prompt detection of a fire so that fire fighting activities may be undertaken.

5.7.6 Modifications and Recommendations

The licensee has proposed to provide capability to detect the loss of battery room ventilation flow, to seal conduit entries in fire barriers, and to install fire detectors in these areas.

We find, subject to implementation of these modifications, that fire protection for the battery rooms conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

5.8 Charging Pump Room and Adjacent Hallway

5.8.1 Safety-Related Equipment

The charging pump room contains the three charging pumps, one of which would be required for safe shutdown to provide capability for boration and make-up of the primary system. High pressure injection pumps which are independent of these areas may also perform this function. Associated cabling and piping is in the area. The hallway contains power and control cabling for the charging pumps, and cabling for the engineered safeguards panel.

5.8.2 Combustibles

Combustibles in the area include a small amount of cabling and a moderate amount of lube oil for each of the charging pumps in the pump area, and a large amount of cabling in the hallway.

5.8.3 Consequences if No Suppression

An unsuppressed cable fire in the pump room could disable all three charging pumps. An unsuppressed fire in the hallway could disable all three charging pumps and redundant instrumentation and certain controls for safe shutdown. A lube oil fire could disable two, and possibly even three, of the charging pumps. Since one of the three charging pumps may be out of service, as allowed by the technical specifications, an unsuppressed lube oil fire may cause loss of charging capability by affecting two of the charging pumps.

5.8.4 Fire Protection Systems

No fire detection devices are provided in these areas. Portable extinguishers with hose stations accessible to the area have been provided.

5.8.5 Adequacy of Fire Protection

The existing manual fire protection would be capable of controlling and suppressing fires in this area, once the fire is detected. Fire detection devices, if provided, would allow prompt detection; however, cable fires may still affect redundant pumps due to poor cable separation, and lube oil fires may still affect redundant charging pumps by oil flowing to the area of other charging pumps.

5.8.6 Modifications and Recommendations

The licensee has proposed to: (1) provide separation between redundant charging pump cables in the charging pump rooms by means of insulation, barriers, or shields, (2) provide alternate shutdown capability independent of the effects of fire damage in the hallway, (3) provide smoke detection devices in the charging pump room and adjacent hallway, and (4) provide a curb between pump A and the other pumps to prevent spread of an oil fire.

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

5.9 Safeguards Area

5.9.1 Safety-Related Equipment

This area has two fire zones, each of which contains the containment spray, low pressure safety injection, and high pressure safety injection pumps of each division. The two zones are separated by a barrier having three-hour fire resistance.

5.9.2 Combustibles

The area contains small amounts of cable insulation, motor lubricating oil, and hydraulic oil in snubbers.

5.9.3 Consequences if No Suppression

An unsuppressed fire would cause moderate amounts of smoke and heat. A fire in one of the zones may affect redundant safety systems, but would not affect safe shutdown capability.

5.9.4 Fire Protection Systems

No fire detection devices are provided in the area. Portable extinguishers with hose stations accessible to most locations in the area are provided for manual fire fighting. Certain locations in one of the zones are beyond the reach of the hose presently stored at the hose station.

5.9.5 Adequacy of Fire Protection

Fire suppression capability presently provided would be adequate to control and suppress most fires which may occur in this area, although lack of

detection capability and adequate hose coverage allow unnecessary generation of heat and smoke and involvement of further equipment and systems prior to extinguishment.

5.9.6 Modifications and Recommendations

The licensee has proposed to provide smoke detectors in this area, and to install fire barriers between the redundant cable trays which are in one of the zones.

We will require that an additional length of hose be provided at the hose station serving this area.

Subject to implementation of the above modification, we find that fire protection for the safeguards area conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

5.10 Component Cooling Pump Area

5.10.1 Safety-Related Equipment

Safety-related equipment in this area includes the three component cooling pumps and heat exchangers which would be required to achieve cold shutdown.

5.10.2 Combustibles

Significant combustibles consist of a small amount of electrical cable insulation and lubricating oil in the three component cooling pumps.

5.10.3 Consequences if No Suppression

Due to the separation of equipment, an unsuppressed fire would not affect more than one pump. However, an unsuppressed fire could create significant amounts of smoke and heat.

5.10.4 Fire Protection Systems

No fire detection devices are provided in this area. Fire suppression capability is afforded by portable extinguishers and hose stations accessible to the area.

5.10.5 Adequacy of Fire Protection

Fire suppression capability presently provided would be adequate to control and suppress fires which may occur in this area, although lack of detection capability would allow unnecessary generation of heat and smoke until the fire is discovered and suppressed.

