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Docket No. 50-305

Mr. E. W. James
Senior Vice President
Wisconsin Public Service Corporation
Post Office Box 1200
Green Bay, Wisconsin 54305

Dear Mr. James:

The Commission has issued the enclosed Amendment No. 23 to Facility Operating License No. DPR-43 for the Kewaunee Nuclear Power Plant. This amendment adds to your Facility Operating License a condition relating to the completion of facility modifications for fire protection. This amendment constitutes our response to your submittals of May 2, 1977, May 15, 1978, May 26, 1978, July 7, 1978, July 28, 1978, August 4, 1978 and October 25, 1978.

Modifications discussed in Section 3.1 must be completed by the dates specified in Table 3.1. Resolution of open items discussed in Section 3.2 is to be accomplished by February 15, 1979.

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

Sincerely,

ORIGINAL SIGNED

A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors

Enclosures:
1. Amendment No. 23 to DPR-43
2. Safety Evaluation
3. Notice of Issuance

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cc: w/enclosures
See next page

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

WISCONSIN PUBLIC SERVICE CORPORATION

WISCONSIN POWER AND LIGHT COMPANY

MADISON GAS AND ELECTRIC COMPANY

DOCKET NO. 50-305

KEWAUNEE NUCLEAR POWER PLANT

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 23
License No. DPR-43

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

   A. The applications for amendment by the Wisconsin Public Service Corporation, Wisconsin Power and Light Company and Madison Gas and Electric Company (the licensee) dated May 2, 1977, May 15, 1978, May 26, 1978, July 7, 1978, July 28, 1978, August 4, 1978 and October 25, 1978 comply with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commissions rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the applications, 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, add paragraph 2.C(3) to Facility Operating License No. DPR-43 to read as follows:

2.C(3) The licensee may proceed with and is required to complete the modifications identified in Paragraphs 3.1.1 through 3.1.28 of the Fire Protection Safety Evaluation Report. These modifications shall be completed by the dates specified in Table 3.1. Dates for resolution of items discussed in Section 3.2 of the Safety Evaluation Report are specified in Table 3.2. In the event that these dates for completion cannot be met, the licensee shall submit a report explaining the circumstances and propose a revised schedule.

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

FOR THE NUCLEAR REGULATORY COMMISSION

A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors

Date of Issuance: December 12, 1978

SAFETY EVALUATION REPORT

BY THE

OFFICE OF NUCLEAR REACTOR REGULATION

U.S. NUCLEAR REGULATORY COMMISSION

SUPPORTING AMENDMENT NO. 23 TO

FACILITY OPERATING LICENSE NO. DPR-43

WISCONSIN PUBLIC SERVICE CORPORATION

WISCONSIN POWER AND LIGHT COMPANY

MADISON GAS AND ELECTRIC COMPANY

KEWAUNEE NUCLEAR POWER PLANT

DOCKET NO. 50-305

DATED: December 12, 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 licensee 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:

(a) "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.

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

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

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

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

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

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

We have reviewed the licensee's analyses and have visited the plant to examine the relationship of safety-related components, systems and structures with both combustibles and the associated fire detection and suppression systems. Our review was based on the fire protection review team's site visit of March 28-31, 1978 and the licensee's proposed program for fire protection as described in the following docketed information:

(1) The Kewaunee Final Safety Analysis Report;

(2) "Fire Protection Program Analysis," dated May 2, 1977.

(3) "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance," submittal from Wisconsin Public Service Corp., dated May 15, 1978; and

(4) "Response to Request for Additional Information and Staff Positions Concerning Fire Hazards Analysis," dated May 26, 1978.

(5) "Response to Request for Additional Information and Staff Positions Concerning Fire Hazards Analysis," dated July 28, 1978.

(6) "Response to Request for Additional Information and Staff Positions Concerning Fire Hazards Analysis," dated August 4, 1978.

(7) "Response to Request for Additional Information on Fire Protection," October 25, 1978.

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 the Kewaunee Nuclear Power Plant. The chronology of our evaluation is summarized in Appendix A of this report.

3.0 SUMMARY OF MODIFICATIONS 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 criteria to assure that the design is acceptable prior to actual implementation of these modifications. The design information required has been discussed with the licensee. These design criteria should be provided at least 90 days before implementation. The balance of the other modifications has been described in an acceptable level of detail.

3.1.1 Relay Room Carbon Dioxide System

A total flooding carbon dioxide system, manually actuated, will be provided in the relay room and cable spreading area; isolation dampers actuated by the carbon dioxide system will be installed in the relay room ducts (5.8, 4.3.2).

3.1.2 CO_2 Tank Room Barriers

The CO_2 tank room will be separated from the turbine building by sealing barrier penetrations and providing a fire door (5.14).

3.1.3 Reactor Coolant Pump Suppression System

An automatic foam suppression system will be provided for each of the two reactor coolant pumps (5.1, 4.3.1.6).

3.1.4 Maintenance Storage Area Suppression System

The existing wet pipe sprinkler system for the maintenance storage area in the auxiliary building will be modified to an automatic deluge system (5.7, 4.3.1.5).

3.1.5 Cable Tray Sprinkler System

A wet pipe sprinkler system will be installed to provide coverage of safety-related cable trays at elevation 616 feet of the auxiliary building, fire area AX-32 (5.7, 4.3.1.5).

3.1.6 Hose Stations

Eight additional hose stations have been installed in the auxiliary building (4.3.1.4).

3.1.7 Fire Doors

Three-hour fire doors and frames are being installed in certain doorways between the turbine room and safety-related areas (4.9.1).

3.1.8 Sealing of Fire Barrier Openings

Openings in the fire barriers for electrical cable trays and piping will be sealed to provide protection equivalent to that required of the fire barrier (4.9.3).

An evaluation is being performed on cable penetration firestops to assure that the penetrations meet or exceed the required fire rating; firestops will be upgraded as required (4.9.3)

3.1.9 Ventilation Duct Penetrations

Ventilation duct penetrations of various fire barriers will be provided with fire dampers (4.9.2) including those in the turbine-driven auxiliary feedwater pump room (5.10) and the battery rooms (5.12).

3.1.10 Fire Detection System Electrical Supervision

Electrical supervision of the fire alarm system circuitry from the main detector panel in the turbine building to the control room will be provided (4.2).

3.1.11 Portable Smoke Removal Equipment

Additional portable smoke exhausters and flexible ductwork will be provided (4.4.1).

3.1.12 Battery Room Ventilation Monitors

Air flow monitors will be provided for the battery rooms to alarm in the control room on loss of exhaust ventilation (5.12).

3.1.13 Hose Cart

A hose cart with 200 feet of 1-1/2-inch fire hose and 200 feet of 2-1/2-inch fire hose will be provided for the yard area (5.16).

3.1.14 Post Indicator Valve

The post-indicator valve near hose house No. 2 will be protected with vehicle guards (5.16).

3.1.15 Screenhouse Sprinkler System

Sprinkler protection will be provided over the redundant cables in trays in the screenhouse corridor in the area outside the diesel room doors (5.15).

3.1.16 Gasketed Fire Door

The fire door between the control room and relay room will be gasketed (5.16).

3.1.17 Supplemental Lighting

Additional fixed lighting units with individual battery packs will be provided in several plant areas (4.6). Sealed beam or hand lights will be provided for fire brigade use (4.6).

3.1.18 Diesel Generator Room Curbing

Curbing will be provided in the diesel generator 1-B room to contain potential oil leaks (5.11, 4.5).

3.1.19 Control Room Fire Extinguishers

A 2-1/2-gallon water type portable fire extinguisher will be provided for the control room (5.6, 4.3.3).

3.1.20 Reactor Building Fire Hose Nozzles

Nozzles will be provided on service water hoses in the reactor building to permit them to be used for fire fighting (5.1).

3.1.21 Valve Supervision

All valves in the fire water system that protect safety-related areas will be provided with tamper indicating seals (4.3.1.3).

3.1.22 Protection from Water Spray

A safety-related motor control center will be protected from water spray from fire protection system actuation or rupture (4.3.1.7).

* 3.1.23 Fire Door Control

Fire doors protecting safe shutdown areas from large fire hazards or separating areas containing redundant safe shutdown cables and/or equipment will be electrically supervised (4.9.1).

3.1.24 Fire Detectors

Fire detectors will be provided in fire zones AX-23 and TU-94, in the corridor to the screen house (5.15), and in the turbine-driven auxiliary feedwater pump room (5.10).

3.1.25 Administrative Control Changes

Procedures are being developed or changed to incorporate controls over combustible materials and ignition sources, fire brigade staffing and training, fire fighting procedures, quality assurance provisions, and definition of fire protection duties and responsibilities (6.0).

3.1.26 Reactor Building Service Water Hose

The licensee will verify that available service water hose lines in the reactor building will reach significant cable concentrations and provide sufficient hose so that this may be achieved (4.3.1.4).

3.1.27 Cooking Area Exhaust Hood

The oven unit and burners in the control room cooking area will be replaced with a microwave oven (5.6).

3.1.28 Fire Hose Nozzles

"Electrical" type nozzles will be provided at the hose stations located near high voltage equipment (4.3.1.4).

3.2 Incomplete Items

Our review of certain items of the licensee's fire protection program is not yet complete. The incomplete items are listed below. The schedule for the licensee's submittal of additional information known is given in Table 3.2. This schedule has been established such that, if our review indicates the need for further modifications, they can be implemented on a schedule consistent with the completion schedule for the modifications listed in Section 3.1.

3.2.1 Fire Brigade Size

The staff has taken the position that a minimum fire brigade of five trained individuals should be provided on all shifts. The licensee is continuing to review this position and possible use of certain security personnel to help in satisfying this position. The licensee should provide details on the training to be provided additional personnel to assure an adequately trained five-man fire brigade ((6.0).

3.2.2 Safe Shutdown Instrumentation

The staff has taken the position that instrumentation required for safe shutdown be provided independent of fire damage that may result to wiring in the relay or control rooms. The licensee has provided the results of an analysis to show that safe shutdown can be achieved and maintained without instrumentation that may be damaged in a relay room fire. The staff is reviewing the licensee's analysis and will request additional details from the licensee (4.10, 5.6, 5.8).

TABLE 3.1

IMPLEMENTATION DATES FOR PROPOSED MODIFICATIONS

		Item	Date
	3.1.1	Relay Room Carbon Dioxide System	Complete
	3.1.2	CO_2 Tank Room Barriers	Prior to startup following next refueling
**	3.1.3	Reactor Coolant Pump Suppression System	Prior to startup following next refueling
	3.1.4	Maintenance Storage Area Suppression System	Prior to startup following next refueling
**	3.1.5	Cable Tray Sprinkler System	Prior to startup following next refueling
**	3.1.6	Hose Stations	Complete
	3.1.7	Fire Doors	Complete
	3.1.8	Sealing of Fire Barrier Openings	January 1, 1980
	3.1.9	Ventilation Duct Penetrations	Prior to startup following next refueling
	3.1.10	Fire Detection System Electrical Supervision	Complete
	3.1.11	Portable Smoke Removal Equipment	January 1, 1979
	3.1.12	Battery Room Ventilation Monitors	Prior to startup following next refueling
	3.1.13	Hose Cart	January 1, 1979
	3.1.14	Post Indicator Value	Prior to startup following next refueling
	3.1.15	Screenhouse Sprinkler System	January 1, 1980
	3.1.16	Gasketed Fire Door	Complete
	3.1.17	Supplemental Lighting	Complete
	3.1.18	Diesel Generator Room Curbing	Prior to startup following next refueling
	3.1.19	Control Room Extinguisher	Complete
**	3.1.20	Reactor Building Fire Hose Nozzles	Prior to startup following next refueling
	3.1.21	Valve Supervision	Complete
	3.1.22	Protection from Water Spray	Prior to startup following next refueling
	3.1.23	Fire Door Control	February 23, 1979
**	3.1.24	Fire Detectors	Prior to startup following next refueling
	3.1.25	Administrative Control Changes	April 1, 1979
	3.1.26	Reactor Building Service Water Hose	Prior to startup following next refueling
	3.1.27	Cooking Area Exhaust Hood	Complete
	3.1.28	Fire Hose Nozzles	Complete

**New or revised Technical Specifications should be prepared for these modifications at least 90 days prior to implementation of the modification.

TABLE 3.2

RESOLUTION DATES FOR INCOMPLETE ITEMS

	Item	Date
3.2.1	Fire Brigade Size	February 15, 1979
3.2.2	Safe Shutdown Instrumentation	February 15, 1979

4.0 EVALUATION OF PLANT FEATURES

4.1 Safe Shutdown Systems

There are several arrangements of safe shutdown systems which are capable of shutting down the reactor and cooling the core during and subsequent to a fire. The exact arrangement available in a fire situation will depend upon the effects of the fire on such systems, their power supplies and control stations. 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; various reactor coolant and steam generator instrumentation; high pressure injection system or charging system; auxiliary feedwater system; residual heat removal system; component cooling water system; service water system; and safety relief valves. Supporting systems and equipment may also be required such as: engineered safety features batteries; emergency diesel generators; 4160 volt and 480 volt buses, switchgear, and motor control centers; condensate storage and makeup water tanks; and various valves to properly align required systems and to isolate systems not required.

4.2 Fire Detection and Signaling Systems

The plant has a protective signaling system which transmits fire alarm and supervisory signals to the control room where distinctive audible and visual operator notification is provided. The system transmits actuation and trouble signals from fire detectors; sprinklers; deluge and carbon dioxide systems; fire pumps; and manual fire alarm pull boxes. Electrical tamper switches are also provided on deluge system gate valves.

The signaling system is supplied power from one of the ESF buses, which provides an acceptable emergency supply if offsite AC power is lost. The signaling system complies with those provisions of NFPA 72-D which are considered essential for this type of facility, except that wiring between the main fire alarm panel in the turbine building and the control room annunciator was not originally electrically supervised.

Smoke detectors of the ionization type have been provided in several areas of the plant for personnel notification, and in two QA/QC vaults to activate an automatic Halon system. Heat detectors actuate the carbon dioxide system protecting the diesel generator rooms, turbine bearings and head enclosure, and telephone equipment room. Infrared flame detectors are also provided in the diesel generator rooms for notification only. Pneumatic rate-of-rise detectors actuate deluge systems protecting transformers, turbine lube oil reservoirs, charcoal filters and the heating boiler fuel pump.

There are some areas containing safety-related equipment and electrical cables that are not provided with fire detection. To provide adequate detection coverage, the licensee has proposed to provide fire detectors in fire zones AX-23 and TU-94, in the corridor to the screen house, and in the turbine-driven auxiliary feedwater pump room.

The licensee has provided electrical supervision of the wiring between the main fire alarm panel and the control room.

Subject to implementation of these modifications, the fire detection and signaling system conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

4.3 Fire Control Systems

4.3.1 Water Systems

4.3.1.1 Water Supply

The fire protection water supply for the plant consists of two fire pumps taking suction from the circulating water intake, which receives water directly from Lake Michigan. We conclude that the basic water supply system conforms to the provisions of Appendix A to BTP 9.5-1. Accordingly, we find the fire water supply acceptable.

4.3.1.2 Fire Pumps

The two fire pumps are vertical turbine electric motor-driven units, each having a rated capacity of 2000 gpm at 125 psig. Each pump is supplied electric power from a different ESF bus; the two buses can be tied together in the event that power is lost on one. The fire pumps are located in the screen house which also contains the service and circulating water system pumps. There is good separation between the two fire pumps, and their electrical power supply cables.

A jockey pump is provided to maintain pressure on the fire water system. The fire pumps are arranged to start automatically when the fire loop pressure drops due to a large water demand. One fire pump also starts automatically upon actuation of a deluge system. Fire pump running and trouble signals are transmitted to the control room. Either of the two fire pumps has sufficient capacity to supply the maximum design sprinkler demand with adequate reserve available for fire hoses as specified in Appendix A to BTP 9.5.1.

We find that the general design of the fire pumps meets the objectives outlined in Section 2.2 of this report and is, therefore, acceptable.

4.3.1.3 Fire Water Piping System

The two fire pumps have separate discharge lines into the fire loop which encircles the plant. Valving is arranged so that a single piping break will not remove both pumps from service.

Fixed water suppression systems and interior fire hose stations in the turbine, material storage and administration buildings are supplied by a header which passes through the plant and is connected to the fire loop at both ends. Interior fire hose stations in the auxiliary building are supplied by the service water system. Sectionalizing valves are provided on the fire loop to allow isolation of various sections for maintenance. There are locations where a single piping break could affect both primary automatic and manual backup water suppression systems; however, none of these areas contains safety-related equipment or electrical cables.

Yard fire hydrants supplied by the fire loop have been provided at 250-foot intervals around the exterior of the plant. The hydrants have not been equipped with an auxiliary gate valve; however, the arrangement of the fire loop and interior header is such that repair or maintenance of a hydrant will not result in loss of water supply to interior suppression systems.

The position of fire water system control valves is monitored by administrative controls only. The licensee has also proposed to utilize tamper indicating seals.

Fire hose and other manual fire fighting equipment has been provided at hose cabinets located at each fire hydrant. The hydrant hose threads are compatible with those of the local fire department.

The licensee has proposed to make certain modifications to fire suppression equipment in yard areas (see Section 5.16.6). We find that, subject to implementation of these modifications, the fire water piping system will satisfy the objectives detailed in Section 2.2 of this report and is, therefore, acceptable.

4.3.1.4 Interior Hose Stations

The licensee has provided hose stations throughout the plant to reach potential hazards to safety-related equipment with the hose stored at the hose station but with not greater than 100 feet of hose. Interior hose stations supplied by the fire water system and equipped with 1-1/2-inch lined fire hose have been installed in the turbine building and at the diesel generator rooms and screen house. Interior hose stations supplied by the service water system and equipped with hard rubber hose on reels have been installed in the auxiliary building.

Adjustable nozzles have been provided on all hoses; the licensee has proposed to provide spray-only type nozzles in areas with higher voltage electrical equipment.

The licensee has proposed to provide nozzles to be used on service water system hoses to fight fires which may occur inside containment. The licensee is verifying that these hoses will reach all significant cable concentrations and areas where oil fires may occur. The licensee has verified that fire suppression demands will not affect capability of the service water system to meet safe shutdown demands.

The licensee has shown that piping arrangements on hoses supplied by the service water system are capable of providing sufficient volume and pressure for effective fire hose streams if one-inch nozzles are used. The licensee has proposed to provide one-inch nozzles on several of the hose stations in the auxiliary building.

We find that, subject to implementation of the above described modifications, the interior fire hose installation conforms to the provisions of Appendix "A" to BTP 9.5-1 and is, therefore, acceptable.

4.3.1.5 Sprinkler Systems

Automatic wet pipe sprinkler systems have been provided in the administration building, on the basement and mezzanine levels of the turbine building, and in portions of the auxiliary building and material storage building. The sprinkler systems have been designed in accordance with NFPA 13, "Sprinkler Systems."

Automatic water spray systems are provided on combustible liquid hazards in the turbine building (hydrogen seal oil unit, oil storage reservoirs), the heating boiler fuel oil pumps in the auxiliary building, and the oil-filled transformers in the yard area. The general design of the water spray systems complies with NFPA 15, "Water Spray Fixed Systems."