5.10.6 Modifications and Recommendations

The licensee has proposed to provide smoke detection capability in this area.

We find that, subject to implementation of the above described modification, fire protection for the component cooling pump area conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

5.11 Refueling and Spent Fuel Pool Area

5.11.1 Safety-Related Equipment

Safety-related equipment in this area include the new and spent fuel pools, fuel storage racks, and fuel handling equipment. No safe shutdown systems or equipment are in this area.

5.11.2 Combustibles

Combustibles in the area consist of grease in the equipment crane and various transient loads, particularly during refueling operations, such as plastic sheeting, ropes, hoses, solvents, and "anti-C" clothing. Fire loading is considered moderate during such periods.

5.11.3 Consequences if No Suppression

An unsuppressed fire may cause significant levels of smoke and heat, which may travel to other areas. Barriers would contain the fire in the area and preclude its spreading to other areas. Safe shutdown equipment would not be affected.

5.11.4 Fire Protection Systems

No fire detection devices are provided in this area. Fire suppression capability is afforded by portable extinguishers and hose stations accessible to the area.

5.11.5 Adequacy of Fire Protection

Fire suppression equipment would be adequate to suppress fires which may occur in this area and reduce smoke and heat generated. However, lack of detection devices would preclude prompt fire detection and suppression.

5.11.6 Modifications and Recommendations

The licensee has proposed to provide detection devices in the part of this area where combustibles may be located during refueling operations. We find that fire protection for the refueling and spent fuel pool area satisfies the objectives detailed in Section 2.2 of this report and is, therefore, acceptable.

5.12 Cable Penetration Rooms

5.12.1 Safety-Related Equipment

There are two cable penetration areas into containment totally separated from each other by distance and a number of fire barriers. Each area contains cables for safety-related equipment redundant to the other area.

5.12.2 Combustibles

The significant combustible in each of these areas is a moderate amount of electrical cable insulation stacked in open cable trays.

5.12.3 Consequences if No Suppression

An unsuppressed fire in either of the penetration areas could cause extensive damage to cables affecting one division of safe shutdown systems but would not cause loss of safe shutdown capability due to the availability of redundant cables in the other penetration area which would not be affected by the fire.

5.12.4 Fire Protection Systems

Fire detection in these areas is provided by water flow alarms which are actuated by flow to the sprinkler system. Fire extinguishment is provided by an automatic sprinkler system in each area backed up by portable extinguishers and hose stations located in adjacent areas.

5.12.5 Adequacy of Fire Protection

Existing fire protection is adequate to control and extinguish fires in these areas. Fires in either of these areas would not cause loss of safe shutdown capability.

5.12.6 Modifications and Recommendations

The licensee has proposed to provide smoke detection and cable penetration fire seals where cables penetrate fire barriers.

We find, subject to implementation of these modifications that fire protection for the penetration areas conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

5.13 Reactor Containment Building

5.13.1 Safety-Related Equipment

Safety-related equipment inside the reactor containment building required for safe shutdown includes the reactor vessel and steam generators, primary system piping, steam and feedwater piping, and instrumentation for pressurizer pressure and level and steam generator level.

5.13.2 Combustibles

Significant combustible material in this area is approximately 80 gallons of lube oil in each reactor coolant pump and a moderate amount of cable insulation. Cable insulation is mainly concentrated at the cable penetration areas.

5.13.3 Consequences if No Suppression

An unmitigated fire in either cable penetration area could involve all the cables in one penetration area, but would not affect safe shutdown, since only cables of one division are located in each penetration area. An unmitigated fire in the electrical cable in the area containing the instrumentation transmitters could cause loss of instrumentation necessary for safe shutdown. An unmitigated lube oil fire could cause loss of various cables located in the area of the reactor coolant pumps, and could potentially flow into the area below one electrical penetration area.

5.13.4 Fire Protection Systems

No fire detection devices are provided in the reactor containment. Reactor coolant pump bearing temperature and motor winding temperature readout may give indication of a fire in the reactor coolant pump area. No automatic suppression systems are provided in this area. Portable carbon dioxide extinguishers are provided.

5.13.5 Adequacy of Fire Protection

Detection provided would not be adequate to promptly detect cable insulation or lube oil fires. Portable extinguishers would not be adequate to control or suppress cable insulation or lube oil fires.

5.13.6 Modifications and Recommendations

The licensee has proposed to (1) provide fire detection devices in the instrument room and the containment penetration areas, (2) provide an oil collection system for the reactor coolant pumps, (3) provide fire stops in certain trays to prevent propagation of fire between redundant safety divisions, (4) provide 8 2-1/2-gallon water fire extinguishers to be located in cable tray areas to fight cable fires, and (5) install fire detection devices in the containment air recirculation system.

The provision of portable water extinguishers may not be adequate to extinguish fires in cable trays in all areas of containment due to the concentration of cables in certain areas and due to the difficulty of reaching some locations with a hand extinguisher. The licensee has therefore proposed to provide water hose stations in containment with adequate hose to suppress fires in cables in cable trays.

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

5.14 Engineered Safeguards Panel Area and Adjacent Stairwell
5.14.1 Safety-Related Equipment

This area contains the panel for control of shutdown equipment as backup to the control room equipment if the control room must be evacuated, but control room equipment is intact. In addition, the diesel generator room ventilation fan breakers are located within the area. Other equipment not

related to safe shutdown includes the radwaste control panel and MCCs which provide power for the fuel pool cooling pumps, boric acid heaters, and control room and fuel handling area ventilation systems. The area is bounded by three-hour rated firewalls.

5.14.2 Combustibles

The significant combustible in the area is electrical cable insulation and some wood supports for shielding.

5.14.3 Consequences if No Suppression

An unsuppressed fire in this area could involve and cause loss of the remote shutdown control and other safety equipment not required for safe shutdown. This would cause the loss of instrumentation and certain controls for safe shutdown equipment from this panel as well as from the control room.

5.14.4 Fire Protection Systems

Fire detection capability is not provided for this area. Fire extinguishment is provided by a water hose station in an adjacent area and by portable extinguishers.

5.14.5 Adequacy of Fire Protection

The lack of smoke detection devices could allow extensive damage to safety-related systems, some of which are related to safe shutdown. Manual extinguishment capability is adequate to extinguish fires, although redundant safe shutdown systems may be lost in a fire due to proximity of redundant cables to each other and cable crossings in the area of the emergency shutdown panel.

5.14.6 Modifications and Recommendations

The licensee has proposed to:

(1) Increase the hose at the hose station to 75 feet to ensure total area coverage;

(2) Provide smoke detection devices in the room and adjacent stairwell to detect incipient cable fires; and

(3) Provide alternate shutdown capability independent of the effects of fire damage in this area.

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

5.15 Turbine Building

5.15.1 Safety-Related Equipment

Some instrumentation cabling from one safety division is located in the turbine building, however, redundant safe shutdown cabling is not routed through the turbine building.

5.15.2 Combustibles

Significant combustibles in the turbine building include lube oil in main feedwater pumps; turbine lube oil system storage tanks, and oil reservoir; oil in the hydrogen seal oil unit; hydrogen in the generator and piping; and electrical cable insulation.

5.15.3 Consequences if No Suppression

An unmitigated fire in this area could cause significant damage and loss of nonsafety-related equipment and could damage certain instrumentation of one division required for safe shutdown, but would not affect the safe shutdown capability of the plant. Other safe shutdown related equipment is isolated from the turbine building by three-hour fire-rated walls.

5.15.4 Fire Protection Systems

Automatic sprinkler systems are provided over portions of the turbine building containing lube oil piping, the feedwater pumps, and the hydrogen seal oil unit. The turbine lube oil tanks, reservoir, and other oil system components are located within a sprinklered 3-hour fire-rated curbed enclosure to contain fires in this area. The turbine lube oil supply lines use guarded pipe to contain oil leaks. The generator casing is also designed to withstand the explosive forces of an internal hydrogen explosion. Hose stations and portable extinguishers are provided throughout the building. Fire detection is accomplished by water flow alarms activated upon sprinkler system actuation.

5.15.5 Adequacy of Fire Protection

The major sources of combustibles are adequately protected with automatic suppression systems, and fires in the turbine building would not prevent safe shutdown of the plant.

5.15.6 Modifications and Recommendations

The licensee has proposed to provide a sprinkler system in the condensate pump area surrounding the pump pit to protect against spill fires. This modification is related to property protection and does not affect safety systems. We find that this modification is acceptable.

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

5.16 Yard Area

5.16.1 Safety-Related Equipment

The yard area contains safety-related condensate storage tanks and a buried fuel oil storage tank which provides fuel to diesel generator and diesel fire pump day tanks. No other safety-related equipment is in this area.