The licensee has proposed to install wet pipe sprinklers on safety-related electrical cable in fire area AX-32, in the hallway of the screenhouse (area SC70), and to convert the existing wet pipe system in the working materials storage room (auxiliary building) to a deluge system.

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

4.3.1.6 Foam

One portable foam nozzle and foam concentrate is available. The plant had no fixed foam system prior to this review; however, the licensee has installed an automatic foam suppression system on each of the two reactor coolant pumps. We find that, subject to implementation of this modification, the foam systems conform to the provisions of Appendix A to BTP 9.5-1 and are, therefore, acceptable.

4.3.1.7 Effects of Suppression Systems on Safety Systems

Floor drainage and the use of pedestals and curbs will prevent flooding of safety-related equipment by water from fire suppression systems. The licensee has proposed to protect a safety-related motor control center from the effects of water spraying from ruptured fire protection system piping or inadvertent operation of fire suppression systems. No other safety-related equipment is susceptible to water damage from suppression system failure or inadvertent operation. We find that, subject to implementation of the above modification, the objectives detailed in Section 2.2 of this report are satisfied.

4.3.2 Gas Fire Suppression Systems

An automatic total flooding, low-pressure carbon dioxide system provides fire suppression for the diesel generator rooms, telephone equipment room, turbine bearings and head enclosure, and record storage room. The system is actuated in each area by heat detectors. The system also supplies carbon dioxide hose reels at the relay room and the three switchgear areas.

The licensee has provided a manually actuated carbon dioxide system in the relay room, providing total flooding for this area. Dampers have been installed between the relay room and control room to confine the carbon dioxide.

The carbon dioxide system is supplied by a 7.5-ton storage tank and designed to conform with the requirements of NFPA 12, "Carbon Dioxide Systems."

We find that the gas suppression systems meet the requirements of Appendix A to BTP 9.5-1 and are, therefore, acceptable.

4.3.3 Portable Fire Extinguishers

Portable carbon dioxide, dry chemical and pressurized water fire extinguishers have been provided throughout the plant in accordance with the requirements of NFPA 10, "Portable Fire Extinguishers." The licensee has proposed to provide a water type extinguisher in the control-computer room area to combat potential cable insulation fires.

Subject to implementation of this modification, we find the portable fire extinguisher installation 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

The plant does not have exhaust systems designed specifically for smoke removal. However, the normal ventilation systems in most areas can be

used for limited smoke removal. The effectiveness of these systems is limited because: fans and other equipment may not be able to withstand high temperatures and could be rendered inoperative by the heat from a significant fire; the capacity and configuration of the normal air-handling systems may preclude effective smoke removal; heat-actuated dampers in fire barriers may close; and some ventilation system power supply cables may be affected by a fire.

The licensee has one portable smoke removal fan available. In view of the potential limitations of dependence upon the normal air-handling systems for smoke removal, the licensee has proposed to provide additional qualified portable smoke removal fans and ducting. Subject to implementation of this modification, we find that smoke removal capability satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.4.2 Filters

Charcoal and HEPA filter units are enclosed in substantial metal housings and charcoal filters are protected by automatic water spray. The filters are generally separated from ignition sources and the amount of contained radioactive material is insufficient to cause ignition. Filter units do not present a significant fire exposure to safe shutdown systems. We find that fire protection for the filters satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.4.3 Breathing Equipment

A sufficient number of self-contained breathing units is provided at the facility to supply the operating crew and fire brigade with breathing air for a period of at least six hours. We find that the portable breathing equipment conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

4.5 Floor Drains and Curbing

Floor drains are provided in various areas to remove suppression water. In other areas, water would flow out of doors or through grating to lower elevations such that standing water would not affect safety-related equipment.

Drains for turbine building oil hazards drain to a separate lube oil sump. No safety-related areas drain to this sump. The diesel generator rooms do not have drains. The licensee has proposed to provide a curb at the doorway of one diesel generator room to prevent spread of oil. The other diesel generator room has an open trench containing service water piping; this trench would also contain oil and suppression water, if hose stations are used, and prevent their flowing to other areas.

The turbine oil storage tank, conditioners, coolers, transfer pumps, and reservoir are contained in enclosures or diked areas to prevent spread of oil.

We find that, subject to implementation of the above described modification, adequate floor drains are provided for removal of suppression water, adequate means are provided to prevent the spread of fire through the drain system by flowing of flammable liquids, and floor drains and curbs conform to the provisions of Appendix A to BTP 9.5-1. Accordingly, we find the floor drains and curbs acceptable.

4.6 Lighting Systems

In addition to the normal AC lighting, there are separate DC and AC emergency lighting systems provided in the plant. Although certain of these systems may be powered from emergency AC or DC power supplies, redundant systems with cabling routed in separate safety divisions are not provided. Therefore, a fire may potentially cause loss of all fixed lighting systems.

Thirteen lighting units with individual battery supplies are provided, with six in the control room and seven in other areas of the plant. These do not provide adequate coverage for lighting in a fire situation. The licensee has proposed to provide five additional fixed battery powered lighting units in specific locations outside of the control room. With these additional units, adequate lighting will be available for access to safety-related areas and shutdown of the plant in a fire situation.

Also, the licensee has proposed to provide a minimum of ten portable sealed beam handlights for fire brigade use.

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

4.7 Communication Systems

Three fixed communication systems suitable for emergency use are provided in the plant: a paging system, an emergency communication network, and a sound-powered system. The paging system has speakers and handsets at numerous locations in the plant with power provided by normal AC. The emergency communication network has five stations at key shutdown locations outside of the control room with power provided by noninterruptible AC. The sound-powered system consists of 75 jack boxes throughout the plant, with headsets. All three of these systems are hardwired systems that are not separated as safety divisions and as such are susceptible to damage by a fire. Should a fire cause loss of fixed communication systems in the fire area or if communication stations are not convenient to the fire location, portable radios are available for use by the fire brigade. These may be used in most areas of the plant. We find that the communication systems satisfy the objectives of Section 2.2 of this report and are, therefore, acceptable.

4.8 Electrical Cable Combustibility

The licensee has stated that the cable insulation used in the plant consists of ethylene-propylene rubber with a chlorosulfonated polyethylene jacket,

and that the electric cable construction passes the current IEEE-383 flame test. Accordingly, we find the electrical cables used at the Kewaunee plant conform to the provisions of Appendix A to BTP 9.5-1 and are, therefore, acceptable.

4.9 Fire Barrier Penetrations

4.9.1 Fire Doors

Doorway penetrations in required fire barriers are equipped with 1-1/2-hour and 3-hour labeled fire doors in unlabeled frames. The licensee has proposed to upgrade doors in certain barriers protecting safe shutdown systems from the turbine building by installing labeled 3-hour fire rated doors and frames. We have evaluated the design and installation of the unlabeled frames and find that they provide adequate protection for the fire hazards involved.

The licensee proposes to install alarms on all fire doors separating safe shutdown systems from the turbine building and between one diesel generator room and the 480V switchgear room.

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

4.9.2 Ventilation Duct Penetrations

Ventilation ducts pass through some required fire barriers and the licensee has proposed to upgrade these penetrations with dampers having a fire rating equivalent to that required of the barrier. We find that, subject to implementation of the above modification, the ventilation duct penetrations conform to the provisions of Appendix A of BTP 9.5-1 and are, therefore, acceptable.

4.9.3 Electrical Cable and Piping Penetrations

Most electrical cable penetrations in fire barriers are protected with seals utilizing a 1/4-inch steel plate, silicone sealant and sprayed fire resistive mastic. The design has not been subjected to an ASTM E-119 type fire test. The licensee will perform an evaluation of cable penetration firestops, and has proposed to upgrade firestops where they do not meet the fire resistance required of the barrier in which they are located. Penetrations without seals will be provided with seals having a fire rating equivalent to that of the barrier in which they are installed.

We find that, subject to implementation of this modification or provision of data demonstrating the adequacy of seals, the electrical cable and piping penetrations conform to the provisions of Appendix A to BTP 9.5-1 and are, therefore, acceptable.

4.10 Separation Criteria

The licensee has stated that the separation of redundant cables of the reactor protection system and safety features is accomplished by separation in accordance with the following criteria:

"Redundant circuitry for reactor protection and engineered safety systems is separated into groups as follows:

Class 1E cables are divided into the following groups:

Orange - Safeguard Train A circuits
Green - Safeguard Train B circuits
Red - Reactor protection system
White - Reactor protection system
Blue - Reactor protection system
Yellow - Reactor protection system"

Each group is run in a separate tray, ladder, trough or conduit. Within containment the tray systems for the four reactor protection instrument channels are separated 3 feet horizontally where they involve 2/4 logic, and are separated approximately 20 feet where they involve 2/3 logic. Vertical separation is 5 feet where practical, and where impractical, barriers are installed. These barriers are solid metal covers on the lower trays.

Class 1E trays containing instrument, control or power cables have a minimum horizontal separation between redundant circuits of 36 inches. Redundant circuits are not permitted in the same tray or conduit. If closer spacing than 36 inches cannot be avoided, an approved barrier must be placed between the circuits. Cable trays are routed to avoid a fire hazard area, such as oil storage rooms, oil tanks, etc., whenever possible. When this cannot be done, the cable tray system is protected by fire resisting barriers. Where practical, these barriers will be tray covers. Whenever possible, a wall or floor has been introduced between trays carrying redundant safeguard circuits. Barriers are required where mutually-redundant trays cross. The barriers shall extend to each side of the protected tray by a distance equal to approximately three times the widest of the two trays.

Mixing of power cables with control or instrument cable in the same tray is not permitted throughout the plant. Whenever a control and/or instrument cable tray and a power tray are in the same stack, the power tray is located in the top tier.

Trays for Train A and Train B are separated three feet horizontally except in the relay room, where practical design considerations require one-foot vertical and horizontal separation. The two trains are separated by 40 feet at the reactor containment vessel penetrations.

Power cables for engineered safeguards are kept strictly in cable trays so designated. Occasionally, a nonsafety-related power cable may be run in a

safeguards cable tray, but a safeguard cable will never run in any tray other than its own system. Control cables are similarly separated, and control and instrumentation of the same train designation may be run in the same control cable tray. Nonsafety-related power control or instrumentation cable shall not be permitted to cross over from one safeguards tray to another.

Where the wiring for redundant engineered safety features is within a single panel or panel section, this wiring is separated, one group from the other, by a six-inch air space or a fireproof barrier. The barriers are sheet metal or flexible metallic conduit. The flexible conduit may be applied to one "train" to separate it from the other "train." Wiring not associated with either "train" may be grouped with one train but may not cross from one "train" bundle to the other "train."

In general, separation between redundant divisions far exceeds these minimum requirements and is such that most fires would not cause functional loss of redundant safe shutdown equipment. The licensee, however, did not consider cables in conduit to be vulnerable to cable fires. During the site visit the separation of cables in conduit was generally found to be comparable to trays; there were a few locations identified where cable in conduit was in close proximity to trays of the opposite division. Subsequently, the licensee has evaluated the effect of the loss of cables in conduit where they are in close proximity to cables in open cable trays of the redundant division and found that safe shutdown will not be affected by a postulated fire. For certain areas where redundant safe shutdown equipment may be lost in a fire, an alternate shutdown capability has been provided, with the exception of instrumentation. These areas are the relay room (5.8) and control room (5.6). The alternate shutdown capability is afforded by the auxiliary feedwater control panel located in the air compressor and pump rooms. The plant could be brought to hot shutdown from this location, and cold shutdown could be achieved by manually closing breakers and operating valves. This alternate capability contains adequate equipment to achieve safe shutdown; however, the availability of required instrumentation is still under review. The licensee has performed an analysis to show how safe shutdown would be achieved and maintained without instrumentation that may be damaged as a result of a major relay room fire. The staff is currently reviewing this analysis. We will further address the adequacy of instrumentation available to achieve safe shutdown in a supplement to this Safety Evaluation Report.

4.11 Fire Barriers

Substantial fire barriers have been provided throughout the plant. The licensee's fire hazards analysis concludes that the basic wall, floor and ceiling structures bounding each fire area have adequate fire resistance to prevent the spread of an unsuppressed fire through the barrier. Barriers not having a three-hour fire resistance rating are found acceptable on the basis of the light combustible loading, or on the basis that redundant safe shutdown equipment will not be jeopardized if the barrier is breached.

The critical fire barriers have been reviewed by the staff, and it is concluded that, with one exception, subject to implementation of the modifications and requirements discussed in other sections of this report, barriers will be adequate where relied on to prevent redundant safe shutdown systems from being involved in the same fire incident. The fire barriers in question are the 1½-hour fire rated barriers separating the diesel generator rooms from the corridor to the screenhouse. The adequacy of these barriers and required upgrading are discussed in Section 5.11 of this report.

We find that, with the exception of these barriers discussed in Section 5.11, fire barriers conform to the provisions of Appendix A to BTP 9.5-1 and are, therefore, acceptable.

4.12 Access and Egress

All areas are reasonably accessible for manual fire fighting. However, delays would be experienced in entering the reactor building and shield building for fires in these areas. The adequacy of fire protection and proposed modifications for the reactor building are discussed in Section 5.1 of this report. Additionally, access to the relay room could be delayed since entry via the circular stairway from the control room would be difficult due to heat and smoke. However, entry could be made from the turbine building.

We find that existing access and egress capability is acceptable for manual fire fighting in safety-related areas and satisfies the objectives detailed in Section 2.2 of this report.

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, 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 safety shut down the plant. Proposed modifications to upgrade fire barrier penetrations are discussed in Section 4.9 of this report. 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 as to the potential releases to the environment. We have reviewed the licensee's evaluation and find that the releases resulting from fire in these areas are acceptably low.

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 is discussed in the following sections.

5.1 Reactor Containment

5.1.1 Safety-Related Equipment

Safety-related equipment in the reactor containment (fire area RC-60) which may be required for safe shutdown includes the reactor vessel, pressurizer, steam generators, safety relief valves, isolation valves, and associated piping, instrumentation, and electrical cables.

5.1.2 Combustibles

The significant combustibles in the reactor containment include a large quantity of lube oil in each of the two reactor coolant pumps and electrical cable insulation.

5.1.3 Consequences if No Fire Suppression

An unsuppressed fire could cause damage to redundant electrical cables associated with instrumentation which may be required for safe shutdown.

5.1.4 Fire Protection Systems

Smoke detectors have been provided in the area of the electrical cable penetrations and on each reactor coolant pump. Manual fire suppression would utilize portable fire extinguishers in the area. No automatic suppression or manual fire hose stations are provided.

5.1.5 Adequacy of Fire Protection

The fire detection provided would likely alert personnel to a fire in the area. However, portable fire extinguishers alone may not be sufficient to effectively suppress a fire involving reactor coolant pump lube oil or electrical cables in open trays.

5.1.6 Modifications and Recommendations

The licensee has proposed to install an automatic foam protection system on each reactor coolant pump, designed to control fires involving the pump lube oil system.

The licensee has also proposed to provide nozzles on service water hose stations so that all areas containing combustible materials, including electrical cables, are within reach of a hose line using not over 100 feet of hose. The licensee is verifying that these hoses will reach all significant cable concentrations. The licensee has shown that fire suppression demands will not affect capability of the service water system to meet safe shutdown demands.

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

5.2 Shield Building

5.2.1 Safety-Related Equipment

This area (fire area SB-65) contains electrical cabling for redundant safety-related systems.

5.2.2 Combustibles

The only combustible material in this area is electrical cable insulation.

5.2.3 Consequences if No Fire Suppression

An unsuppressed fire in this area would only result in damage to electrical cables associated with one division of instrumentation that may be required for safe shutdown. The other division would not be affected due to the wide separation.

5.2.4 Fire Protection Systems

Smoke detectors are provided at the two electrical penetration areas. No automatic suppression or manual hose stations are provided for the area. Manual fire suppression would utilize portable fire extinguishers.

5.2.5 Adequacy of Fire Protection

The fire detection provided would alert personnel to a fire in the area. However, portable fire extinguishers alone may not be sufficient to effectively suppress a fire involving electrical cables in open trays.

5.2.6 Modifications and Recommendations

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

5.3 Auxiliary Building - Basement Floor

5.3.1 Safety-Related Equipment

In addition to the special ventilation rooms discussed in Section 5.9 of this report, this elevation contains some safety-related cabling from both divisions (fire areas Ax-24 and Ax-21). The cabling is widely separated on opposite sides of the auxiliary building with intervening fire barriers.

5.3.2 Combustibles

Combustibles in this area are minimal with some cable insulation, compactible solid wastes, and grease in pumps and valves. Compactible wastes are stored in drums prior to shipment offsite. The maximum wastes which could be burned would be about a drum of compacted wastes.

5.3.3 Consequences if No Fire Suppression

An unmitigated cable fire may affect systems within one division, but would not cause loss of shutdown capability. An analysis performed by the licensee has shown that a fire in compactible solid wastes would not result in releases that exceed those previously considered acceptable for failures in radwaste equipment.

5.3.4 Fire Protection Systems

Fire protection is provided by smoke detectors in some areas, portable extinguishers, and manual hose stations.

5.3.5 Adequacy of Fire Protection

Existing fire protection is adequate to control and suppress fires in most areas at the basement elevation of the auxiliary building.

5.3.6 Modifications and Recommendations

The licensee has proposed to upgrade fire barrier penetrations, as discussed in Section 4.9 of this report. Hose stations referenced in Section 5.3.4, above, have been recently installed.

We find that, subject to implementation of this modification, fire protection for the basement elevation of the auxiliary building satisfies the objectives of Section 2.2 of this report and is, therefore, acceptable.

5.4 Auxiliary Building - Mezzanine Level

5.4.1 Safety-Related Equipment

In addition to the relay room, special ventilation rooms, and service rooms discussed in other sections of this report, the mezzanine level

includes the condensate and makeup water tanks and certain equipment of the chemical and volume control system (fire areas Ax-22, Ax-24, and Ax-33). None of the equipment would be required for safe shutdown.

5.4.2 Combustibles

Only minimal combustibles are located at this elevation, consisting mainly of small amounts of cable insulation and grease in motors and valves.

5.4.3 Consequences if No Fire Suppression

Unmitigated fires may cause loss of certain normal operating equipment, but would not affect safe shutdown equipment.

5.4.4 Fire Protection Systems

Fire protection is provided by portable extinguishers and hose stations.

5.4.5 Adequacy of Fire Protection

Fire protection in this area would be adequate to promptly detect, control and suppress fires at the mezzanine level of the auxiliary building.

5.4.6 Modifications and Recommendations

No specific modifications are proposed for this area, although fire barrier penetrations will be upgraded, as discussed in Section 4.9 of this report. The hose stations referenced in Section 5.4.4, above, have been recently installed.

We find that fire protection for the mezzanine level of the auxiliary building satisfies the objectives of Section 2.2 of this report and is, therefore, acceptable.