5.16.2 Combustibles

Significant combustibles in the yard consist of fuel oil in buried storage tanks, oil in several transformers, and a temporary office building near the air intakes for the diesel generator.

5.16.3 Consequences if No Suppression

A fuel oil fire from the main storage tank or auxiliary boiler tank is not feasible since the tanks are buried. A fuel oil fire in a fuel truck when refilling the storage tank, if unsuppressed, would become large as the oil spreads out in the yard. Sand and gravel would absorb much of the fuel oil, reducing the amount of fuel for the fire. Safe shutdown would not be affected since safe shutdown equipment is inside structures which have adequate walls to serve as barriers against fire damage. If the condensate storage tanks were damaged, water for auxiliary feed to the steam generators would be available from the service water system drawing on Lake Michigan.

An unsuppressed transformer fire would not affect safe shutdown capability due to intervening fire barriers between transformers and safety-related areas. A fire in a temporary transformer outside of the diesel generator rooms could result in smoke infiltration into these rooms.

5.16.4 Fire Protection Systems

Automatic deluge systems are provided on the transformers in the yard area, except the temporary transformer near the diesel generator intakes. Hose hydrants and hose houses with 200 feet of hose are provided on the yard loop.

5.16.5 Adequacy of Fire Protection

Fire protection provided is adequate to control and suppress fires that may occur in the yard. Fires in the temporary office building or temporary transformer may still affect the diesel generators.

5.16.6 Modifications and Recommendations

The licensee has proposed to remove the temporary office building and temporary transformer from the area of the diesel intakes.

We find that, with these modifications, fire protection for the yard area conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

6.0 ADMINISTRATIVE CONTROLS

The administrative controls for fire protection consist of the fire protection organization, the fire brigade's training, the controls over combustibles and ignition sources, the prefire plans and procedures for fighting fires, and the quality assurance provisions for fire protection.

The licensee's description of the administrative controls is not adequate to permit a conclusion by the staff. The licensee has committed to review his administrative controls using the guidelines set forth in "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance."

The staff has evaluated a preliminary response from the licensee, and will provide positions to the licensee regarding certain exceptions. The licensee will submit a fire plan describing how the administrative control guidelines will be met.

The licensee has proposed that a three-man fire brigade to be available on all shifts. Based upon information provided to date, the staff is not able to conclude that this provides an adequate number of personnel to transport equipment to the fire scene and effectively fight fires which may occur, allowing for potential injury to individuals, and rotating crews of two men handling the fire hose to change air bottles and to relieve the crew fighting the fire. The licensee will be providing further bases for the proposed fire brigade based upon potential fire scenarios.

Our evaluation of the administrative controls for fire protection will be addressed in a supplement to this report.

7.0 TECHNICAL SPECIFICATIONS

The Technical Specifications have been modified to incorporate interim Technical Specifications which include limiting conditions for operation and surveillance requirements for existing fire protection systems and administrative controls. Following the implementation of the modifications of fire protection systems and administrative controls resulting from this review, the Technical Specifications will be similarly modified to incorporate the limiting conditions for operation and surveillance requirements for these modifications.

For fires in certain areas, primary reliance is placed on equipment not affected by the fire to achieve safe shutdown. In some cases, this equipment is not presently required to be available by the facility technical specifications. The licensee has proposed to develop such technical specifications and to submit these by October 1, 1978. These will include changes to the specifications on the auxiliary feedwater system.

8.0 CONCLUSIONS

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 Palisades 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 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.

> "A probability assessment of public safety or risk in quantitative terms is given in the Reactor Safety Study (WASH-1400). As the result of the calculation based on the Browns Ferry fire, the study concludes that the potential for a significant release of radioactivity from such a fire is about 20% of that calculated from all other causes analyzed. This indicates that predicted potential accident risks from all causes were not greatly affected by consideration of the Browns Ferry fire. This is one of the reasons that urgen action in regard to reducing risks due to potential fires is not required. The study (WASH-1400) also points out that 'rather straightforward measures, such as may already exist at other nuclear plants, can significantly reduce the likelihood of a potential core melt accident that might result from a large fire.'
>
> "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 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 CONSULTANTS' REPORT

Brookhaven National Laboratory under contract to the NRC has provided the services of fire protection consultants who participated in the evaluation of the fire protection program. They have also participated in the preparation and review of this safety evaluation report. Their report, "Fire Protection in Operating Nuclear Power Stations," dated July 1978, discusses many items which have been addressed in this report. The consultants' recommendations which we have not totally adopted are discussed in Appendix "B". Our basis for not adopting these recommendations is given therein.