5.5 Auxiliary Building - Operating Floors

5.5.1 Safety-Related Equipment

In addition to the control room (5.6), service rooms (5.7), and special ventilation rooms (5.9) which are discussed in other sections of this report, the operating floor level of the auxiliary building contains the new and spent fuel pools, fuel handling equipment, and the main trip breakers (fire areas Ax-24 and Ax-37).

5.5.2 Combustibles

Combustibles in the various rooms at this elevation include small to moderate amounts of electrical cable insulation. During refueling periods, the fuel pod area contains moderate amounts of transient combustibles such as plastic sheeting, anti-"C" clothing, and packaging materials.

5.5.3 Consequences if No Fire Suppression

An unmitigated fire in any of the areas at this elevation may result in damage to some safety-related equipment, but would not affect the capability to achieve safe shutdown. Fires affecting the trip breakers may cause a reactor trip, but would not prevent safe shutdown.

5.5.4 Fire Protection Systems

Fire protection is provided by smoke detectors in some areas, portable extinguishers, and manual hose stations. The operating floor elevation is divided into several fire areas, each enclosed by fire barriers. Certain of the fire areas are discussed in other sections of this report, as noted in Section 5.5.1.

5.5.5 Adequacy of Fire Protection

Fire protection is adequate to control and suppress fires in these areas. Safe shutdown capability would not be affected.

5.5.6 Modifications and Recommendations

No specific modifications are proposed for the operating floor level of the auxiliary building, although penetrations of fire barriers will be sealed or protected, as described in Section 4.9 of this report. Hose stations referenced in Section 5.3.4, above, have been recently installed. We find that the fire protection for the operating floor level of the auxiliary building satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.6 Control Room and A/C Equipment Room

5.6.1 Safety-Related Equipment

This area (fire area Ax-35) contains cabling and components mounted in cabinets and consoles which are associated with redundant equipment required for safe shutdown of the plant.

5.6.2 Combustibles

The significant combustible in this area is electrical cable insulation. There is no exposed cabling in the control room; all cabling is located and terminated within the cabinets and consoles. An insignificant amount of ordinary combustible material may be found in wastebaskets.

5.6.3 Consequences if No Fire Suppression

It is unlikely that an unmitigated fire in this area could cause loss of control of redundant safe shutdown equipment from the control room, due to the separation of redundant circuits within cabinets by distance or barriers

and due to the low combustible load. Should control from the control room be lost, safe shutdown capability would not be lost due to the availability of the safe hot shutdown control station outside the control room whose cabling is independent of the control room and relay room; however, the availability of instrumentation required for safe shutdown is still under review. Cold shutdown conditions can be achieved by manual operation of valves and manual actuation of circuit breakers to provide power for the operation of pumps. See Section 4.10 for further discussion of the alternate shutdown capability.

5.6.4 Fire Protection Systems

Smoke detectors are provided in all safety-related cabinets and consoles. Fire extinguishment capability is provided by portable water and CO_2 extinguishers as well as hose stations, located outside the room, which are accessible to the area.

5.6.5 Adequacy of Fire Protection

The fire protection for this area is adequate to detect and suppress fires that may occur. The quantity of cables in cabinets and consoles is low and redundant cables are neatly tied and separated by distance or barriers, and it is therefore unlikely that a fire could cause loss of control from the control room of redundant safe shutdown systems prior to detection and extinguishment of the fire. In the unlikely event that redundant cables should be damaged, capability exists independent of this area to perform safe shutdown. However, manual operation of valves to operate the auxiliary feedwater system may be required, and the availability of required instrumentation for safe shutdown is still under review.

5.6.6 Modifications and Recommendations

The licensee has proposed to gasket the door between the control room and the relay room to prevent smoke infiltration into the control room for fires in the relay room and to seal CO_2 in the relay room if discharged. We are continuing to evaluate the adequacy of protection for tinstrumentation for relay room and control room fires as discussed in Section 5.8.6. We will address the adequacy of fire protection for the control room upon resolution of required protection for safe shutdown instrumentation wiring.

5.7 Service Rooms

5.7.1 Safety-Related Equipment

This area (fire area Ax-32) contains electrical cables on trays and in conduit for redundant safety-related systems. It also contains the main steam, safety, relief and isolation valves, and associated piping.

5.7.2 Combustibles

The combustible exposing safety-related systems is primarily electrical cable insulation. Piping for hydrogen and propane also pass through the portion of this area containing safety-related cable tray runs. Other

combustibles in the area include ordinary combustibles such as wood, paper, cloth and similar materials in the supply rooms and personnel areas.

5.7.3 Consequences if No Fire Suppression

It is unlikely that an unsuppressed fire would involve redundant safe shutdown related electrical cables in the area due to the wide physical separation. An unmitigated fire could do extensive damage to one division of safety-related cables.

5.7.4 Fire Protection Systems

Smoke detectors are provided in the cable run area which contains redundant safety-related cables, and in the personnel areas. Manual fire hose capability is provided to reach all portions of the area and portable extinguishers are also available. Automatic wet pipe sprinklers are provided in the working material supply area.

5.7.5 Adequacy of Fire Protection

Although there is generally good separation between the electrical cables of redundant trains, conduit from one train could be exposed to a fire in a cable tray of the opposite train. A fire involving a hydrogen or propane leak could expose redundant electrical cables. The cable run area has limited access, which could make manual fire suppression difficult, and allows involvement of redundant safety systems, some of which may be required for safe shutdown. The existing wet pipe system in the working materials supply area may not promptly detect and suppress a fire in this area.

5.7.6 Modifications and Recommendations

The licensee has proposed to install wet pipe automatic sprinklers in the cable run area and to convert the existing wet pipe sprinklers in the working material storage area to an automatic deluge system. Subject to implementation of the modifications described above, we find that fire protection for this area satisfies the objectives detailed in Section 2.2 of this report and is, therefore, acceptable.

5.8 Relay Room

5.8.1 Safety-Related Equipment

This area (fire area Ax-30) contains control and instrumentation cabling of redundant safety divisions in open cable trays, including cabling associated with safe shutdown equipment. The area also contains a large number of cabinets containing electrical equipment.

5.8.2 Combustibles

The significant combustible in this area is a large quantity of electrical cable insulation stacked in open cable trays several trays deep.

5.8.3 Consequences if No Fire Suppression

An unmitigated fire in this area could affect redundant divisions of safe shutdown equipment and cause the loss of control of these components from the control room. The loss of this area would not preclude safe plant shutdown, since a capability to safely shut down the plant exists independent of this area to attain hot shutdown and to proceed to cold shutdown by manual operation of valves and manual actuation of breakers to provide power to operate pumps; however, availability of required instrumentation for safe shutdown is still under review. See Section 4.10 for further discussion of the alternate capability to shut down.

5.8.4 Fire Protection Systems

Fire detection for this area is provided by smoke detectors. These detectors provide alarm in the adjacent control room from which rapid response to extinguish a fire can be taken. Fire suppression is provided by the CO_2 hose reels, and by water and CO_2 portable extinguisher units. Hose stations in adjacent areas are also accessible to the area.

5.8.5 Adequacy of Fire Protection

Fire protection is adequate to detect and suppress most fires that could occur in this area. Should a fire become large enough to damage redundant cables in this area despite the protection provided, safe shutdown capability would still be available independent of damage in this area. Safe shutdown may be hampered by the loss of certain safe shutdown instrumentation; the availability of required instrumentation for safe shutdown is still under review.

5.8.6 Modifications and Recommendations

The licensee has proposed to provide a fixed manually actuated CO_2 system to provide additional suppression capability. The licensee has provided the results of an analysis to show how safe shutdown would be achieved and maintained without instrumentation or other circuits that may be damaged as a result of a major relay room fire. We are reviewing the results of this analysis. We will address resolution of the required protection for safe shutdown instrumentation and the adequacy of relay room fire protection in a supplement to this report.

5.9 Special Ventilation Rooms

5.9.1 Safety-Related Equipment

This (fire area Ax-23) area consists of several rooms and open areas on different levels which are collectively considered to be one large fire area. The area contains the equipment and associated cables for residual heat removal pumps, refueling water storage tank, boric acid tanks, boric acid transfer pumps, residual heat removal system heat exchangers, component cooling water system heat exchangers, and charging pumps. Various other safety-related equipment not required for safe shutdown is also located in this area.

5.9.2 Combustibles

The significant combustibles in this area are a moderate amount of cable insulation in open cable trays and a small amount of lube oil in pumps. Cable tray loading is very light in most portions of this area, although there are some multi-level trays. Approximately one-half of the cable in this area is in rigid or flexible conduit.

5.9.3 Consequences if No Fire Suppression

An unmitigated fire in this area would not cause loss of redundant equipment due to the light loading of combustibles and the physical separation of equipment and cables.

5.9.4 Fire Protection Systems

Fire detection for portions of the area is provided by smoke detectors which alarm in the control room. Fire extinguishing means are provided by water and CO_2 hose stations backed up by a large number of portable water and CO_2 extinguishers.

5.9.5 Adequacy of Fire Protection

Smoke detection for this area is inadequate in that the basement level of the area which contains safety-related cables for safe shutdown is not provided with smoke detectors. A fire could therefore progress for an extended period before action is taken to suppress the fire. Manual fire suppression is adequate to control and suppress fires, and to prevent the loss of safe shutdown capability due to the wide separation between redundant equipment and cables related to safe shutdown.

5.9.6 Modifications and Recommendations

The licensee has proposed to install smoke detectors to detect fires in safety-related areas at the lower level of this fire area. We find that, subject to implementation of this modification, fire protection for this area satisfies the objectives of Section 2.2 of this report and is, therefore, acceptable.

5.10 Air Compressor and Pump Rooms

5.10.1 Safety-Related Equipment

Safety-related equipment for safe shutdown in this area (fire area TU-95) consists of two redundant electric-driven and one steam-driven auxiliary feedwater pump, only one of which is necessary for safe shutdown. The steam-driven feedwater pump is in a separate concrete enclosure from the rest of the area. Other safety-related equipment which may be used for safe shutdown includes both of the 4160/480 volt transformers, the auxiliary feedwater panel, and 480 volt switchgear. Additionally, the instrument air compressors are located in the area, but these are not required for safe shutdown.

5.10.2 Combustibles

The significant combustibles in this area consist of a moderate amount of electrical insulation on cables and in transformers and switchgear. Cable trays are four deep with a light loading of cables in each tray. Other combustibles consist of a small to moderate amount of lube oil in each of the pumps.

5.10.3 Consequences if No Fire Suppression

An unmitigated fire in the cable or oil in the area may cause loss of safe shutdown equipment within one safety division, but would not cause loss of safe shutdown capability due to the relatively light loading of combustibles and the physical separation of components and cables. Redundant cables in trays are separated by a horizontal distance of approximately 12 feet and are greater than 10 feet above the floor. In addition, the steam-driven auxiliary feedwater pump is in a separate concrete enclosure with access to the room from either side.

5.10.4 Fire Protection Systems

Fire detection is provided by smoke detectors. Fire extinguishing means are provided by water and CO_2 hose stations inside the area and water hose stations outside the area, backed up by portable extinguishers. The area is passively protected from adjacent hazards by three-hour rated fire barriers.

5.10.5 Adequacy of Fire Protection

Fire detection for the area is inadequate in that detection is not provided in the steam-driven auxiliary pump room. The fire suppression provided is adequate to extinguish fires and prevent the involvement of redundant safe shutdown equipment and cables.

5.10.6 Modifications and Recommendations

The licensee has proposed to add smoke detectors in the steam-driven auxiliary pump room to provide prompt detection capability.

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

5.11 Diesel Generator and Diesel Day Tank Rooms

5.11.1 Safety-Related Equipment

Each of the two redundant diesel generator rooms contains one emergency diesel generator unit along with the cabling, controls, and 4160 volt switchgear associated with that division of safety equipment. Each day tank is located in a separate room within the associated diesel generator room. One of the two diesel generators, other associated equipment, and certain 4160 volt switchgear are necessary to achieve cold shutdown in the

event of a loss of normal AC power. (Fire areas TU-90, TU-91, TU-92, and TU-93).

5.11.2 Combustibles

The significant combustibles in these areas are lube oil, diesel fuel and electrical cable insulation. The diesel fuel is contained within tanks in each of the day tank rooms.

5.11.3 Consequences if No Fire Suppression

An unsuppressed fire in either diesel generator room could cause the loss of one diesel generator and its associated switchgear. This would not cause loss of safe shutdown capability, since the fire would not affect the redundant diesel generator. Some redundant cables in conduit are located in these rooms. The licensee has determined that some of these cables are related to bus ties and status of possible power sources, but are designed such that a fire in either of these areas would not affect the redundant equipment. Portions of a fire barrier separating each room from the screenhouse corridor are only 1½-hour fire rated, such that an unmigitated fire in either diesel generator room may potentially affect cables in the screenhouse corridor which include power cables for redundant service water pumps.

5.11.4 Fire Protection Systems

Each diesel generator room and day tank room is protected by an automatic total flooding CO_2 system actuated by heat detectors. Infra-red flame detectors are also provided for the detection of incipient fires. One of the diesel rooms has a trench to contain oil spills so that oil is confined to the room; the other room is not drained.

Backup fire extinguishing means are provided by hose stations and portable extinguishers in adjacent areas accessible to the diesel generator and day tank rooms.

5.11.5 Adequacy of Fire Protection

Fire protection is adequate to detect and extinguish fires characteristic of these areas. However, one of the diesel generator rooms does not have curbs or trenches to prevent oil from seeping under doors into adjacent safety-related areas. Though unlikely, this could affect cables for redundant service water pumps located in the adjacent corridor to the screenhouse. Required protection for the electrical cables in the screenhouse corridor to protect from diesel generator room exposure fires is discussed in Section 5.15.6.

5.11.6 Modifications and Recommendations

The licensee has proposed to install curbs in the one diesel generator room which has no oil containment capability to prevent oil from seeping into other safety-related areas in case of a spill.

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

5.12 Battery Rooms

5.12.1 Safety-Related Equipment

Each of the two redundant batteries is located within its own room (fire areas TU-97 and TU-98). Each room contains, in addition to the battery, the DC distribution cabinets and cabling associated with that battery. One battery is required to supply power to some equipment normally operated to achieve safe shutdown.

5.12.2 Combustibles

The significant combustibles in each room consist of plastic battery cases and electrical cable insulation.

5.12.3 Consequences if No Fire Suppression

An unsuppressed fire in one of the battery rooms could affect the other battery room equipment or cables, due to an opening in the wall and a duct without a fire damper between the rooms. This would cause the loss of capability to control some devices required for shutdown from the control room; however, manual action would still be available to achieve safe shutdown.

5.12.4 Fire Protection Systems

Smoke detection is provided in each area. Water and CO_2 hose stations as well as portable extinguishers are provided in adjacent areas to extinguish fires. These extinguishing means are within easy access of these rooms.

5.12.5 Adequacy of Fire Protection

Fire protection is adequate to detect and extinguish fires in these rooms and to prevent the loss of both batteries. However, due to the opening between the rooms, there is a possibility, although unlikely, that a fire might pass between the rooms. Adequate battery room ventilation flow is provided to preclude hydrogen buildup. However, loss of ventilation air flow is not detected, which may allow hydrogen buildup to occur undetected resulting in a possible explosion hazard.

5.12.6 Modifications and Recommendations

The licensee has proposed to seal the opening and provide a damper in the duct between the battery rooms to prevent a fire from passing between the rooms, and to provide detection of the loss of battery room ventilation flow.

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

5.13 Turbine Room

5.13.1 Safety-Related Equipment

Several safety-related areas are contained within the turbine building; however, after modifications, these will be separated from the turbine room by three-hour fire rated barriers. These safety-related areas are discussed in other sections of this report and include the air compressor and pump rooms (5.10), diesel generator rooms (5.11), battery rooms (5.12), and CO_2 tank room (5.14). The turbine room, however, contains no safety-related equipment or cabling (fire area TU-22).

5.13.2 Combustibles

The significant combustibles in the turbine room include electrical cable insulation, hydrogen seal oil, hydrogen, main feedwater pump lube oil, and turbine lube oil. The turbine lube oil is the largest hazard, with oil contained in reservoirs, tanks, piping, and coolers.

5.13.3 Consequences if No Fire Suppression

With the present fire barriers (see Section 4.9), an unmitigated turbine room fire may cause loss of safe shutdown equipment in adjacent areas, and potentially the capability to achieve safe shutdown. If damage can be limited to the turbine room, safe shutdown capability would not be affected.

5.13.4 Fire Protection Systems

Portable extinguishers and manual hose stations are provided at all three elevations of the turbine room. Automatic water spray systems are provided for the turbine oil storage tank, turbine oil reservoir, and hydrogen seal oil unit. Wet pipe water sprinkler systems are provided for coverage of the turbine building basement and the turbine oil piping. A carbon dioxide system is provided for the turbine generator bearings and turbine head enclosure. The turbine oil storage tank is contained in its own enclosure, and the turbine oil reservoir and conditioner are contained in a diked area. The lube oil piping is guarded with the high pressure supply line contained within the return line.

5.13.5 Adequacy of Fire Protection

The protection provided is adequate to control and suppress lube oil fires or cable insulation fires and prevent involvement of safe shutdown equipment.

5.13.6 Modifications and Recommendations

The licensee has proposed to upgrade fire barriers separating the turbine room from safety-related areas. Openings will be sealed and doors will be replaced with three-hour fire rated doors and frames.

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

5.14 Carbon Dioxide Tank Room

5.14.1 Safety-Related Equipment

This room (fire area TU-94) contains electrical cables on trays and an instrument air compressor, both associated with only one safety train. The room is separated from the turbine building by a substantial wall; however, this wall has certain unprotected openings.

5.14.2 Combustibles

The primary combustible in this area is electrical cable insulation.

5.14.3 Consequences if No Fire Suppression

An unsuppressed fire could damage safety-related electrical cables and the instrument air compressor for one safety train. The carbon dioxide fire suppression system protecting the diesel generator rooms as well as several nonsafety-related areas could also be rendered inoperative.

5.14.4 Fire Protection System

No automatic fire detection or suppression is provided in this room. Manual fire hoses and portable extinguishers are available.

5.14.5 Adequacy of Fire Protection

Without automatic detection, a fire could cause considerable damage to safety-related cable and equipment, and to the carbon dioxide fire suppression system before discovery. With prompt detection, manual fire suppression would be adequate to prevent major damage.

5.14.6 Modifications and Recommendations

The licensee has proposed to upgrade the fire barrier between this room and the adjacent turbine building. In addition, the licensee has proposed to provide automatic fire detection in the room. We find that, subject to implementation of the above modifications, fire protection for the carbon dioxide tank room satisfies the objectives detailed in Section 2.2 of this report and is, therefore, acceptable.

5.15 Screen House

5.15.1 Safety-Related Equipment

Safety-related equipment in this area (fire area SC-70)includes four service water pumps, two in each safety division, and associated piping, valves and cabling. This equipment may be required for safe shutdown to provide: an alternate source of water to the auxiliary feedwater pumps; diesel generator cooling; cooling to the RHR heat exchangers; and water for auxiliary building and reactor building hose stations. Only one of the two pumps in either safety division would be required to supply water demands and cooling loads for safe shutdown in a fire situation. The area also contains the two fire pumps.