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 1, 1976, Standard Review Plan 9.5.1, "Fire Protection," was issued, incorporating the various recommendations contained in NUREG-0050.

By letter dated May 11, 1976, Consumers Power Company 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," dated May 1, 1976 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 therefor.

By letter of September 28, 1976, Consumers Power Company was requested to provide the results of a fire hazards analysis and propose Technical Specifications pertaining to fire protection. Consumers Power Company was also provided a copy of Appendix A which includes acceptable alternatives to the guidelines of Standard Review Plan 9.5.1.

By letters of December 1, 1976, June 17, 1977 and November 25, 1977, we provided model Technical Specifications and requsted submittal of fire protection Technical Specifications.

On March 31, 1977 and September 29, 1977, Consumers Power Company provided submittals responding to our requests of May 11, 1976 and September 29, 1976. On October 28, 1977 and December 15, 1977, Consumers Power Company provided proposed Technical Specifications for fire protection.

On March 1, 1978, we issued Technical Specifications for fire protection.

On March 9, 1978, we requested additional information.

On May 8-12, 1978, the DOR fire protection review team visited the Palisades Plant. On May 12, 1978 a meeting was held at the Palisades Plant at which the review team presented positions and requests for additional information.

On June 19, 1978, Consumers Power Company submitted a preliminary response to staff guidelines pertaining to administrative controls for fire protection.

On May 15, 1978, the licensee submitted responses to staff requests for additional information and positions.

On June 19, 1978, we requested additional information and stated staff positions.

On June 30, 1978, the licensee submitted responses to staff requests for additional information and positions requested June 19, 1978.

On July 24, 1978, we transmitted additional positions and requests for information in connection with the licensee's submittal of June 30, 1978.

By letter of July 28, 1978 and July 31, 1978, the licensee provided information requested on July 24, 1978.

APPENDIX B

DISCUSSION OF CONSULTANTS' 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 in Operating Nuclear Power Stations - Palisades," dated July 1978, discusses several matters which have been addressed in the SER. The consultants' report contains recommendations which have, for the most part, been implemented during our evaluation. The consultants' recommendations which we have not adopted, along with our basis therefor, are identified herein.

1. Consultants' Comment: Valve Supervision

"SER Item 4.3.1.3 indicates that the position of fire protection system valves will be controlled by locks or seals with periodic inspections. Locking or sealing programs depend upon ongoing administrative controls that are subject to human failure. Locks can also prevent prompt water shutoff if piping ruptures. It is recommended that electrical supervision be required on all control valves for fire protection systems protecting areas containing or exposing safety-related equipment."

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 means of assuring that valves in fire protection water system are in the correct position. Valves on other systems in the plant are presently under administrative control. The plant Technical Specifications require a monthly check of all valves in the flow path to fire suppression systems. A review by the staff of Licensee Event Reports on all plants using such periodic checks indicates that valves being in the incorrect position has 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 indicate that electrical valve supervision will significantly improve the availability of fire suppression systems in nuclear power plants.

2. Consultants' Comment: Seismic Damage

"The SER does not consider the effect of seismic damage on primary and backup fire protection systems, although Branch Technical Position 9.5-1 addresses this item for new plants. It is recommended that the potential

that a seismic event could cause both a fire and damage to the protective features provided to cope with the fire be further evaluated. This should include fires started in nonseismically qualified systems or areas that spread to safety-related systems because protective systems are damaged."

Staff Response

The guidelines of Appendix A to BTP 9.5-1 do not require fire protection systems at operating plants to be seismically designed. In developing the guidelines of Appendix A to BTP 9.5-1, the staff performed a study of the likelihood of a fire being caused by a seismic event concurrent with failure of fire suppression water systems as a result of a seismic event. The staff found that the contribution to overall risk from potential seismically induced fires is low and would not be significantly affected whether the fire protection system is designed to Category I requirements or not. Seismic qualification of the fire protection system was not a part of the evaluation of the Palisades fire protection program.

3. Consultants' Comment: Smoke Removal

"SER Item 4.4.1 indicates that portable fans and ducts will be accepted as the means for removing smoke from many plant areas. Fires in electrical insulation can generate copious amounts of dense smoke which hamper fire control efforts by rendering the atmosphere toxic and reducing visibility in the area. Properly used, self-contained breathing apparatus can minimize the problem of toxic atmosphere, but little can be done to improve visibility except to remove the smoke from the building.

"Massive changes will be required in most areas of this plant if effective permanent smoke removal systems are required, the design of which would also have to include consideration of radioactivity releases. While portable fans and ducts may be effective for smoke control in many instances, there is concern that they will not be sufficient for a major fire in some areas of the plant. It is recommended that this item be held open until better guidelines are developed for the evaluation of smoke generation potential and smoke removal system design."

Staff Response

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 upon 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. Ventilation prior to this time serves no purpose but to add oxygen to active fire sites. The current 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 require the licensees and applicants to develop prefire plans which include the proper use of ventilation equipment in each plant area of concern. This is addressed in our Administrative Controls review.

Consequently, there is adequate information available at this time to continue to evaluate plant smoke removal capability. The use of fire suppression equipment, fire barriers and other fire protection measures is evaluated based upon 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 with due consideration of the advice of the manual fire fighting consultants.

4. Consultants' Comment: Unsuppressed Turbine Building Fires

"SER Item 5.15 concludes that fire protection in the turbine building is acceptable. However, the applicant's fire hazard analysis does not adequately address the consequences of an unsuppressed lube oil fire in the turbine building (see October 24, 1977 letter from L. P. Herman to R. E. Hall on this subject)."

Staff Response

In the above mentioned letter, Mr. Herman states his belief that manual fire fighting would not provide an effective backup to automatic suppression systems in the turbine building, and that automatic suppression systems are not highly reliable. He suggests that all plants should be designed to sustain an unsuppressed turbine building fire that could result in collapse of the turbine building.

The staff does not deem such a design basis event assumption to be consistent with criteria used in evaluating other plant areas. In other areas such as in the cable spreading room, our conclusions are based upon the effects of fire with automatic and manual suppression systems. We therefore have allowed the applicant to evaluate the effects of fires in the turbine building assuming the automatic suppression systems protecting major oil hazards function as designed.

We have determined that the oil hazards in the turbine building are protected as follows: automatic sprinkler systems are provided over portions of the turbine building containing lube oil piping, the feedwater pumps, and the hydrogen seal oil unit; the turbine lube oil

tanks, reservoir, and other oil system components are located within a sprinklered three-hour fire-rated curbed enclosure to contain fires in this area; the turbine lube oil supply lines use guarded pipe to contain oil leaks; and the generator casing is designed to withstand the explosive forces of an internal hydrogen explosion. In addition, manual hose stations and portable extinguishers are provided throughout the turbine building to supplement these automatic suppression systems.

We have found that these systems provide adequate protection to assure the integrity of the turbine building. The staff believes that the reliability of such systems is at least equivalent to suppression systems in other areas of the plant and does not warrant design of the turbine building to sustain an unsuppressed fire.

7590-01

UNITED STATES NUCLEAR REGULATORY COMMISSION

DOCKET NO. 50-255

CONSUMERS POWER COMPANY

NOTICE OF ISSUANCE OF AMENDMENT TO PROVISIONAL OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 42 to Provisional Operating License No. DPR-20, issued to Consumers Power Company (the licensee) for operation of the Palisades Plant (the facility) located in Covert Township, Van Buren County, Michigan. The amendment, which adds paragraph 3.E to the license, is effective as of its date of issuance.

The amendment incorporates a condition in the license relating to the completion of facility modifications to improve the fire protection program. Additional operating and surveillance requirements for the modifications being performed will be added to the Technical Specifications after the modifications are complete.

The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment. Prior public notice of this amendment was not required since the amendment does not involve a significant hazards consideration.

The Commission has determined that the issuance of this amendment will not result in any significant environmental impact and that pursuant to 10 CFR §51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with issuance of this amendment.

For further details with respect to this action, see (1) the application for amendment dated March 31, 1977, and supplements thereto dated September 29, 1977, December 15, 1977, May 15, 1978, June 19, 1978, June 29, 1978, June 30, 1978, July 28, 1978, and July 31, 1978, (2) Amendment No. 42 to License No. DPR-20, and (3) the Commission's related Safety Evaluation. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N. W., Washington, D. C. and at the Kalamazoo Public Library, 315 South Rose Street, Kalamazoo, Michigan 49006. A copy of items (2) and (3) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland, this 1st day of September, 1978.

FOR THE NUCLEAR REGULATORY COMMISSION

Dennis L. Ziemann, Chief
Operating Reactors Branch #2
Division of Operating Reactors