5.15.2 Combustibles

Combustibles in the area include a light amount of electrical cable insulation, about 6 gallons of lube oil in each of the four service water pumps, and approximately 50 gallons of lube oil in each of the two circulating water pumps.

5.15.3 Consequences if No Fire Suppression

An unsuppressed cable fire would not affect the redundant division cables due to the wide spatial separation and lack of intervening combustibles, and thus safe shutdown capability would not be affected.

An unsuppressed circulating water pump lube oil fire would be contained in the circulating water pump torus or the sump. The licensee has evaluated the potential effects of such a fire on the service water pumps, and found that redundant pumps would not be affected. The staff has reviewed this evaluation and found it acceptable.

As noted in Section 5.11, a diesel generator room fire could potentially expose and damage cables for redundant service water pumps in the corridor to the screenhouse.

5.15.4 Fire Protection Systems

Fire detection is provided by smoke detectors. Fire suppression capability is provided by portable extinguishers and manual hose stations in the area. The screenhouse, including the corridor, is a single fire area enclosed by fire barriers.

5.15.5 Adequacy of Fire Protection

Adequate detector coverage is provided in all locations of the screenhouse with the exception of the corridor where no detectors are located. Manual fire suppression would adequately control fires that may occur. The fire barriers between the screenhouse corridor and the diesel generator rooms are 1½ hour fire rated due to the 1½ hour rated doors and dampers. This does not provide adequate separation between the diesel generator rooms and redundant service water pump power cables in the corridor.

5.15.6 Modifications and Recommendations

The licensee has proposed to provide fire detectors in the hallway to the screenhouse. In addition, the licensee has proposed to provide automatic sprinklers over the electrical cables in the corridor. We find that, subject to implementation of these modifications, fire protection for the screenhouse conforms to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable.

5.16 Yard Area

5.16.1 Safety-Related Equipment

The yard area contains the redundant buried fuel tanks for the emergency generators.

5.16.2 Combustibles

The combustibles which were considered for their potential to expose safety-related systems include oil-filled transformers and underground diesel fuel tanks for the emergency generators (35,000 gallons each) and the building heat boiler (30,000 gallons).

5.16.3 Consequences if No Fire Suppression

An unsuppressed fire in the yard area would not present a significant exposure to safety-related systems because of intervening distance or barriers.

5.16.4 Fire Protection Systems

The oil-filled transformers adjacent to the turbine building are separated from the building and from each other by fire barriers, and each transformer is protected by an automatic water spray system. Yard hydrants and hose are available for manual fire fighting in the yard area.

5.16.5 Adequacy of Fire Protection

The fire barriers and automatic water spray systems on oil-filled transformers would confine fire damage to one transformer, precluding any damage to safety-related systems. Manual suppression would be adequate to control other yard area fires; however, use of certain yard fire fighting equipment may be impeded due to the roadway interfering with the opening of the doors on one hose house, lack of adequate hose lengths in the hose house, and the potential for damage to one hydrant and post-indicator valve from vehicle traffic.

5.16.6 Modifications and Recommendations

The licensee has proposed to provide a hose cart with additional fire hose in the yard area, raise one hose house so that the door can be easily opened, and install a guard on one hydrant and one post-indicator valve to prevent vehicle damage.

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

6.0 ADMINISTRATIVE CONTROLS

The administrative controls for fire protection consists of the fire protection organization, the qualifications and training for fire protection personnel, the controls to be exercised over combustibles and ignition sources, plans and procedures for fighting fires in the various plant areas, and the quality assurance provisions for fire protection. The licensee has provided a detailed description of proposed administrative controls. Plans and procedures stipulating the management and staff organization and its qualifications; the fire brigade training program; controls over combustibles and ignition sources; and the pre-fire plans for fighting fires are being revised or developed, and implemented. The program and its implementing procedures as provided by letter from the licensee dated May 15, 1978, and as supplemented by letter dated August 4, 1978, are found acceptable by the staff, except as noted below, using items referenced in Sections 1.0(e) and 1.0(f).

We have evaluated the areas at Kewaunee to determine the minimum required fire brigade size to cope with fires that may occur, and have determined that a five man brigade is required. The licensee has proposed a three man fire brigade to be available on site during all shifts, along with two additional support personnel who have some fire fighting training. We are continuing to evaluate the adequacy of the training for the support personnel to determine whether they may be considered members of the fire brigade. We find that the training provided the three brigade members is satisfactory.

We find that, subject to implementation of the above described programmatic changes, and resolution of the size of the fully trained fire brigade the fire protection program satisfies the objectives identified in Section 2.2 of this report. We will address the adequacy of the fire brigade size in a supplement to this report.

7.0 TECHNICAL SPECIFICATIONS

The Technical Specifications have been issued 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.

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 relted 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 Kewaunee 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 continue safe operation of the facility, while the remaining items are completed.

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

> "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 urgent 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 recognize that the "Risk Assessment Review Group Report to the U.S. Nuclear Regulatory Commission" NUREG/CR-0400 (The Lewis Committee Report) states that this Review Group is unconvinced of the correctness of the WASH-1400 conclusion that fires contribute negligibly to the overall risk of nuclear plant operation.

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

We have determined that the license amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and pursuant to 10 CFR Section 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

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 this report. Their report, "Fire Protection in Operating Nuclear Power Stations - Kewaunee Nuclear Power Plant" (letter, R. E. Hall to R. L. Ferguson, dated August 1978), discusses several matters which have been addressed in this report. Those elements of the consultants' recommendations which the consultants believe we have not adopted are identified in Appendix B along with our bases therefor.

APPENDIX A

CHRONOLOGY

February 1976	Issuance of NUREG-0050, "Recommendations Related to the Browns Ferry Fire," NRC Special Group.
May 1, 1976	Issuance of Standard Review Plan 9.5.1, "Fire Protection."
September 30, 1976	Letter to licensee requesting submittal of a detailed fire hazards analysis.
May 2, 1977	Letter from licensee forwarding "Fire Protection Program Analysis."
August 19, 1977	Letter to licensee forwarding "Nuclear Plant Fire Protection Functional Responsibility Administrative Controls and Quality Assurance."
February 14, 1978	Letter to licensee requesting that fire protection review be conducted in accordance with guidelines forwarded by August 19, 1977 letter.
March 13, 1978	Letter to licensee requesting additional information resulting from staff review of licensees' May 2, 1977 submittal.
March 28-31, 1978	NRC fire protection review team visit to Kewaunee Nuclear Power Plant.
April 26, 1978	Letter to licensee requesting additional information resulting from fire protection review team's site visit.
May 15, 1978	Letter from licensee responding to staff's letter of February 14, 1978 regarding conformance with fire protection guidelines.
May 26, 1978	Letter from licensee regarding fire protection technical specifications.
May 26, 1978	Letter from licensee forwarding responses to requests for additional information and staff positions dated March 13, 1978 and April 26, 1978.
July 7, 1978	Letter from licensee regarding minimum fire brigade size.

July 10, 1978	Letter to licensee requesting additional information regarding licensee's responses to questions and positions in letters dated May 15 and May 26, 1978.
July 28, 1978	Letter from licensee responding to staff questions/ positions forwarded by letter dated July 10, 1978.
August 4, 1978	Letter from licensee responding to staff positions on administrative controls stated in letter dated July 10, 1978.
September 28-29, 1978	Meeting in Bethesda, Maryland, between NRC staff and licensee representatives to discuss incomplete items.
October 6, 1978	Letter to licensee requesting further detail on certain proposed modifications, and forwarding a further staff position.
October 25, 1978	Letter from licensee responding to staff questions/ positions forwarded by letter dated October 6, 1978.

APPENDIX B

DISCUSSION OF CONSULTANTS' REPORT

Under Contract to the 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 - Kewaunee," dated August 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. Consultant's Comment: Control Valves

   SER Item 4.3.1.3 indicates that the position of fire protection system valves will be controlled by locks or seals with periodic inspection. 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 systems piping will not damage safety-related equipment due to curbs, drains, mounting of equipment above floor level, grating, and doorways. To date, the staff has not found any data that indicates that electrical valve supervision will significantly improve the availability of fire suppression systems in nuclear power plants.

2. Consultant's Comment: Smoke Removal

   SER Item 4.4.1 indicates that portable fans and ducts will be accepted as a means for removing smoke from many plant areas. Fires in electrical insulation can generate copious amounts of dense smoke which

can hamper manual 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.

At this time, BNL and the majority of its fire protection consultants agree that in those areas without engineered fixed smoke removal systems, the optimum generic recommendation is to have available portable fans and ducts. This will allow for diversified applications in numerous fire situations. The uncertainties introduced by this approach of ventilation to respond to all fire scenarios also exists in an engineered fixed system. Mr. L. P. Herman concludes that 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, therefore, recommended, based on Mr. L. P. Herman's concern, 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 on such equipment, smoke removal is not generally initiated until the room atmosphere is cooled sufficiently, by fixed sprinkler operation or manual hose fogging to permit entry by fire fighting personnel. 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. Our manual fire fighting consultant has made his evaluation of the fire fighting capability of this plant and has recommended use of the portable smoke exhaust systems. The licensee has agreed to provide qualified smoke ejectors and associated flexible ductwork. The licensee has also proposed to develop prefire plans which will include the proper use of ventilation equipment in each plant area of concern.

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 are evaluated based on the need for immediate access into an area and the limitations imposed by the currently available portable smoke removal units. These concerns are evaluated on an area basis at each plant with due consideration of the advice of the manual fire fighting consultants.

3. Consultants' Comment: Turbine Building

SER Item 5-16 concludes that fire protection in the turbine building is acceptable. However, Mr. L. P. Herman, consultant to BNL, concludes that the licensee'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 relay room, our conclusions are based on the effects of fire with automatic and manual suppression systems. We, therefore, have allowed the licensee to evaluate the effects of fires in the turbine building using the defense in depth approach, rather than assuming that the automatic suppression systems as well as the manual suppression backup capability both fail.

We have determined that the oil hazards in the turbine building are protected as follows: automatic water spray systems are provided for the turbine oil storage tank, turbine oil reservoir, and hydrogen seal oil unit; wet pipe water sprinkler systems are provided for coverage of the turbine building basement and the turbine oil piping; a carbon dioxide system is provided for the turbine generator bearings and turbine head enclosure; the turbine oil storage tank is contained in its own enclosure; the turbine oil reservoir and conditioner are contained in a diked area; and, the lube oil piping is guarded with the high pressure supply line contained within the return line. 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.

4. Consultant's Comment: Portable Smoke Removal Equipment - SER 3.1.11

No acceptable minimum requirement is observed. Suggest since Kewaunee has two fans, a minimum of two smoke ejectors of about 5000 cfm with portable ducting be required. Rationale: Two units of the same size can be used in series with one size duct to achieve better directional control of exhaust.

Staff Response

The staff took a position during the site visit which exceeded the above recommendation as suggested by Mr. Riopelle. In response to the staff's position, the licensee committed to obtain three portable smoke exhausters with a combined capacity of 15,000 cfm and to provide associated portable duct work. This commitment was provided in the Wisconsin Public Service Corporation letter of May 26, 1978 to the NRC. We consider this item to be acceptably resolved and not to be an item of differing engineering judgment as identified above by BNL.

5. Consultant's Comment: Hose Cart - SER 3.1.13

In addition to the 1-1/2" and 2-1/2" fire hose the cart should be equipped with 1 - 1-1/2" adjustable hose nozzle, 1 - 2-1/2" adjustable hose nozzle, 1 - 1-1/2" electric spray nozzle, 1 - 2-1/2" x 1-1/2" x 1-1/2" gated wye.

Staff Response

The licensee has already committed to provide a hose cart with 200 feet of 2-1/2 inch fire hose and 200 feet of 1-1/2 inch fire hose. This was offered to the licensee as an alternative to providing additional hose in each hose house. This option was recommended by Mr. Riopelle at the site visit. Neither at the site visit nor in his consultant's report of April 20, 1978 did Mr. Riopelle call for hose nozzles and a gated "wye" to also be provided on the hose cart. Since this equipment is already provided in the hose houses and the purpose of the hose cart was only to resolve a deficiency in the quantity of fire hose in each hose house, we believe it is unnecessary to also provide this equipment on the hose cart.

6. Consultant's Comment: Breathing Equipment - SER 4.4.3

The BNL consultant (James H. Riopelle) recommended 10 additional 2200 psi air mask bottles be provided (see paragraph 9.a, JHR Report), and that KNPP acquire a system to recharge emergency breathing air bottles for Plant personnel (see paragraph 9.b, JHR Report). Rationale: The local serving (contract) offsite fire department (KFD) does not have a sufficient breathing air capability for a long fire: the KFD

obtains its air from a local vendor in Sturgeon Bay, Wisconsin, a great distance from the KNPP site (see paragraph 4, page 7 of JHR Report).

Staff Response

The staff took the position as identified above. On May 26, 1978 in a letter from E. W. James of Wisconsin Public Service Corporation to the NRC, the licensee committed to this position and indicated that at that time they had the required emergency breathing air capability (i.e., 10 breathing air masks, two spare bottles each, and an additional six-hour recharge capability). We consider this item to be acceptably resolved and that it does not reflect a differing engineering point of view from our consultant as identified above by BNL.

7. Consultant's Comment: Air Compressor and Pump Rooms

The air compressor and pump rooms described in Section 5.10 of the SER draft contain in one fire area (TU-95) the redundant emergency 480 V AC power supplies, the two electric motor-driven auxiliary feedwater pump. This fire area is not protected by any automatic fire suppression systems. When proposed modifications are completed, the room containing the steam-driven pump will be acceptably cut off by fire barriers from the rest of the area. However, it will still be necessary to pass through TU-95 to enter the steam-driven pump room.

It is my understanding that if all of the electrical equipment in TU-95 were damaged by fire, the steam-driven auxiliary feedwater pump would be needed to shut the plant down safely, and that it would be necessary to manually operate valves at the steam-driven pump to place it in service.

I am in basic agreement with the NRC evaluation that the fire loading from electrical cables and lubricants in TU-95 is relatively light. However, the TU-95 area communicates through fire doors with the turbine room lube oil area on one side and diesel generator room on the other, each of which are potentially severe fire exposures. There is also the remote possibility that transient combustibles could be brought into the TU-95 area.

In my opinion, the critical relationships between the safe shutdown systems involved requires a highly conservative approach to protecting this area. Therefore, I recommend that a fire barrier be installed above the steam-driven pump room so that the two entrances to the room are located in separate fire areas. This will provide access to the steam-driven pump even if a significant fire should occur in TU-95. An alternative to this recommendation would be to provide safe shutdown capability which is totally independent of the TU-95 area.

Staff Response

The concern, as stated by the consultant, is that the turbine building and one of the diesel generator rooms are located adjacent to the subject area and that doors communicating between these might fail due to a large fire in either the turbine building or the diesel generator room.

The hazards located in the adjacent turbine building and the diesel generator areas are well protected by automatic and manual fire suppression systems as discussed in Sections 5.10 and 5.12 of this report. In addition, to provide another level of protection between these areas, the walls and any doors have a three-hour fire rating as recommended by BTP 9.5-1, Appendix "A." The purpose of a wall of such rating is to assure that a fire, such as an oil fire, could burn for an extended period without failure or propagation of fire through the wall; fires in these areas would, of course, be mitigated by the installed suppression systems. The staff, therefore, does not consider failure of the fire barrier to be an event that must be designed for. The guidelines of Appendix A to BTP 9.5-1 do not require that failures of three-hour fire-rated barriers be postulated.

The consultant has also expressed a concern for access to the steam-driven auxiliary feedwater pump which is enclosed in a room within the subject area, should a fire cause loss of all other equipment in these rooms. Although the staff does not consider such an event to be credible, due to the light combustible loading and the wide separation between redundant cables in the area, it should be noted that the consultant did not identify measures that would be available to allow access to the steam-driven pump room. Due to the availability of an access point from either side of the steam-driven pump room, it is highly unlikely that access to this room would be prevented during a fire in the surrounding area. However, in the unlikely event breathing may be a problem due to smoke buildup, emergency self-contained breathing apparatus is available for use by the operators to gain access to operate the pump. Only a limited period of time would be required to operate valves which would place the auxiliary feedwater pump into operation. Ventilation systems are also provided as well as portable smoke removal equipment to remove smoke.

The staff deems that adequate protection will be provided to assure availability of auxiliary feedwater for fires in the air compressor and pump rooms or in adjacent areas, and that the wall recommended by the consultant is unwarranted.

8. Consultant's Comment: Screen House Hallway

The hallway between the screen house and the diesel generator rooms described in Section 5.15 of the SER draft contains power cables in overhead electrical trays for the four service water pumps. At least one service water pump is required for safe shutdown.

The cable trays are well separated into two redundant divisions and are lightly loaded; there appears to be little potential that a fire in the combustibles present could cause loss of all four pumps.

Nevertheless, consideration should be given to the exposure presented by the diesel generator rooms which communicate with this hallway through 1-1/2-hour fire doors and dampers. The diesel generator rooms are protected by a carbon dioxide fire suppression system which could be rendered ineffective if one of the hallway doors or dampers were not closed properly at the time of discharge. Such an open door or damper would also expose the service water pump electrical cables to fire damage.

In my judgment, it is prudent to install automatic sprinklers in this hallway to protect the service water pump electrical cables from such a fire exposure.

Staff Response

The staff recognizes the inadequacy of the fire doors and dampers in the walls separating the diesel generator rooms from the hallway as noted by the consultant. To correct this deficiency, the staff took the position that these doors and dampers, or that a sprinkler system be installed over the cables in the corridor as recommended by the recommended by the consultant.

Subsequently, by letter dated October 25, 1978, the licensee proposed to install a sprinkler system in the hallway of the screenhouse to provide the required protection. Therefore, this item has been resolved to the satisfaction of the staff and meets the recommendation of the consultant identified above.

7590-01

UNITED STATES NUCLEAR REGULATORY COMMISSION

DOCKET NO. 50-305

WISCONSIN PUBLIC SERVICE CORPORATION

WISCONSIN POWER AND LIGHT COMPANY

MADISON GAS AND ELECTRIC COMPANY

NOTICE OF ISSUANCE OF AMENDMENT TO FACILITY OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 23 to Facility Operating License No. DPR-43 issued to Wisconsin Public Service Corporation, Wisconsin Power and Light Company, and Madison Gas and Electric Company which revises Technical Specifications for operation of the Kewaunee Nuclear Power Plant located in Kewaunee, Wisconsin. The amendment is effective as of the date of issuance.

The amendment adds a license condition relating to the completion of facility modifications for fire protection. 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 licensee's submittals dated May 2, 1977, as supplemented by letters dated May 15, 1978, May 26, 1978, July 7, 1978, July 28, 1978, August 4, 1978 and October 25, 1978, (2) Amendment No. 23 to Facility Operating License No. DPR-43, 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, NW, Washington, D. C. 20555, and at the Kewaunee Public Library, 314 Milwaukee Street, Kewaunee, Wisconsin 54216. 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 12th day of December, 1978.

FOR THE NUCLEAR REGULATORY COMMISSION

A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors