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NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION REPORT BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 33 TO LICENSE NO. DPR-67

FLORIDA POWER & LIGHT COMPANY

ST. LUCIE PLANT, UNIT NO. 1

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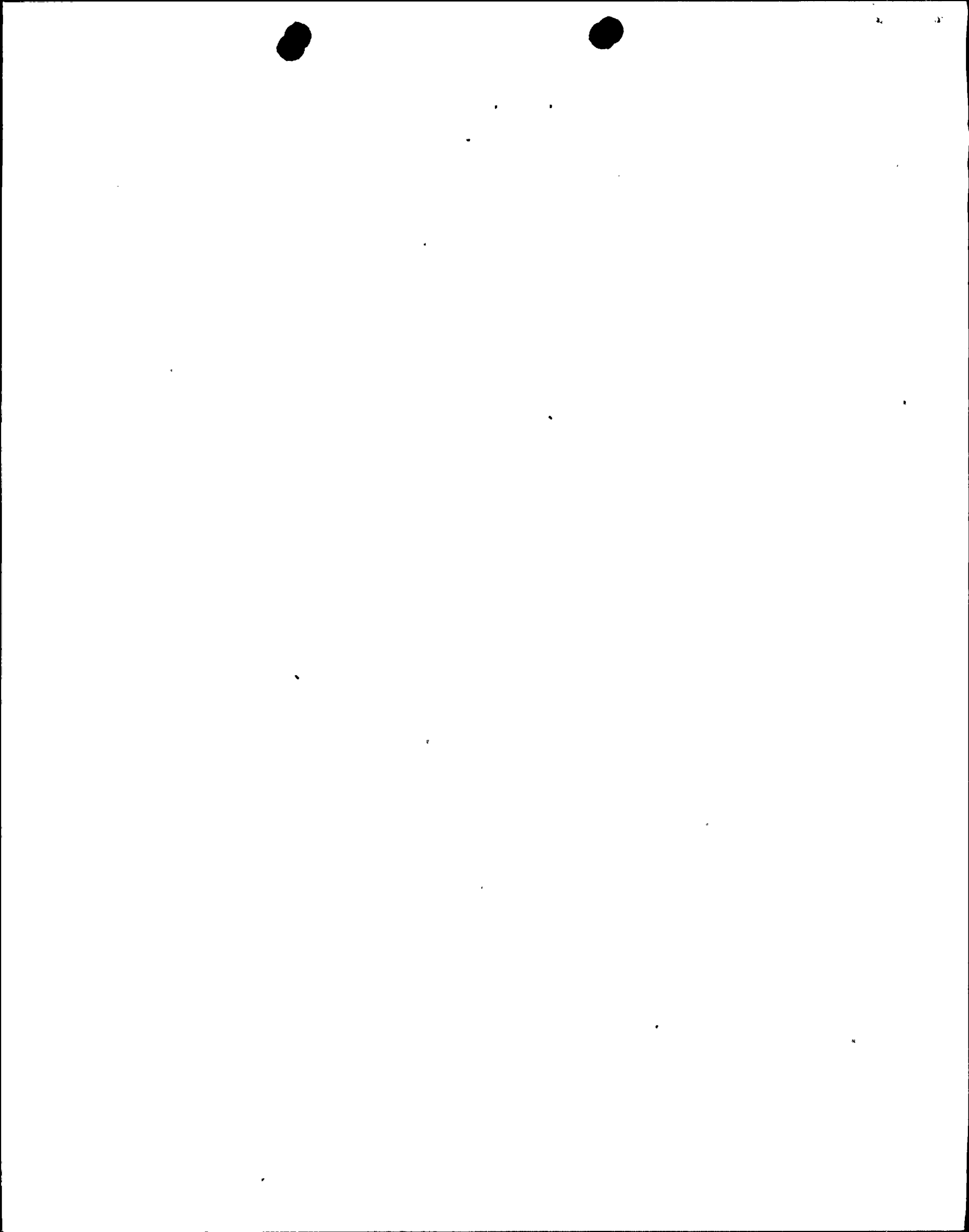
TABLE OF CONTENTS

	<u>PAGE</u>
1.0 Introduction	1-1
2.0 Fire Protection Guidelines	2-1
2.1 General Design Criterion 3 - Fire Protection	2-1
2.2 Supplementary Guidance	2-1
3.0 Summary of Modifications	3-1
3.1 Fire Pumps	3-1
3.1.1 Guard Posts	3-1
3.1.2 Valve Position Identification	3-1
3.1.3 Fire Pump Suction Piping	3-1
3.1.4 Upgrade Existing Fire Pumps	3-1
3.2 Fire Protection Water Piping System	3-2
3.2.1 Hydrant and PIV Guard Posts	3-2
3.2.2 Hydrant Protection	3-2
3.2.3 Isolation Valves	3-2
3.2.4 Additional Hydrant	3-2
3.2.5 Hydrant Hose Valves	3-2
3.3 Foam Equipment	3-2
3.4 Portable Smoke Ejectors	3-2
3.5 Air Breathing Equipment	3-2
3.6 Fire Door Evaluation	3-3
3.7 Ventilation Duct Penetrations	3-3
3.8 Control Room	3-3
3.8.1 Fire Extinguishers	3-3
3.8.2 Records Storage	3-3
3.8.3 Smoke Detectors	3-3
3.8.4 Fire Door	3-3
3.8.5 Fire Dampers	3-3
3.9 Cable Spreading Room - Fire Barrier	3-4

3.10	Switchgear Room	3-4
3.10.1	Storage Cabinets	3-4
3.10.2	Polyurethane Pipe Insulation	3-4
3.11	Battery Room Ventilation	3-4
3.12	Reactor Auxiliary Building	3-4
3.12.1	Fire Door Repairs	3-4
3.12.2	Ladders to Cable Tray Areas	3-4
3.12.3	Polyurethane Pipe Insulation	3-4
3.12.4	Cable Loft Conduit	3-4
3.12.5	Laundry/Decontamination Area Fire Door	3-5
3.12.6	Hydrogen Gas Piping Identification	3-5
3.12.7	Smoke Detectors	3-5
	(1) Low Pressure Safety Injection Pumps	
	(2) High Pressure Safety Injection Pumps	
	(3) Containment Spray Pumps	
3.12.8	Drumming Station Barrier	3-5
3.12.9	Anti-C Clothing Disposal Containers	3-5
3.13	Reactor Building	3-5
3.13.1	Tool Lockers	3-5
3.13.2	Reactor Coolant Pump Fire Detectors	3-5
3.13.3	Reactor Coolant Pump Oil Collection System	3-6
3.14	Diesel Generator Building	3-6
3.14.1	Curbs	3-6
3.14.2	Fire Door	3-6
3.14.3	Oil Vent Lines	3-6
3.14.4	Early Warning Detectors	3-6
3.14.5	Automatic Sprinkler System	3-6
3.14.6	Tank Dikes	3-6
3.15	Yard Area Curbs	3-7
	(1) Manholes	
	(2) Service Water Intake Structure	
4.0	Evaluation of Plant Arrangement	4-1
4.1	Safe Shutdown Systems	4-1
4.2	Fire Detection and Signaling System	4-1
4.3	Fire Control Systems	4-2
4.3.1	Water Systems	4-2

4.3.1.1	Water Supply	4-2
4.3.1.2	Fire Pumps	4-3
4.3.1.3	Fire Water Piping System	4-4
4.3.1.4	Interior Fire Hose Stations	4-6
4.3.1.5	Water Suppression Systems	4-7
4.3.1.6	Foam	4-8
4.3.1.7	Effects of Suppression Systems on Safety Systems	4-9
4.3.2	Gas Suppression Systems	4-9
4.3.3	Portable Fire Extinguishers	4-9
4.4	Ventilation Systems and Breathing Equipment	4-9
4.4.1	Ventilation Systems	4-9
4.4.2	Filters	4-10
4.4.3	Breathing Equipment	4-10
4.5	Floor Drains	4-10
4.6	Lighting Systems	4-11
4.7	Communication Systems	4-11
4.8	Electrical Cables	4-12
4.9	Fire Barrier Penetrations	4-12
4.9.1	Fire Doors	4-12
4.9.2	Ventilation Duct Penetrations	4-13
4.9.3	Electrical Cable Penetrations	4-14
4.10	Separation Criteria	4-14
4.11	Fire Barriers	4-15
4.12	Access and Egress	4-15
4.13	Toxic and Corrosive Combustion Products	4-16
4.14	Nonsafety Related Areas	4-16
4.15	Instrument Air	4-16
5.0	Evaluation of Specific Plant Areas	5-1
5.1	Control Room	5-1
5.2	Cable Spreading Room	5-2
5.3	Switchgear Room - 43 Foot Elevation	5-4
5.4	Switchgear Room - 19.5 Foot Elevation	5-5
5.5	Battery Rooms	5-6
5.6	Reactor Auxiliary Building - 62.00' Elevation	5-7
5.7	Reactor Auxiliary Building - 43.00' Elevation	5-9
5.8	Reactor Auxiliary Building - 19.50' Elevation	5-10
5.9	Reactor Auxiliary Building - (-) 0.50 Elevation	5-12
5.10	Containment Electrical Penetration Areas	5-14
5.11	Reactor Building	5-15
5.12	Auxiliary Feedwater Pump Area	5-16

5.13 Intake Structure - Service Water Pumps	5-18
5.14 Diesel Tank Generator Building and Fuel Oil Storage	5-19
5.15 Yard Area	5-21
5.16 Turbine Building	5-23
6.0 Administrative Controls	6-1
7.0 Technical Specifications	7-1
8.0 Conclusions	8-1
9.0 Consultant's Reports	9-1



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 fire 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.

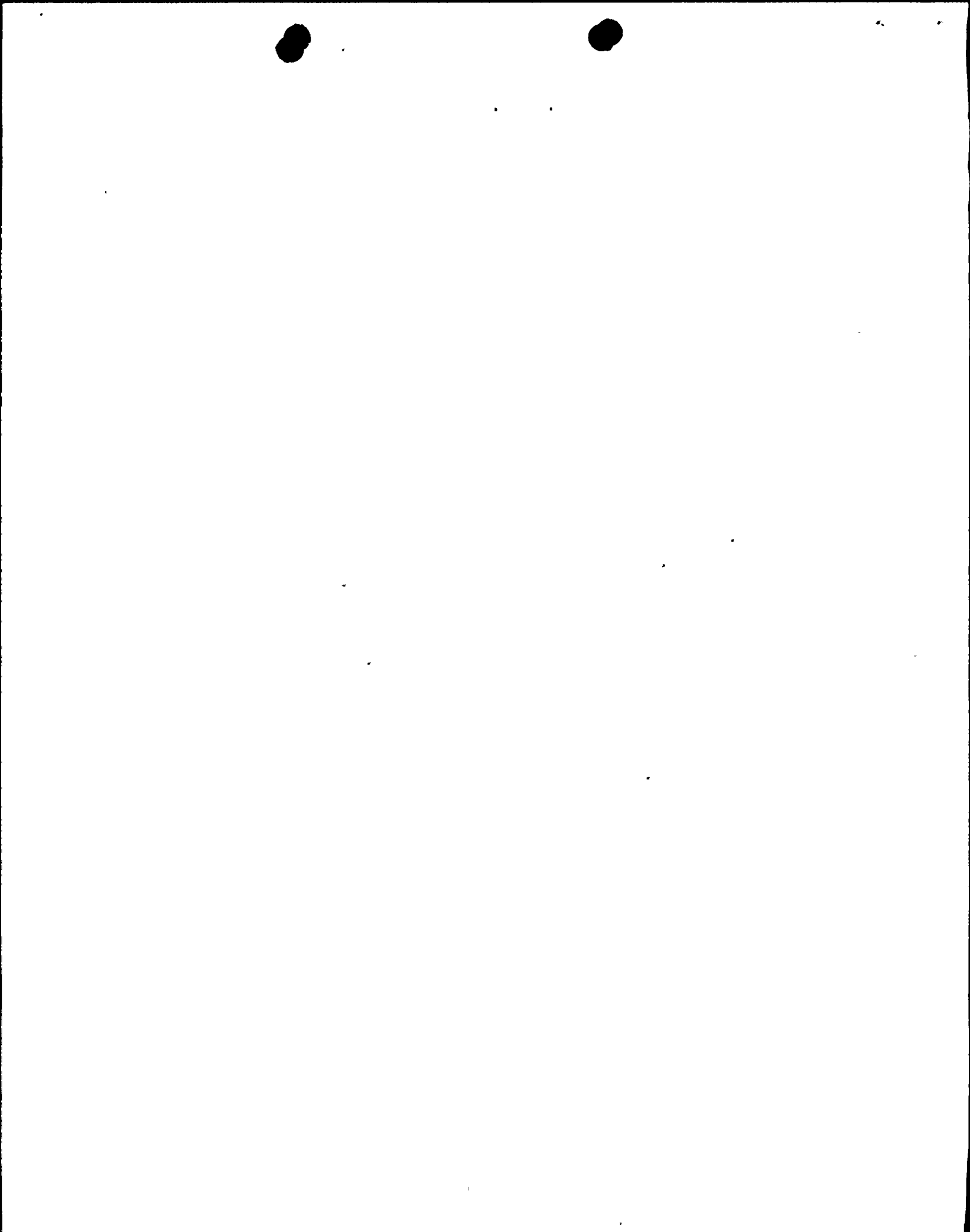
The NRC issued new guidelines for fire protection programs in nuclear power plants which reflect the recommendations in NUREG-0050. These guidelines are contained in the following documents:

- . "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 APCS 9.5.-1) May 1, 1976.
- . "Guidelines for Fire Protection for Nuclear Power Plants" (Appendix A to BTP APCS 9.5.-1), August 23, 1976.
- . "Supplementary Guidance on Information Needed for Fire Protection Program Evaluation", September 30, 1976.
- . "Sample Technical Specifications," May 12, 1977.
- . "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance," June 14, 1977.
- . "Manpower Requirements for Operating Reactors" June 5, 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 analysis and have visited the plant to examine the relationship of safety-related components, systems and structures with both combustibles and the associated fire detection and suppression systems. Our review has been limited to the aspects of fire protection within the NRC jurisdiction, i.e., those aspects 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 summarizes the results of our evaluation of the fire protection program at Florida Power and Light Company's St. Lucie Unit 1.



2.0 FIRE PROTECTION GUIDELINES

2.1 General Design Criterion 3 - "Fire Protection"

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

"Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fire and explosions."

"Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and the control room."

"Fire detection and protection systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components important to safety."

"Fire fighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components."

2.2 Supplementary Guidance

Guidance on the implementation of General Design Criterion 3 for existing nuclear power plants is provided in Appendix A of Branch Technical Position 9.5.-1, "Guidelines for Fire Protection for Nuclear Power Plants."

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

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

- (1) reduce the likelihood of occurrence of fires;
- (2) promptly detect and extinguish fires if they occur;
- (3) maintain the capability to safely shut down the plant if fire occurs; and

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

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

3.0 SUMMARY OF MODIFICATIONS

The licensee plans to make certain plant modifications to improve the fire protection program as a result of both his and the staff's evaluations. The proposed modifications are summarized below. The sections of this report, which discuss the modifications are noted in parenthesis following each item. The licensee will provide a schedule for all modifications. Certain items listed below are marked with an asterisk (*) to indicate that the NRC staff will require additional information in the form of design details, test results, or acceptance criteria to assure that the design is acceptable prior to implementation of these modifications. The balance of other modifications has been described in an acceptable level of detail.

3.1 Fire Pumps (4.3.1.2)

3.1.1 Guard Posts (4.3.1.2)

Guard posts will be provided to protect the fire pumps and ancillary equipment from vehicular damage.

3.1.2 Valve Position Identification (4.3.1.2)

Means will be provided for visual indication of the position of the valves controlling flow from the fire pumps.

3.1.3 Fire Pump Suction Piping (4.3.1.1)(4.3.1.2)

Capability will be provided to permit the fire pumps to take suction from either of the water storage tanks.

*3.1.4 Upgrade Existing Fire Pumps (4.3.1.2)

The existing fire pump installation will be upgraded as follows:

- (1) The existing two electric motor driven pumps will be modified to be capable to automatically operate upon loss of offsite power and to start upon drop of pressure in the distribution system; except under engineered safety features actuation signal (ESFAS) conditions.
- (2) A pressure switch arranged to start pump upon drop of pressure in the fire protection water system will be provided near the discharge piping from each fire pump.

(3) The stop devices for the fire pumps located in the control room will be removed.

3.2 Fire Protection Water Piping System (4.3.1.3)

3.2.1 Hydrant and PIV Guard Posts (4.3.1.3)

Guard posts will be provided to protect hydrant and control valve indicator posts which are subject to vehicular damage.

3.2.2 Hydrant Protection (4.3.1.3)

A means will be provided to protect the fire hydrant located in the construction area for Unit 2 from mechanical damage.

3.2.3 Isolation Valves (4.3.1.3)

A post indicator valve will be provided between fire hydrants 9 and 10 to preclude the potential that shutting a portion of the fire loop to service a hydrant will not result in depriving fire water to safety-related areas.

3.2.4 Additional Hydrant (4.3.1.3)(5.14.6)

A charged 2-1/2-inch hose outlet will be provided at the security wall between the auxiliary building and diesel generator building until such time as the security wall has been removed.

3.2.5 Hydrant Hose Valves (4.3.1.3)

A 2 1/2-inch gated hydrant hose valve will be provided in each hose house.

3.3 Foam Equipment (4.3.1.6)(5.14.5)

Two portable foam eductors sized for connection to 1 1/2-inch fire hose and at least 50 gallons of foam concentrate will be provided.

3.4 Portable Smoke Ejectors (4.4.1)

Two fire service portable smoke ejectors of the explosion proof type with a capacity of 5000 cfm or greater will be provided for fire brigade use.

3.5 Air Breathing Equipment (4.4.3)

A cascade type system to refill air breathing cylinders will be provided.

*3.6 Fire Door Evaluation (4.9.1)

An evaluation will be made of the fire rating of all doors in barriers separating fire areas and fire zones. Based on this study, existing doors in fire barriers will be upgraded where necessary to meet the fire rating of the barrier or the highest fire loading on either side of the barrier.

*3.7 Ventilation Duct Penetrations (4.9.2)

The ventilation duct penetrations of barriers enclosing safety related systems are to be reevaluated. Fire or smoke dampers will be provided at locations where the evaluation shows that potential effects due to an unmitigated fire could affect safe shutdown.

3.8 Control Room (5.1)

3.8.1 Fire Extinguisher (4.3.3)(5.1.6)

Two 2 1/2 gallon pressurized water fire extinguishers will be provided for the control room.

3.8.2 Records Storage (5.1.6)

The drawings and records within the control room will be stored in enclosed metal cabinets which will be located away from safety related equipment.

3.8.3 Smoke Detectors (4.2) (5.1.6)

Automatic smoke detectors will be provided within the standup control panels (RTG Boards) in the control room.

3.8.4 Fire Door (4.9.1)(5.1.6)(5.6.6)

A one hour fire rated self closing door will be provided at the entrance to the corridor serving the kitchen/office area.

3.8.5 Fire Dampers (5.1.6)(5.6.6)

FPL will provide an evaluation of the need for fire rated dampers in the duct area between the control room and the mechanical equipment room.

*3.9 Cable Spreading Room -Fire Barrier (4.11)(5.2.6)(5.3.6)

A 1-1/2-hour rated fire barrier will be provided for the wall opening separating the cable spreading room from the "Train B" switchgear room.

3.10 Switchgear Rooms (43 Foot Elevation) (5.3)

3.10.1 Storage Cabinets (5.3.6)

Enclosed metal cabinets will be provided for the storage of combustible records in the "Train B" switchgear room.

3.10.2 Polyurethane Pipe Insulation (5.3.6)

The polyurethane insulation on the piping in the switchgear room will be covered with a fire retardant material.

3.11 Battery Room Ventilation (5.5.6)

The weighted damper in the exhaust duct of each battery room will be removed to help eliminate the possibility of hydrogen accumulations within the rooms.

3.12 Reactor Auxiliary Building

3.12.1 Fire Door Repairs (4.9.1)(5.6.6)

The ordinary glass windows in the stairway fire doors will be replaced with wire glass or fire rated doors will be provided.

3.12.2 Ladders to Cable Tray Areas (4.12)(5.8.6)

Fixed ladders for access to the cable trays in the areas above Fire Zones 43 and 44 will be provided.

3.12.3 Polyurethane Pipe Insulation (5.6.6)

The polyurethane insulation on the piping in the control room mechanical equipment room (Fire Zone 71) will be covered with a fire retardant material.

3.12.4 Cable Loft Conduit (5.8.6)

The conduit in the cable loft above Fire Zones 43, 44 and 54 will be plugged with an approved fire retardant material where cables enter the open end of the conduit.

3.12.5 Laundry/Decontamination Area Fire Door (4.9.1)(5.8.6)

A 1-1/2-hour fire rated door and frame will be provided for the wall opening between laundry/decontamination area (Fire Zone 43) and the corridor (Fire Zone 55).

3.12.6 Flammable Gas Piping Identification (5.8.6)

The flammable gas supply piping within the reactor auxiliary building will be identified by color coding or lettered markers.

*3.12.7 Smoke Detectors (4.2)(5.8.6)(5.9.6)

Automatic smoke detectors connected to the fire alarm system in the control room will be provided for the following areas:

- (1) Low pressure safety injection pumps
- (2) High pressure safety injection pumps
- (3) Containment spray pumps

3.12.8 Drumming Station Fire Barrier (4.9.1) (5.8.6)

A three-hour fire rated door and frame will be provided in the wall separating the drumming station (Fire Zone 51) from the corridor (Fire Zone 55).

3.12.9 Anti-C Clothing Disposal Containers (5.9.6)

The anti-C protective clothing disposal containers in the corridor of the auxiliary building (Fire Zone 36) will be provided with covers.

3.13 Reactor Building (5.11)

3.13.1 Tool Lockers (5.11.6)

Metal tool lockers will be provided within the containment for the storage of combustible materials left inside the containment building.

3.13.2 Reactor Coolant Pump Fire Detectors (4.2)(5.11.6)

Automatic fire detectors connected to the alarm system in the control room will be provided above each reactor coolant pump.

*3.13.3 Reactor Coolant Pump Oil Collection System (5.11.6)

Action on the provision of an oil collection system for the reactor coolant pumps has been deferred pending final resolution of an EPRI study, "Evaluation and Test of Improved Fire Resistant Fluid Lubricants for Water Reactor Coolant Pump Motors. If a suitable lubricant is not found, a fire suppression system or a suitable oil collection system will be provided.

3.14 Diesel Generator Building and Fuel Oil Storage Tanks (5.14)

3.14.1 Curbs (5.14.6)

Curbs will be provided at the doorway between the two generators rooms and at the manholes adjacent to the diesel generator building to prevent migrating oil from entering these areas.

3.14.2 Fire Door (4.9.1)(5.14.6)

The door opening between the diesel generator rooms will be provided with a three hour fire rated door.

3.14.3 Oil Vent Lines (5.14.6)

The vent lines for the diesel generator skid tanks will be relocated to vent outside the diesel generator rooms.

3.14.4 Early Warning Detectors (5.14.6)

A portion of the existing fire detectors in each diesel generator room will be replaced with early warning type detectors.

*3.14.5 Automatic Sprinkler System (4.3.1.5)(5.14.6)

An automatic fire suppression system will be provided in each diesel generator room.

3.14.6 Tank Dikes (5.14.6)

The pipe holes in the dike surrounding the diesel fuel oil storage tanks adjacent to the diesel generator building will be sealed to insure that, in the event of a tank rupture, the contents of the fuel tanks will be contained within the diked area.

3.15

Yard Area (5.13.6)(5.15.6)

- (1) Curbs will be provided for manholes in the yard area containing shutdown related cables which would be affected by migrating oil.
- (2) Curbs will also be provided between the circulating water pumps and intake water pumps at the service water intake structure to prevent oil, in the event of a circulating water pump oil release, from endangering the intake water pumps which are required for safe shutdown.

TABLE 3.1

Implementation Dates for Proposed Modifications

<u>Modifications</u>	<u>Implementation Dates</u>
3.1 Fire Pumps	
3.1.1 Guard Posts	
3.1.2 Valve Position Identification	
3.1.3 Fire Pump Suction Piping	
3.1.4 Upgrade Existing Fire Pumps	
3.2 Fire Protection Water Piping System	
3.2.1 Hydrant and PIV Guard Posts	
3.2.2 Hydrant Protection	
3.2.3 Isolation Valves	
3.2.4 Additional Hydrant	
3.2.5 Hydrant Hose Valves	
3.3 Foam Equipment	
3.4 Portable Smoke Ejectors	Completed
3.5 Air Breathing Equipment	
3.6 Fire Door Evaluation	
3.7 Ventilation Duct Penetrations	
3.8 Control Room	
3.8.1 Fire Extinguishers	
3.8.2 Records Storage	
3.8.3 Smoke Detectors	
3.8.4 Fire Door	
3.8.5 Fire Dampers	
3.9 Cable Spreading Room - Fire Barrier	
3.10 Switchgear Room	

3.10.1	Storage Cabinets	Completed
3.10.2	Polyurethane Pipe Insulation	
3.11	Battery Room Ventilation	
3.12	Reactor Auxiliary Building	
3.12.1	Fire Door Repairs	
3.12.2	Ladders to Cable Tray Areas	
3.12.3	Polyurethane Pipe Insulation	
3.12.4	Cable Loft Conduit	
3.12.5	Laundry/Decontamination Area Fire Door	
3.12.6	Hydrogen Gas Piping Identification	
3.12.7	Smoke Detectors	
	(1) Low Pressure Safety Injection Pumps	
	(2) High Pressure Safety Injection Pumps	
	(3) Containment Spray Pumps	
3.12.8	Drumming Station Barrier	
3.12.9	Anti-C Clothing Disposal Containers	
3.13	Reactor Building	
3.13.1	Tool Lockers	
3.13.2	Reactor Coolant Pump Fire Detectors	
3.13.3	Reactor Coolant Pump Oil Collection System	
3.14	Diesel Generator Building	
3.14.1	Curbs	
3.14.2	Fire Door	
3.14.3	Oil Vent Lines	
3.14.4	Early Warning Detectors	
3.14.5	Automatic Sprinkler System	
3.14.6	Tank Dikes	
3.15	Yard Area Curbs	
	(1) Manholes	
	(2) Service Water Intake Structure	

4.0 EVALUATION OF PLANT FEATURES

4.1 Safe Shutdown Systems

There are several arrangements of safe shutdown systems which are capable of achieving safe shutdown subsequent to a fire. The exact arrangement available in a fire situation will depend upon the affects of the fire on such systems, their power supplies and control stations. To preclude a single event from effecting redundant systems, these systems are separated into two safety trains, either of which would be capable of achieving safe shutdown. The system components required for both hot and cold shutdown conditions, were identified to assess the impact of fires on these systems. This analysis has demonstrated that in most areas of the plant, an unmitigated fire would not threaten the capability to achieve safe shutdown. The separation of redundant cables and certain barriers between fire areas as discussed in this SER are, however, still under review by the NRC. In other areas of the plant, fire detection and suppression systems are provided or have been proposed which are adequate to limit the consequences of fires in these areas. We find that with the exception of separation of redundant cables and certain barriers between fire areas which are still under review, a sufficient basis has been provided to assure that fire damage would not result in the loss of capability to safely shut down the plant and maintain the plant in a safe shutdown condition.

4.2 Fire Detection and Signaling System

The plant is provided with an integrated security fire alarm signaling system utilizing fire detectors in various areas of the plant with alarm indication at the control room and local zone panels. The detectors are arranged in zones with each zone having a local indicating panel. Each zone is provided with multiple detectors to prevent an undetected fire due to the single failure of a detector. In safety-related areas, the redundant detectors are cross zoned by connecting the redundant detectors to separate electrical circuits to assure the availability of at least one system. Most detectors in the plant are of the ionization (smoke) type. Some areas of the plant are monitored by fixed thermal fire detectors. The status of the detection zones is continuously monitored by a computer in the control room. Upon actuation of one or more of the detectors, an alarm will sound in the control

room and, upon acknowledgement of the alarm, the computer provides a print-out of the zone number from which the signal originated. By means of a view graph of the zone, the operator can determine the area covered by the alarmed detector.

The licensee has stated that the installed fire alarm system is in conformance with NFPA 72A and is connected to the emergency electrical power supply. The licensee has also verified that all circuits of the system are supervised to indicate malfunction of the system indicating broken wires, short circuits, ground faults and inoperative components.

The licensee will provide additional early warning detectors in the following areas:

- (1) Over reactor coolant pump motors
- (2) Within the main control panels in the control room.
- (3) High pressure safety injection pumps, Fire Zone 35.
- (4) Low pressure safety injection pumps, Fire Zone 35.
- (5) Containment spray pump, Fire Zone 34.

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

4.3 Fire Control Systems

4.3.1 Water Systems

4.3.1.1 Water Supply

The fire protection water supply for the plant consists of two 500,000-gallon above ground steel storage tanks which are filled by a rated flow of approximately 1200 gpm at 40 psi from an 8-inch connection to the Ft. Pierce municipal water system. The tanks are equipped with low level alarms arranged to indicate in the control room when the level reaches 325,000 gallons in either tank to assure minimum water supply in accordance with the Technical Specifications. Taps are provided near the bottom of each tank for lines leading to the fire pumps and the domestic water pumps. Taps are also provided for connecting a portable fire pump to the tanks. A line with isolation valves interconnects both tanks. The licensee has proposed to revise the fire pump piping to permit the pumps to take suction from either of the ground storage water tanks and to reserve one tank for fire protection usage. The valve to the domestic water pumps from this tank will be maintained in the closed position except for emergency situations and maintenance situations as allowed by the Technical Specifications.

The low water level alarms and administrative controls provided for the storage tanks and available supply rate should assure that the minimum Technical Specifications water storage requirements of 300,000 gallons in each tank will be maintained. This quantity of water will provide sufficient water in each tank to supply the two 350 gpm at 125 psi domestic pumps, exterior fire hose demand of 750 gpm and the largest sprinkler system requirement (turbine building) of 503 gpm for at least three hours. Also, a portable 500 gpm fire pump (described in Section 4.3.1.2) which can take suction from one of the cooling water canals or other water storage tanks is available to supplement the water supply system.

We find that, subject to implementation of the above modification, the fire water supply is adequate to meet the anticipated fire protection demands of the plant and is, therefore, acceptable.

4.3.1.2 Fire Pumps

Two horizontal shaft centrifugal fire pumps are located in the yard adjacent to the fire water storage tanks. Each fire pump is supplied through a suction line from one of the tanks. The two discharge lines from the fire pumps are connected to the underground fire water system. Each fire pump is rated at 2,500 gpm at 125 psi and is electrically driven by power supplied from independent safety-related buses. Valves controlling the flow from the pumps are locked in the proper position with frangible locks. The valve stems which indicate whether the valves are open or shut have been enclosed making visual checking of valve position difficult. The location of the fire pumps next to the service roadway could result in damage to the fire pumps or ancillary equipment from vehicular traffic.

The fire pumps are automatically started when the pressure in the fire water systems falls below 85 psi which is sensed by pressure switches at headers supplying the transformer deluge system and fire suppression system header at the mezzanine of the turbine building. The automatic start signal, however, is overridden upon loss of offsite power. The pumps must be started manually from the controls in the yard adjacent to the pumps or in the switchgear rooms. The pumps can be stopped from the control room, switchgear rooms or at the pumps. Aside from the above, the licensee has compared the control and power supply features of the existing fire pump installation and determined that they are technically equivalent to the design criteria of NFPA-20.

A 500 gpm gasoline engine driven fire pump mounted on wheels for portable use is stored in the building near the stationary fire pumps. Fittings and hose are also stored in the building to connect the portable fire pump to the storage water tanks, hydrants or one of the cooling water canals.

The licensee will improve the fire pump capability by making the following modifications:

- (1) Guard posts will be provided to protect the fire pumps and ancillary equipment from vehicular damage.
- (2) Visual indication of the position of the valves controlling the flow from the fire pumps will be provided.
- (3) Capability will be provided to permit the fire pumps to take suction from either of the water storage tanks.
- (4) The existing fire pump installation will be upgraded as follows:
 - a. The existing two electric motor driven fire pumps will be modified to be capable to automatically operate upon loss of offsite power and to start upon drop of pressure in the water distribution system except under engineered safety features actuation signal (ESFAS) conditions.
 - b. A pressure switch arranged to start pump upon drop of pressure in the fire protection water system will be provided near the discharge piping from each fire pump.
 - c. The stop devices for the fire pumps located in the control room will be removed.

We find that, subject to implementation of the above described modifications, the fire pumps will provide adequate fire water supply. This satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.3.1.3 Fire Water Piping System

A separate 12-inch discharge line from each fire pump supplies the 12-inch underground fire loop. Valving is provided at the juncture so a single break in the discharge piping will not remove both pumps from service. Sectionalizing valves with post indicators subdivide the loop into a number of sections enabling a single section to be isolated without impairing the entire loop. The post indicators are not provided with electrical supervision, but are locked and periodically checked to insure the valves are maintained in the correct position. Some post indicators are not adequately protected from damage from vehicular traffic.

All yard hydrants, fixed water suppression systems and interior hose stations are supplied from the underground fire loop. Lead ins supplying fixed water extinguishing systems are provided with isolation valves and post indicator valves.

Yard fire hydrants have been provided at approximately 200-foot intervals around the plant. Isolation valves, however, have not been provided in the laterals supplying the hydrants which could result in shutting down a portion of the loop when servicing a hydrant is necessary. Some of the hydrants are not adequately protected from vehicular damage or obstructed by adjacent obstacles. The licensee will provide additional vehicular guard posts where necessary. The licensee has studied the effects of shutting down various portions of the fire loop to service the hydrants and, to preclude loss to supply to safety-related areas, will provide an additional PIV isolation valve between fire hydrants 9 and 10.

Hose houses are provided at six of the hydrant locations and are inventoried monthly to assure that the following equipment is maintained.

<u>EQUIPMENT</u>	<u>QUANTITY</u>
2-1/2" x 50' hoses	2
1-1/2" x 50' hoses	2
2-1/2" fog nozzles	1
1-1/2" fog nozzles	2
2-1/2" x 1-1/2" adapters	2
Hydrant Wrenches	2
Hose spanner wrenches	2
Wye 2-1/2" x 1-1/2" x 1-1/2"	1

*Note: One hose house is under control of Unit 2 and is therefore, not subject to Unit 1 inventory.

In addition to this equipment, the licensee will provide a 2-1/2-inch hydrant hose valve in each hose house.

The hose houses, although poorly ventilated, are adequate in construction and inventory of equipment. The hose used at the site is 300 pound, rubber lined, synthetic jacket type and is hydrostatically tested at 200 psi annually. Threads on hydrant outlets and hose couplings are compatible with the equipment being used by the fire departments which serve the plant.

Construction of Unit 2 at the south side of the plant has resulted in cutting off access to hydrants which could be used to fight fires at the diesel generator buildings and east side of the reactor auxiliary building.

The licensee will provide the following modifications in order to upgrade the fire water piping system:

- (1) Traffic guard posts will be provided for hydrants and valve indicator posts which are subject to vehicular damage.
- (2) The hydrant adjacent to the gas cylinder storage area on the Unit 2 side of the site will be protected in order to avoid potential damage to the fire loop.
- (3) An isolation valve will be provided between fire hydrants 9 and 10 to preclude loss of supply to safety-related areas when shutting down a portion of the fire loop to service the hydrants.
- (4) A charged 2-1/2 inch hose outlet will be provided at the wall between the auxiliary building and diesel generator building until such time as the security wall has been removed.

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

4.3.1.4 Interior Hose Stations

One and a half inch hose lines with electrically safe fog nozzles and continuous flow type hose reels are distributed throughout the plant except for the containment and fuel buildings. The location and area of coverage of these hose stations are listed below:

<u>STATION NO.</u>	<u>BUILDING/ELEVATION FT-IN/ LOCATION</u>	<u>FIRE AREA</u>	<u>NOMINAL HOSE LGTH.</u>
HS-15-1	TB/62/Col. L-8	25	75'
HS-15-2	TB/39-6/Col. L-8	23	50'
HS-15-3	TB/19-6/Col. L-8	17	75'
HS-15-4	TB/62/Col. A-5	25	75'
HS-15-5	TB/39-6/Col. B-5	23	50'
HS-15-6	TB/19-6/Col. B-5	18	50'
HS-15-7	TB/62/Col. A-11	25	75'
HS-15-8	TB/39-6/Col. B-11	23	50'
HS-15-9	TB/19-6/Col. B-11	19	50'
HS-15-10	TB/62/Col. A-18	25	50'
HS-15-11	TB/19-6/Col. D-16	20	75'
HS-15-12	TB/62/Col. L-14	25	50'
HS-15-13	TB/19-6/Col. L-14	16	75'
HS-15-14	TB/39-6/Col. G-18	23	75'
HS-15-28	Aux./-.5/(RAG-RA3z)	36	50'
HS-15-31	Aux/43/(RAI-RA3)	56	75'
HS-15-32	Aux/43/(RAL-RA2)	57	50'
HS-15-33	Aux/19-6/(RAJ-RA4)	55	50'
HS-15-34	Aux/19-6/(RAK-RA2z)	43	50'
HS-15-35	Aux/43/(RAD-RA4)	62	75'
HS-15-36	Aux/43/(RAC-RA3)	62	50'
HS-15-37	Aux/43/(RAF-RA3z)	61	50'
HS-15-38	Aux/19-6/(RAC-RA3)	55	50'
HS-15-39	Aux/19-6/(RAA-RA4)	51	50'
HS-15-40	Aux/19-6/(RAG-RA3)	55	50'
HS-15-41	Aux/-.5/(RAC-RA3z)	36	50'
HS-15-42	Aux/43/(RAL-RA5)	56	50'
HS-15-43	Aux/-.5/(RAK-RA3)	28	50'

We find that the Interior Hose Stations are adequate for manual firefighting capability and satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.3.1.5 Automatic Water Suppression Systems

Wet pipe (fusible link) automatic sprinkler systems are provided in the turbine building to protect the steam generator feed pump and condensate pump lube oil systems, and the heater drain pump lube oil system.

Deluge (open head) automatic sprinkler systems actuated by fixed temperature/rate-of-rise detectors have been provided to protect the following high hazard areas:

- (1) Hydrogen seal oil unit
- (2) Turbine oil conditioner units
- (3) Turbine oil reservoir
- (4) Turbine oil storage tank
- (5) Auxiliary boiler fuel storage tank
- (6) Main transformers
- (7) Auxiliary transformers
- (8) Start-up transformers

The licensee has stated that all the automatic water suppression systems conform to NFPA 13 or 15. The valves controlling the water supply to these systems are adequately supervised to insure the valves are open. Supervision of the valves controlling the flow of water to the automatic water suppression systems consists of electrical tamper switches at each control valve with alarm indication at the control room or chains and locks or seals on valves along with administrative procedures to insure the devices are in place and the valves are in the correct position.

The licensee will also provide automatic fire suppression systems to protect the diesel generator building.

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

4.3.1.6 Foam

The plant presently has no firefighting foam equipment. In order to upgrade the firefighting capability involving an oil or fuel fire, the licensee will provide two portable foam educators suitable for applying foam through hose streams and 50 gallons in portable containers of foam concentrate such as AFFF type.

We find that, subject to implementation of the above described modification, the foam firefighting capability will be adequate for the hazards protected which satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.3.1.7 Effects of Water Suppression Systems

Existing water suppression systems are not located in areas that would be highly sensitive to the effects of water impingement. The deluge systems protecting the outside transformers will not have a detrimental effect on these units as this equipment is designed for outside environments. The suppression systems protecting the lube oil and fuel storage areas in the turbine building will not discharge in the area of safety-related equipment such as switchgear which is sensitive to water. Pumps and equipment are mounted on pedestals which will prevent the water accumulations on the floors from affecting them. The sprinkler systems protecting the equipment in the turbine building will not affect safety related equipment because of the distance factor.

4.3.2 Gas Suppression Systems

The only area provided with a gas suppression system is the Document Control Center which is not a safety-related area.

4.3.3 Portable Fire Extinguishers

Approximately 130 CO₂ and dry chemical portable fire extinguishers have been distributed throughout the plant. Most of the dry chemical extinguishers have an ABC fire rating. The licensee will provide two additional 2 1/2 gallon pressurized water fire extinguishers with a "Class A Rating" at the entrances to the control room.

We find that, subject to implementation of the above described provision, portable fire extinguisher capability will satisfy the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.4 Ventilation Systems and Breathing Equipment

4.4.1 Ventilation Systems

The plant does not have exhaust systems designed specifically for smoke removal. The normal air handling systems in most areas can be used for smoke removal; however, their effectiveness may be limited. The fans and other equipment in the air handling systems are not designed to withstand high temperatures, and can be rendered inoperative by the heat from a significant fire. Also, the capacity and configuration of the normal air handling systems may be inadequate for effective smoke removal. To supplement the

normal air handling systems two fire service portable smoke ejectors of the explosion-proof type with a capacity of 5,000 cfm or greater have been purchased for fire brigade use.

We find that the capability for smoke and heat venting satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.4.2 Filters

The pre-filters and HEPA filters provided at the facility utilize a low fire hazard charcoal filter media. These charcoal filter units are enclosed in substantial metal housings. These units are provided with detectors which will alarm in the control room if overheating occurs, allowing them to be promptly isolated. The filter units do not present a significant fire exposure to safe shutdown systems.

We find that the 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

The existing air breathing equipment consist of 22 self-contained air breathing apparatus and 20 spare air cylinders. A cascade system for refilling cylinders will be provided. Additional backup capability for air breathing requirements can be provided by responding offsite fire assistance groups.

We find that, subject to implementation of the above describe modifications, the air breathing equipment capability satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.5 Floor Drains

Floor drains from the various areas of the plant are routed according to their contents. The floor drains from potentially contaminated areas are collected in a 40,000 gallon aerated waste storage tank for decontamination if required, or if non-contaminated, the liquid is discharged into the circulating water discharge canal. Storm and floor drains from non-contaminated areas are routed to settling basins south of the plant. Drainage from areas, which may contain oil or other combustible liquids, are routed through oil-water separators located outside of plant structures prior to being discharged into the storm water drainage

system. The emergency diesel generator rooms are provided with independent drainage systems which are connected to the same oil-water separator. The arrangement of the drainage systems should prevent the spread of combustible liquid fires via the drainage system. The licensee analyzed the arrangement, location and capacity of the drainage system to assure that they were adequate.

We find that the floor drainage systems are arranged to prevent the spread of fire and satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.6 Lighting Systems

Three lighting systems consisting of normal AC, normal/emergency AC and emergency DC are provided. The normal AC system supplies the ordinary interior and exterior power and illumination fixtures located throughout the plant. The normal/emergency AC system consist of two physically and electrically separate systems which are arranged to provide lighting for the plant at all times. This system is powered through the emergency portion of the auxiliary buses which upon failure of off-site power are supplied by the emergency diesel generators. Four hour rated battery powered emergency lighting units are also provided in some areas for lighting in the event of the complete loss of AC power.

The control room is supplied with normal and normal/emergency lighting and a redundant emergency DC lighting system. The DC system is supplied from two physically and electrically separated systems which are energized from separate battery sources. This system is automatically energized by fail closed relays located within the control room.

Portable seal beam battery-operated lights are also provided for the fire brigade and emergency operations personnel.

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

4.7 Communication Systems

Normal communications within the plant consist of commercial telephone system, an intraplant paging system (PA), an inter-office communication system (PAX), and a sound powered communication system. Communication stations are provided at pre-selected locations throughout the plant. Portable radios are also avail-

able for emergency use. Arrangements have been made to assure that at least two portable radios will be readily available at all times for use by the fire brigade.

We find that the communications systems provided to coordinate fire fighting and safe shutdown activities satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.8 Electrical Cables

The cable insulation used in the plant consists primarily of cross-linked polyethylene insulated conductors. Cable jackets are primarily polyvinyl chloride (PVC). The flame test standard for cables, IEEE Std. 383-1974, was not in effect at the time most of the cables were purchased and installed. Flame retardant coatings ("Flamemastic 71A") have been used extensively in all areas of high cable concentration to reduce the fire hazards associated with combustible insulation materials.

We find that the use of fire retardant coatings adequately addresses the combustible characteristics of cable insulation materials. This satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.9 Fire Barrier Penetrations

4.9.1 Fire Doors

A number of doorway penetrations of fire barriers in the plant are not provided with fire doors, have door with a lower fire resistance rating than the barrier requirements or have fire doors in need of repair or upgrading. The licensee will evaluate the fire rating of all the doors in barriers separating fire areas and fire zones. Where necessary based on this study, the licensee will upgrade the fire doors to meet the fire rating of the barrier or the highest fire loading on either side of the barrier. In addition, the licensee will make the following modifications:

- (1) A 3-hour fire door will be provided for the door opening between the diesel generator rooms.
- (2) A 1-hour fire door will be provided at the entrance to the corridor serving the kitchen area.

- (3) A 3-hour fire door will be provided in the entranceway to the drumming station room between Fire Zones 51 and 55.
- (4) Plain glass in all fire doors will be replaced with wired glass or fire rated doors will be provided. This modification will include doors in the auxiliary building stairwell leading to the control room.
- (5) A fire door and frame with a 1-1/2-hour fire rating will be provided between laundry/decontamination area (Fire Zone 43) and the corridor (Fire Zone 55).

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

4.9.2 Ventilation Duct Penetrations

Ventilation ducts pass through fire barriers at several locations without the provision of fire dampers or smoke dampers within the duct. An exception to this is in the supply ductwork of the electrical equipment and battery room ventilation system. The licensee has stated that ventilation duct penetrations are sealed in all areas of the plant. In addition, the licensee has examined all fire area penetrations and openings in safe shutdown related areas for fire spread potential via the spread of burning liquids, combustion gases or direct thermal radiation and found them to be acceptable. The licensee also states that the HVAC ductwork is capable of withstanding postulated gas temperatures generated in fire areas, hence ductwork integrity is maintained. Smoke venting would not be inhibited since the non-fire dampered exhausts go directly to the outside.

Some areas of the plant containing safe shutdown equipment may be jeopardized by the lack of fire or smoke dampers in the ducts penetrating these areas. As recommended by the staff, the licensee will reevaluate the ventilation duct penetrations identifying all locations where ducts penetrate barriers enclosing safety-related systems. Fire or smoke dampers will be provided at locations where the evaluation shows that potential effects due to an unmitigated fire could affect safe shutdown.

We find that, subject to the implementation of the above described evaluation and potential modifications, the ventilation duct penetrations satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.9.3 Electrical Cable Penetrations

Electrical cable penetrations in fire barriers have been sealed utilizing marinite board, sleeves, cerafelt and sprayed on fire retardant coatings. Tests of the typical types of electrical cable penetrations were conducted at Florida Power and Light's Material Test Laboratory and at outside test facilities. The testing program included tests in accordance with the requirements of ASTM E119-73 with the exception of the hose stream test nozzle, water pressure, and nozzle distance. The tests did, however, utilize hose nozzles and pressures simulating the actual plant equipment and conditions. The tests demonstrated that the fire barrier penetrations would resist the passage of fire for at least 3 hours and no water penetrated the test wall during the hose stream tests.

Based on the description of the tests, we find that the electrical cable penetrations meet the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.10 Separation Criteria

Physical separation, as a protection against common failures to redundant cable installations within the plant, has been achieved by spatial separation and/or by the erection of physical barriers. Spatial separation between redundant cable tray installations is achieved by providing at least a 4-foot vertical or 18-inch horizontal separation between cable trays. In areas where this separation can not be maintained, such as the cable spreading room, permanent physical barriers are provided for a minimum of 18 inches beyond the point of minimum convergence. Also, all cables in trays have been coated with a fire retardant ("Flamemastic 71A") material. We have not, however, completed our review of the adequacy of separation of redundant cables.

The licensee has performed a detailed fire hazard analysis for each area of the plant containing safety-related equipment to determine the possible effects of fires on the capability to achieve safe shutdown. Each of the safety-related areas is discussed in more detail in Section 5.0 of this report.

Accordingly, we find that the fire protection program adequately addresses the physical separation of redundant systems and satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

4.11 Fire Barriers

The fire barriers provided have fire resistance ratings of 1, 2, 3 hours or greater. The licensee's fire hazard analysis concludes that the basic wall structures have adequate resistance to prevent the spread of an unsuppressed fire through the barriers. Because of climatic conditions where the plant is situated, some areas of the plant, especially those containing flammable liquids, are well separated from safety-related areas. Except as discussed below areas not having a three-hour fire rating are found acceptable on the basis of a light combustible loading or that redundant safe shutdown will not be jeopardized if the barrier is breached.

The licensee has proposed a 1-1/2-hour fire rated barrier between Fire Zones 56 (switchgear room) and 57 (cable spreading room). The adequacy of the 1-1/2-hour barrier is under evaluation by the NRC.

We find that, except for the above barrier under review, the fire barriers satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.12 Access and Egress

Most areas of the plant are reasonably accessible in a fire situation. The turbine building is a three story open structure. The turbine is on the top floor level without an enclosure. There is no safety related equipment in the turbine building.

The auxiliary building is a three story structure with a basement. A main corridor provides access directly to most of the safety related equipment in the building, except the electrical cable trays in the areas above the radiochemistry laboratory and locker room on the 19.5 foot elevation are not readily accessible since neither fixed nor portable ladders are provided to these areas. The licensee has proposed to provide fixed ladders for access to these areas. Otherwise, adequate access is provided throughout the auxiliary building. The upper floor levels are accessible from an enclosed and an open stairway both of which are located on the exterior of the building. Access to the below grade floor level is by two unenclosed stairs located within the building. In view of the low combustible loading on the lower floor level the fire fighting access to this area is acceptable.

Adequate access has been provided to the electrical penetrations areas for the reactor building and the access arrangements within the reactor building appear adequate.

Accordingly, we find that, subject to the provision of the above described ladders, adequate access and egress are provided for evacuation and manual fire fighting operations which satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.13 Toxic and Corrosive Combustion Products

The products of combustion for many plastic materials such as cable insulation and jacket materials are toxic to humans and corrosive to metals. Fire retardant coatings for cables and fire detection and extinguishment systems are relied upon to minimize the quantities of such products. As noted in Section 4.4, portable equipment is to be provided for an additional means of smoke removal to aid in fire fighting access. The fire brigade is provided with and trained in the use of emergency breathing appliances for fighting fires involving such materials.

We find that, subject to the implementation of the proposed modification described in this report, adequate precautions have been taken to minimize the effects of toxic and corrosive combustion products. This satisfies the objectives identified in Section 2.2 of this report and is therefore, acceptable.

4.14 Nonsafety-Related Areas

We have evaluated the separation by distance or by fire barrier of safe shutdown systems from nonsafety-related areas and have determined that fires in such areas will not adversely affect the ability to safely shut down the plant. We find that these features satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable.

4.15 Instrument Air

Control air is not required for safe shut down.

5.0 EVALUATION OF SPECIFIC PLANT AREAS

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

5.1 Control Room

5.1.1 Safety Related Equipment

The control room is located at the 62 foot elevation and contains safety related cables within control cabinets and consoles. Details of other areas located on the 62 foot elevation are provided within Section 5.6 of this report.

5.1.2 Combustibles

The combustibles in the control room consist of electrical wire and cable insulation materials and miscellaneous records and drawings used to support operations. A small kitchen, classroom and office area adjoin the control room.

5.1.3 Consequences if No Fire Suppression

An unmitigated fire in the control room has the potential for damaging redundant divisions of safety-related equipment. Isolation switches remote to the control room are provided which may be opened to prevent a fire from adversely impacting vital equipment. Therefore, the capability exists to maintain the unit at safe hot conditions or for safe shutdown from outside the control room in the event of fire damage in the area.

5.1.4 Fire Protection Systems

Fire Suppression for the control room is by manual fire fighting equipment. No automatic fire detectors are provided in the control room or control cabinets, however, the control room is continuously manned which could provide early detection of fire. The office, classroom, kitchen and toilet areas adjoining the control room are provided with fixed temperature and/or ionization detectors which

are connected to the alarm system in the control room. Portable carbon dioxide fire extinguishers are provided for the control room. Additional extinguishers and hose stations are located in adjacent areas.

5.1.5 Adequacy of Fire Protection

Two entrances are provided into the control room for manual fire fighting operations. The control room communicates with the kitchen, classroom and office areas by a 3 X 8 foot passageway and by ducts without fire dampers which penetrate the wall between the control room and mechanical equipment room. These openings result in a potential exposure hazard to the control room. Early warning smoke detectors are not provided within the control panels. Fire extinguishers for use on ordinary type combustibles are not provided within the control room. Combustible records and other data are stored outside of metal cabinets within the control room adjacent to the control panels.

5.1.6 Modifications

The licensee has proposed the following modifications for the control room:

- (1) Two 2½-gallon pressurized water extinguishers will be provided.
- (2) A metal cabinet will be provided for the storage of combustible records.
- (3) Early warning smoke detectors with annunciation in the control room will be provided within the standup control panels (RTG Boards).
- (4) A one hour fire rated self-closing door will be provided at the entrance to the corridor serving the kitchen/office area.
- (5) FPL is reviewing the need for a 3-hour fire damper within the duct from the mechanical equipment room to the control room.

We find that, subject to implementation of the above described modifications and resolution of the possible need for fire dampers in the duct between the mechanical equipment room and the control room, the fire protection provided for the control room satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.2 Cable Spreading Room

5.2.1 Safety Related Systems

The cable spreading room is located at the 43 foot elevation of the auxiliary building directly beneath the control room. Control and power cables associated with safe shutdown and other safety related equipment are located in this area. This area also contains switchgear and secondary power equipment for redundant power systems.

5.2.2 Combustibles

The combustibles in this area consists of electrical cable insulation. All cables have been coated with a fire retardant material.

5.2.3 Consequences if No Fire Suppression

An unmitigated fire in the cable spreading room should be limited to a single division of safety related equipment. All cables routed through this area have been coated with a fire retardant material and have spatial separation and/or physical barriers provided between redundant cables. The adequacy of cable separation in the cable spreading room is, however, still under review by the NRC.

5.2.4 Fire Protection Systems

Fire suppression in this area is by manual fire fighting equipment. An early warning ionization detection system is provided throughout the cable spreading room and is connected to an alarm system in the control room. Portable fire extinguishers and hose stations are located in the room and additional extinguishers and hose stations are located in adjacent areas. All cables have been coated with an acceptable fire retardant material.

5.2.5 Adequacy of Fire Protection

There are three separate entrances to the cable spreading room and good access is available for manual fire fighting. An unprotected 18 X 20 foot wall opening exist between the cable spreading room and "Train B" switchgear room (Fire Zone 56). This switchgear room is also used for the storage of computer printout data paper, charts and records. A nonrated fire door provide access to battery Room 1A (Fire Zone 58). This nonrated door and the unprotected wall opening result in a potential exposure hazard to the cable spreading room from the adjacent areas; however, the fire loading in these areas is low. The separation and/or physical barriers between cables and the fire retardant coating applied to all cables in this area should aid in limiting a fire to a single division of safety related equipment. The separation and physical barriers are, however, still under review.

5.2.6 Modifications

The licensee has proposed to provide a 1-1/2-hour rated fire barrier for the wall opening into the "Train B" switchgear room. We find that, the fire protection for the cable spreading room satisfies the objectives identified in Section 2.2 of this report except for the proposed barrier and the adequacy of cable separation which are under review by the NRC.

5.3 Switchgear Rooms - 43 Foot Elevation

5.3.1 Safety-Related Equipment

Two switchgear rooms are located at the 43 foot elevation of the auxiliary building. Each room contains the switchgear and associated cabling for one train except some cables for redundant trains are routed through one of the switchgear rooms (Fire Zone 60). The safe shutdown panel is located in a separate room within "Train B" switchgear room, well away from any switchgear but located adjacent to record storage cabinets.

5.3.2 Combustibles

The combustibles in the switchgear rooms consist of electrical cable insulation materials plus the storage of combustible print-out data paper, charts, records, etc. in open cabinets and polyurethane pipe insulation in "Train B" switchgear room (Fire Zone 56). All of the cables have been coated with a fire retardant material.

5.3.3 Consequences of No Fire Suppression

An unmitigated fire in either switchgear room would be limited to that area. All cables routed through these rooms have been coated with a fire retardant material which should limit fire damage to a single train. An unmitigated fire in the open record storage cabinets could affect cables and/or other equipment in the area.

5.3.4 Fire Protection Systems

Fire suppression for these areas is by manual fire fighting equipment. An early warning ionization fire detection system is provided throughout each switchgear room and is connected to an alarm system in the control room. Portable fire extinguishers are provided in each room and a hose station is provided in Fire Zone 56. Additional extinguishers and hose stations are located in adjacent areas. All cables have been coated with an acceptable fire retardant material.

5.3.5 Adequacy of Fire Protection

Three separate entrances are provided into each switchgear room for manual fire fighting operations. An unprotected 18 X 20 foot wall opening exists between the cable spreading room and "B" switchgear room (Fire Zone 56) and the other openings in the fire rated walls of the switchgear rooms are protected by non fire rated doors. The unprotected wall opening and nonrated fire doors results in a potential exposure hazard to the switchgear rooms from adjacent areas; however, the current fire loading in these rooms is low. All cables in these rooms have been coated with a fire retardant coating to aid in limiting a fire to a single division of safety related equipment.

5.3.6 Modifications

The licensee has proposed to provide a 1-1/2-hour rated fire barrier for the 18 X 20 foot opening and to provide enclosed metal cabinets for the storage of the combustible records located in the Train B switchgear room (Fire Zone 56). The polyurethane pipe insulation in Fire Zones 56 will be coated with a fire retardant material.

We find that, subject to implementation of the above described modifications, the fire protection for the switchgear rooms on the 43 foot elevation satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.4 Switchgear Room - 19.5 Foot Elevation

5.4.1 Safety-Related Equipment

A combination "AB Train" switchgear room is located at the 19.5 elevation of the auxiliary building. This area contains switchgear and associated cables for 480 volt and 4160 volt equipment which can be aligned to either safety division.

5.4.2 Combustibles

The combustibles in this area consist of electrical cable insulation materials. All cables have been coated with a flame retardant material

5.4.3 Consequences if No Fire Suppression

An unmitigated fire in this switchgear room should be limited to a single division of safety related equipment since all cables in

this area have been coated with a fire retardant material and have spatial separation and/or physical barriers provided between cables for redundant safety divisions. We are, however, continuing our review of the adequacy of cable separation in this room.

5.4.4 Fire Protection Systems

Fire suppression for this area is by manual fire fighting equipment. An early warning ionization fire detection system is provided throughout the switchgear area and is connected to an alarm system in the control room. Portable fire extinguishers are located in the room. Hose stations and additional extinguishers are located in adjacent areas. All cables have been coated with an acceptable fire retardant material.

5.4.5 Adequacy of Fire Protection

This area is readily accessible from the main corridor on the 19.5 foot elevation for manual fire fighting operations. A second means of access is also available in the event of an emergency. The lack of an enclosure around this switchgear room is satisfactory due to the small quantity of combustible materials in the corridor and the fire rated enclosures provided for other adjacent areas. Adequate separation is provided between redundant switchgear for safety related equipment and all cables have been coated with a fire retardant material. The adequacy of cable separation is, however, still under review by the NRC.

5.4.6 Modifications

There are no modifications proposed or recommended for this area. We find that the fire protection of this area satisfies the objectives identified in Section 2.2 of this report except for cable separation which is still under review by the NRC.

5.5 Battery Rooms

5.5.1 Safety Related Equipment

Two battery rooms are located at the 43 foot elevation of the auxiliary building. Each room contains the batteries and cables from only one of the two redundant divisions of safety equipment.

5.5.2 Combustibles

The combustibles in the battery rooms consist of the battery cases and the electrical cable insulation materials, and low levels of hydrogen released while lead-calcium batteries are being charged. The electrical cables in these rooms are installed in conduit or coated with a fire retardant material.

5.5.3 Consequences if No Fire Suppression

An unmitigated fire in a battery room could cause the loss of one of the redundant batteries, but would not affect the redundant battery supply.

5.5.4 Fire Protection Systems

Fire suppression for the battery rooms is by manual fire fighting operations. An early warning ionization fire detection system connected to an alarm system in the control room is provided within each battery room. Portable fire extinguishers and hose stations are provided adjacent to each room.

5.5.5 Adequacy of Fire Protection

A separate entrance is provided into each battery room for manual fire fighting operations. Hydrogen accumulation is precluded by continuously operated ventilation exhaust and redundant supply fans, all of which receive power from the emergency buses. However, hydrogen buildup could occur should the exhaust damper remain closed. The detection system, extinguishers and hose stations provide acceptable protection for this area. Entry to the rooms is through unrated fire doors; however, the fire loading in the battery rooms is very low.

5.5.6 Modifications

The licensee has proposed to remove the weighted damper in the exhaust duct of each battery room. We find that, subject to implementation of the above described modification, the fire protection for the battery rooms satisfies the objectives identified in Section 2.2 of this report, and is, therefore acceptable.

5.6 Reactor Auxiliary Building - 62.00' Elevation

5.6.1 Safety-Related Equipment

The topmost level of the reactor auxiliary building contains the control room and a mechanical equipment room which serves the control room. This level also contains classrooms, offices and a kitchen for control room personnel. Details of the control room are provided within Section 5.1 of this report. The mechanical equipment room for the control room is located adjacent to and contains the HVAC equipment for the control room. Control cables

required for normal plant shutdown are routed through the mechanical equipment room. There is no safety-related equipment in the office, classroom and kitchen areas.

5.6.2 Combustibles

The combustibles in the mechanical equipment room, include cable insulation, expanded polyurethane pipe insulation and charcoal contained in the filter banks of the ventilation system. Combustibles in other portions of this elevation is mostly paper used in the classrooms and offices. All electrical cables are installed in conduit or have been coated with a fire retardant material.

5.6.3 Consequences if No Fire Suppression

A fire in the control room heating and ventilation equipment room could spread through the ventilation ducts, passing through the wall to the adjacent control room. A fire in the kitchen area could spread through the open doorway to the adjacent control room.

5.6.4 Fire Protection System

Fire suppression for this area is by manual fire fighting equipment. The control room is separated from the other areas on this elevation by walls, floor and ceiling having a fire rating of at least 4 hours. The stairway connecting the various levels of the reactor auxiliary building including the control room is enclosed and provided with fire doors at each level although the vision panels in the doors are not glazed with wired glass.

Ionization type detectors are provided in the HVAC equipment to the control room. Fixed temperature and/or ionization fire detectors are provided in the classrooms, offices and kitchen. These detectors are connected into the alarm system in the control room. Portable extinguishers are distributed throughout the area and hose station coverage is available from adjacent areas.

5.6.5 Adequacy of Fire Protection

The fire protection provisions for this level of the reactor auxiliary building is inadequate in several respects. The control room is not properly separated from the other fire areas on this level due to the lack of fire dampers in the ducts penetrating the wall of the control room. Other deficient fire barrier separa-

tions include the lack of a fire door in the corridor leading to the kitchen area and the lack of wired glass vision panels in the fire doors serving the enclosed stairway.

5.6.6 Modifications

The licensee has proposed the following modifications:

- (1) The plain glass vision panels in the stairway doors will be replaced with wired glass or fire rated doors will be installed.
- (2) A 1-hour self-closing fire door will be provided at the entrance to the corridor leading to the kitchen.
- (3) Polyurethane pipe insulation in the heating and ventilating room, (Fire Zone 71) will be coated with a fire retardant material.

We find that, subject to implementation of the above described modifications and resolution of the possible need for fire dampers in the duct between the control room and the mechanical equipment room, fire protection for the 62.00 - ft. elevation of the reactor auxiliary building satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.7 Reactor Auxiliary Building - 43.00' Elevation

5.7.1 Safety-Related Equipment

The 43.00' elevation of the reactor auxiliary building encompasses the 3rd floor of the building. The safety-related areas on this level include: A and B switchgear rooms, A and B battery rooms, cable spreading room and HVAC room. The safety-related equipment in these areas include cable trays, conduit, switchgear, batteries, battery chargers and the remote shutdown panel located in the "Train B" switchgear room. Details on these areas are provided in Sections 5.2, 5.3 and 5.5 of this report, except as discussed below. The remainder of this floor level does not contain any cables or equipment which are required to achieve safe shutdown.

5.7.2 Combustibles

The only significant combustible material in this area is the charcoal filters in the HVAC equipment for the ECCS exhaust system, the shield building exhaust system and the hydrogen purge system.

5.7.3 Consequences if No Fire Suppression

An unmitigated fire in this area would not result in damage to equipment or systems required for safe shutdown.

5.7.4 Fire Protection System

Fire suppression in this area is by manual fire fighting equipment. Most safety-related areas on this elevation are separated from each other by concrete walls although penetrations in many cases do not match the rating of the wall. Ionization fire detectors connected to an alarm system in the control room are provided above safety-related cable trays. Area fire detectors of the same type are installed at the ceiling of portions of the switchgear rooms, and the HVAC rooms. Portable fire extinguishers and hose stations are located in this area and additional hose stations and extinguishers are located in adjacent areas. Fixed temperature fire detectors are also provided for HVAC filters.

5.7.5 Adequacy of Fire Protection

Adequate fire protection features are provided for this area of the 43 foot level of the auxiliary building.

5.7.6 Modifications

There are no modifications proposed or recommended for this area. We find that fire protection for this portion of the 43 foot elevation of the reactor auxiliary building satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.8 Reactor Auxiliary Building - 19.50' Elevation

5.8.1 Safety-Related Equipment

This floor of the reactor auxiliary building is located at grade level. The major safety-related areas include AB switchgear room, a mechanical penetration room, volume control tank room, east and west electrical penetration rooms, the corridor serving these rooms and a cable loft area. The cable loft area is the intervening space between the roof of the radiochemistry lab, machine shop, health physics, shower room, instrument lab, the laundry/decontamination area and the concrete roof of the 43 foot elevation.

Major safety-related components in these areas include cabling, switchgear, volume control tank with associated valves and piping, and the boric acid heat tracing power supply. Details on the AB switchgear room and containment electrical penetration areas are provided in Sections 5.4 and 5.6 of this report.

5.8.2 Combustibles

The combustibles in this area consist of electrical components and cable insulation materials, trash and anti-C protection clothing. All cables have been coated with a flame retardant material. Minor amounts of combustible pipe insulation, rubber and plastic hoses and other transient materials are located in various areas including the cable loft. Periodically, there are considerable quantities of combustible materials in the laundry/decontamination area (Fire Zone 43) and drumming station (Fire Zone 51). A hydrogen gas line encased within seal welded guard pipe and other flammable gas line(s) are routed through this area but the pipes are not identified. A detection system is installed on the hydrogen piping system which sounds a local alarm in the event of high or low pressure.

5.8.3 Consequences if No Fire Suppression

An unmitigated fire in this area would probably be limited to a single division of safety-related equipment since all cables have been coated with a fire retardant material and due to spatial separation and/or physical barriers provided between cables and equipment for redundant safety divisions. Cable separation is, however, still under review by the NRC.

5.8.4 Fire Protection Systems

Fire suppression for this area is by manual fire fighting equipment. The various safety-related areas are separated by concrete walls. Safety-related cable trays are coated with a fire retardant material. Ionization type fire detectors are mounted above the trays and fixed temperature type fire detectors are provided for area protection. These detection systems are connected to an alarm system in the control room. Portable fire extinguishers and hose stations are provided in the area with additional extinguishers and hose stations located in adjacent areas.

5.8.5 Adequacy of Fire Protection

This area is readily available for manual fire fighting operations except ladders are not provided to the cable loft areas above Fire Zones 43 and 44. In general, safety-related areas are separated

by concrete walls and a fire in one area would not in all likelihood, spread to adjacent areas. Periodically, a significant combustible loading does exist in the laundry/decontamination area (Fire Zone 43) and drumming station room (Fire Zone 51). The lack of fire doors in the openings from Fire Zones 43 and 51 to the corridor (Fire Zone 55) could unduly expose safety-related equipment including cabling and the boric acid heat tracing system power supply. Ionization type fire detectors have been provided throughout this elevation. Fixed temperature type fire detectors have also been provided for area protection. Access to the cable loft area above Fire Zones 43 and 44 is difficult because of the lack of stairs or ladders to serve this area.

5.8:6 Modifications

The licensee has proposed the following modifications:

- (1) Fixed ladders will be provided for access to the cable loft areas above Fire Zones 43 and 44.
- (2) Conduits in the cable loft area will be plugged with approved fire retardant material(s) where cables enter the open end of the conduit.
- (3) Three hour fire rated door and frame will be provided in the opening in the wall between the drumming station (Fire Zone 51) and the corridor (Fire Zone 55).
- (4) A 1-1/2-hour fire rated door and frame will be provided for the wall opening between the laundry/decontamination area (Fire Zone 43) and the corridor (Fire Zone 55).
- (5) Flammable gas lines will be identified by color coding or lettering affixed to the pipes.

We find that, subject to implementation of the above described modifications, the fire protection for the 19.50 foot elevation of the reactor auxiliary building satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.9 Reactor Auxiliary Building (-) 0.50' Elevation

5.9.1 Safety-Related Equipment

This area is located below grade level. The safety related areas include rooms housing heat exchangers, safety-related pumps, tanks and the boric acid injection system. Fire Zones 34 and 35 house safeguards equipment including low pressure safety injection pumps, high pressure safety injection pumps, containment spray pumps along with associated piping, valves and cabling. Each fire zone contains one redundant train. Fire Zone 33 houses some of the piping penetrations to containment. Fire Zones 38, 75 and 76 each contain one charging pump and are separated from each other

by partial height walls. Other safety-related equipment include the gas decay tanks, boric acid tanks and pumps and the corridor serving these areas which also serves for routing safety-related cables.

5.9.2 Combustibles

Combustible materials at this elevation include small quantities of lube oil, trash, electrical cable insulation and anti-C protection clothing. The electrical cables have been coated with a fire retardant material. The anti-C protective clothing disposal containers consisting of metal drums without covers are located in the corridor.

5.9.3 Consequences if No Fire Suppression

An unmitigated fire at this level could affect safe shutdown systems. A fire in some of the rooms containing safety related pumps could damage one train before being detected. A fire in an anti-C protection clothing disposal container could expose safety-related cable trays.

5.9.4 Fire Protection Systems

Fire suppression for this area is by manual fire fighting equipment. Most areas containing redundant trains of safety-related equipment are separated by concrete walls or partial height concrete walls. All electrical cable in cable trays is coated with a fire retardant material. Ionization type fire detectors connected to an alarm system in the control room are installed above all the safety-related trays. Portable extinguishers and hose stations are provided in the area for manual firefighting with additional extinguishers and hose stations located in adjacent areas.

5.9.5 Adequacy of Fire Protection

Fire barriers, cable coating, fire detectors above cabling and the provisions for manual firefighting are adequate for this area. Fire Zone 34 and 35 house the safety-related pumps necessary for plant shutdown. This is an unoccupied area and the separation between the redundant trains (Zones 34 and 35) consists of partial height walls. The lack of detectors in this area prevents prompt response to fires which could damage safety-related cables and equipment. The partial height wall barriers are still under review by the NRC.

5.9.6 Modifications

The licensee will provide the following modifications:

- (1) Early warning fire detectors will be provided in the safe-guards pump rooms (Fire Zones 34 and 35).
- (2) The anti-C protective clothing disposal containers in the corridor, Fire Zone 36, will be provided with covers.

We find that, subject to implementation of the above described modifications, fire protection for the (-) 0.50' elevation of the reactor auxiliary building satisfies the objectives identified in Section 2.2 of this report except for the partial height wall barriers which are still under review.

5.10 Containment Electrical Penetration Areas

5.10.1 Safety-Related Equipment

Two containment electrical penetration rooms are provided in the auxiliary building through which cables are routed into the containment of the reactor building. "Train A" control and power cables for equipment required for normal shut down are located in one room and the "Train B" control and power cables for equipment required for normal shut down are located in the other room.

5.10.2 Combustibles

The combustibles in these areas consist of electrical cable insulation which has been coated with a flame retardant material.

5.10.3 Consequences if No Fire Suppression

An unmitigated fire in the containment penetration rooms may result in damage to a single train of safety-related cables.

5.10.4 Fire Protection Systems

The method of fire suppression in this area is by manual fire fighting equipment. An early warning automatic ionization fire detection system is provided in each containment penetration room and is connected to an alarm system in the control room. Portable fire extinguishers and hose stations are located in nearby areas. All cables have been coated with an acceptable fire retardant material.

5.10.5 Adequacy of Fire Protection

Each containment penetration area is provided with a separate entrance which is readily accessible for manual fire fighting operations. The two penetration areas communicate through a non-fire rated door; however, the combustible loading in this area is low. The early warning smoke detection system, the fire retardant coating on the cables, and the manual fire fighting equipment provided should be sufficient to assure that redundant safe shutdown equipment will not be affected during a fire.

5.10.6 Modifications

There are no modifications proposed or recommended for the two containment electrical penetration areas. We find that the fire protection for the cable penetration rooms satisfies the objectives identified in Section 2.2 of this report except for the non-rated door which is under review by the NRC.

5.11 Reactor Building

5.11.1 Safety Related Equipment

Safety related equipment in reactor containment includes reactor vessel, primary coolant piping, pressurizer, instrumentation, control valves, containment air coolers, and associated electrical cables.

5.11.2 Combustibles

Significant combustibles inside the reactor containment include a large quantity of electrical cable insulation, 190 gallons of lubrication oil associated with each of the four reactor coolant pump motors, containment kidney charcoal filter, 34 gallons of lubrication oil associated with the polar crane and various types of transient combustible materials. The electrical cables inside of the containment have been coated with a fire retardant material.

5.11.3 Consequences if No Fire Suppression

An unmitigated fire in the containment could damage redundant divisions of safety related systems required for safe shutdown.

5.11.4 Fire Protection Systems

The fire suppression method for this area is by manual fire fighting equipment. An early warning ionization fire detection system is provided in cable penetration areas, above cable trays

and in the electrical tunnel at the 0.0 foot elevation. These detection systems are connected to an alarm system in the control room. Portable dry chemical and carbon dioxide fire extinguishers are located throughout the containment. All cables have been coated with an acceptable fire retardant material.

5.11.5 Adequacy of Fire Protection

Automatic fire detectors to provide early warning in the event of fire have not been provided for the areas adjacent to the reactor cooling pumps. An adequate means has not been provided to contain a lubrication oil spill from the reactor coolant pumps and keep it from spreading to other areas. Enclosed metal containers are not provided for the storage of miscellaneous combustibles that are left inside the containment. Hose stations have not been provided within the containment structure since all cables have been coated with a fire retardant materials and portable extinguishers should be adequate to fight fires that could affect safe shutdown cables, given early warning detection.

5.11.6 Modifications

The licensee has proposed to provide metal tool lockers for the storage of combustible materials left inside the containment and to provide automatic fire detectors above each reactor coolant pump. The staff has requested an oil collection system for each reactor coolant pump. The licensee has deferred action on this request pending the final resolution of an EPRI study, "Evaluation and Test of Improved Fire Resistant Fluid Lubricants for Water Reactor Coolant Pump Motors." If a suitable lubricant is not found, the licensee will provide a system to suppress potential fires or provide for the removal of potential oil leakage to a safe location.

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

5.12 Auxiliary Feedwater Pump Area

5.12.1 Safety Related Equipment

Two electric and one steam driven auxiliary feedwater pumps are located outside between the turbine building and the auxiliary building in the area beneath the steam trestle. These pumps are

bounded on three sides by 1-inch steel plates and on the remaining side by the containment building. At least one auxiliary feedwater pump is required for safe shutdown.

5.12.2 Combustibles

The combustibles in the area of the auxiliary feedwater pumps consist of about seven gallons of lubrication oil in the steam driven turbine pump and about one gallon of lubrication oil in each electric pump. The electrical cables in this area are installed in conduit.

5.12.3 Consequences if No Fire Suppression

An unmitigated fire in the feedwater pump area would be limited to a small area and involve only one of the three feedwater pumps. The two electric pumps are separated from the steam driven turbine pump by a concrete flood wall with the floors adjacent to the pumps sloped towards a storm catch basin. An oil spill from a pump should not endanger the area on the other side of the concrete floor wall. Safety related electrical cables within the area are installed in conduit approximately 20 feet above the most probable fire area, except for the circuits to the main steam isolation valves. However, these valves can be manually aligned if the circuits to these valves are lost.

5.12.4 Fire Protection Systems

Fire suppression for this area is by manual fire fighting equipment. Exterior fire hydrants with hose house provided with fire fighting equipment and portable fire extinguishers and hose stations from the turbine building are readily available.

5.12.5 Adequacy of Fire Protection

In view of the limited quantity of combustibles and the separation provided between the electric and steam driven pumps a fire would not involve all three of these pumps. This area is outside and readily accessible for manual fire fighting operations. Adequate fire protection features are provided for this area.

5.12.6 Modifications

No modifications are proposed or recommended for this area. We find that the fire protection for the auxiliary feedwater area satisfies the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.13 Intake Structure - Service Water Pumps

5.13.1 Safety Related Equipment

The intake structure contains three intake water pumps, four circulating water pumps, two screen wash pumps and the electrical circuits associated with these pumps. At least one of the intake water pumps is required for safe shutdown.

5.13.2 Combustibles

The significant combustibles in this area consists of the wooden floor grating for the intake structure and the lubrication oil in the pump motors. The water pumps are of the water lubricated type. The quantity of lubrication oil for the pump motors consist of approximately 58 gallons for each circulating pump, 13 gallons for each intake pump and one gallon for each screen wash pump.

5.13.3 Consequences if No Fire Suppression

An unmitigated pump motor lubricating oil fire would not affect more than a single pump due to the small quantity of oil and the separation provided between the pumps. The circulating pumps and intake pumps are installed on 14 foot centers. The screen wash pumps are installed on six foot centers and are located 4.5 feet from the nearest intake water pump. A separation of approximately six feet exists between a circulating pump and the closest intake pump. Release of oil from any of the pumps would be localized around the pump area or drain through the grating to the water below. A fire would not involve the electrical cables to more than one pump since the cables to the pumps are installed in separate conduit encased in concrete from underground duct banks well removed from the intake structure. The intake water pumps are located within a steel tornado missile barrier which is open at the top and bottom for free convection cooling of the pump motors. This arrangement would also prevent any heat buildup in the event of fire.

5.13.4 Fire Protection System

Fire suppression for this area is by manual fire fighting equipment. Exterior fire hydrants and hose houses provided with fire fighting equipment, and portable fire extinguishers from adjacent areas are readily available.

5.13.5 Adequacy of Fire Protection

In view of the limited quantity of combustible materials and the separation between pumps, a fire would not involve more than a single pump. This area is outside and readily accessible for manual fire fighting operations. Adequate fire protection features are provided for this area.

5.13.6 Modifications

To provide additional safeguards from a circulating water pump oil release, the licensee will provide a curb between the circulating water pumps and the intake water pumps and another curb between the circulating pumps and the safety related electrical duct manholes.

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

5.14 Diesel Generator Building and Fuel Oil Storage Tanks

5.14.1 Safety Related Equipment

Each of the two redundant diesel generator rooms are enclosed with reinforced concrete walls, ceilings and floor and are housed in a separate building located at the southeast corner of the site. Two above ground diesel fuel storage tanks, each with a capacity of approximately 20,000 gallons, are enclosed and separated by concrete missile walls located adjacent to the diesel generator building. The component cooling water pumps are located adjacent to these areas.

Each diesel generator room contains a tandem diesel generator unit, two 200 gallon skid mounted fuel tanks, and associated piping, valves, cabling in conduit and control panels.

5.14.2 Combustibles

Combustibles in the area include diesel generator lubricating oil; diesel fuel oil in storage tanks, fuel lines, and skid tanks; and electrical insulation.

5.14.3 Consequences if No Fire Suppression

An unmitigated fire in one diesel generator room could cause loss of availability of one redundant division of safety-related equipment, if normal A.C. was also not available. In the event a fire in one room breached the fire barrier to the adjacent diesel generator room, both redundant units could be lost.

Pipe penetrations in the outside fuel oil tank dikes are not sealed, permitting a fire inside the dike to spread to the component cooling pump area.

5.14.4 Fire Protection Systems

Fire suppression for these areas is by manual fire fighting equipment. The wall separating the two diesel generator rooms was indicated by the licensee to have a 4-hour fire rating. However, a 1-inch thick steel plate door in this wall is not fire rated. Both rooms are monitored by fixed temperature type fire detectors which are connected to an alarm system in the control room. Portable extinguishers are provided within each room and two 150 pound dry chemical extinguishers are located adjacent to the building. Exterior fire hydrants and hose houses provided with manual fire fighting equipment are also available.

5.14.5 Adequacy of Fire Protection

The existing fire protection for the diesel generator building is inadequate for the nature of the hazard and criticality of the systems. A small or smoldering fire could gain considerable headway in one of the rooms before being detected by the existing fixed temperature detectors. Oil spreading along the floor of a diesel generator room could run under the door to the adjacent diesel generator room or under the exterior doors to the yard and migrate to the vicinity of manholes containing safe shutdown cabling. An unmitigated fire involving a large quantity of lubricating oil or diesel fuel could result in an intense fire which might breach the fire barrier separating the redundant units. The yard hydrant closest to the west side of the diesel generator building in which the personnel access doors are located is obstructed from use by a masonry security wall. Manual fire-fighting would require laying long runs of hose from other yard hydrants or attacking the fire from east side through the equipment doors if possible.

The vent lines from the diesel fuel storage skid tanks in each compartment are equipped with vent lines which terminate within the room. Overfilling of the tanks could result in releasing the excess fuel to the room. The unsealed penetrations in the fuel oil tank dikes could allow fuel oil to involve adjacent areas in the event of a tank rupture.

An adequate number of yard hydrants and hose houses equipped with manual fire fighting equipment are located adjacent to the diesel fuel storage tanks for use in the event of a fire involving these tanks. However, as described in Section 4.3.1.6, foam fire fighting equipment is not provided at the plant which is desirable for effective extinguishment of fires involving combustible liquids such as diesel fuel.

5.14.6 Modifications

The licensee has proposed to install curbs at the doorway between the two diesel generator rooms and at the manholes in the vicinity of the diesel generator building in order to prevent migrating oil from entering these areas. The following additional modifications will also be provided:

- (1) The door opening between the diesel generator rooms will be provided with a 3-hour rated fire door.
- (2) The vent lines for the diesel generator skid tanks will be relocated to vent outside the diesel generator rooms.
- (3) A portion of the existing fixed temperature fire detectors in each diesel generator room will be replaced with early warning type fire detectors.
- (4) A charged 2 1/2-inch hose outlet will be provided at the wall between the auxiliary building and the diesel generator building until such time as the security wall has been removed.
- (5) An automatic fire suppression system will be provided in each diesel generator room.
- (6) The pipe holes in the dike surrounding the diesel fuel oil storage tanks adjacent to the diesel generator building will be sealed in order that, in the event of a tank rupture, the contents of the diesel fuel tank will be contained within the diked area.

We find that, subject to implementation of the above described modifications, fire protection for the diesel generator rooms and fuel oil storage tanks will satisfy the objectives identified in Section 2.2 of this report and is, therefore, acceptable.

5.15 Yard Area

5.15.1 Safety-Related Equipment

The safety-related equipment in the yard area includes underground power and control cables, diesel fuel storage tanks and the refueling water storage tank.

5.15.2 Combustibles

The combustibles which were considered because of their potential for exposure to safety-related systems include oil-filled transformers, an oil-fired auxiliary boiler and adjacent fuel storage tank and flammable gas storage. In addition, the potential exists for the introduction of significant combustibles to the yard area, such as fuel oil trucks and construction materials.

5.15.3 Consequences if No Fire Suppression

In general, an unsuppressed fire in the yard area would not present a significant fire exposure to safety-related systems because of intervening distance or barriers. The main, auxiliary and start-up transformers, all situated in the yard area, contain significant quantities of oil in their cooling systems. A rupture of any of these units would result in oil being released to the ground with a chance that it could become ignited. The migrating oil may also flow to the vicinity of manholes containing safe shutdown cables.

5.15.4 Fire Protection Systems

The oil filled transformers at the west side of the turbine building are protected by automatic deluge water suppression systems. The oil storage tanks (Zone 13) are surrounded by a 2.5-foot retaining wall. The turbine oil reservoir, turbine lube oil storage tank, and the construction boiler fuel storage tank are protected by deluge systems actuated by thermal detectors. In addition, hose lines at yard hydrants are available for manual suppression as discussed in Section 4.3.

5.15.5 Adequacy of Fire Protection

The deluge water suppression systems are considered adequate for the hazards protected. The deluge system control valves, however, are located approximately 30 feet away from the main transformers and could be damaged by a transformer oil fire, however, failure of these valves would not affect safety-related equipment. The lack of curbs could allow migrating oil to flow into manholes containing safe shutdown and/or safety-related cables. Provisions for manual firefighting capability is considered adequate with the modifications outlined in Section 4.3.1 of this report.

5.15.6 Modifications

The licensee has proposed to install curbs around manholes in the yard area containing shutdown cables to protect them from migrating oil.

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

5.16 Turbine Building

5.16.1 Safety-Related Equipment

The turbine building is an open sided structure having 3 floor levels. This area contains the steam turbine and generator along with the auxiliary systems associated with the unit. There are no safety-related equipment or systems in this area.

5.16.2 Combustibles

The major combustibles in the turbine building consist of turbine generator lube oil and seal oil systems, and minor amounts of transient maintenance equipment.

5.16.3 Consequences if No Fire Suppression

An unmitigated fire in the turbine building involving the large quantities of lube oil has the potential of spreading to areas which could damage safety-related equipment.

5.16.4 Fire Protection Systems

The turbine lube oil reservoir is located within the curbed area containing other combustible liquid tanks and is covered in Section 5.15 of this report. The seal oil unit is located on the ground floor of the turbine building and is provided with a 6-inch curb surrounding the unit and is protected by an automatic deluge extinguishing system actuated by thermal detectors. Hose stations and portable extinguishers are provided throughout the structure.

5.16.5 Adequacy of Fire Protection

The curbing and drainage system is not adequate to prevent the contents of the seal oil unit from spreading to manholes in the yard containing safety-related cables. The provisions for automatic suppression of oil fires, and the facilities for manual firefighting is considered adequate for this area.

5.16.6 Modifications

The licensee has proposed to protect the manholes in the yard containing shutdown cables from a potential of migrating seal oil by the provision of appropriate methods such as curbs.

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

6.0 ADMINISTRATIVE CONTROLS

The licensee's description of the administrative controls for fire protection as discussed in the initial March 31, 1977 fire protection report was not adequate. We therefore requested that the licensee's administrative controls follow the NRC guidelines set forth in "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls, and Quality Assurance." In responses dated March 6 and June 23, 1978, the licensee stated that the St. Lucie, Unit No. 1 program for administrative controls was in conformance with the NRC guidelines, except for a few specific areas where deviations were noted and a justification provided. Following our review of the justification for deviations, we concluded that sufficient bases had not been provided by the licensee for some of these exceptions. In a response dated August 28, 1978, the licensee subsequently proposed to revise the administrative controls in response to the staff concerns.

We therefore find that, subject to the modification of administrative controls as noted in the licensee's letter of August 28, 1978, the administrative controls for the fire protection program are acceptable. We will report on the resolution of the fire brigade manpower and training requirement, which is still under review, in a supplement to this report.

7.0 TECHNICAL SPECIFICATIONS

The Technical Specifications to include limiting conditions for operation and surveillance requirements for existing fire protection systems and administrative controls were issued on May 12, 1978. When the Technical Specifications were issued for the existing fire protection systems and administrative controls, exceptions taken by the licensee on fire brigade training and shift size were noted as a subject for further staff review. This issue will be included in a supplement to this report.

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. In addition, we have concluded that the licensee should implement certain evaluations or improvements related to the fire protection program. 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. Upon implementation of the licensee's proposed modifications, we find that the objectives identified in Section 2.0 will be satisfied with the exception of cable separation and certain fire barriers which are still under review as discussed in this SER.

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

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

"Fires occur rather frequently; however, fires involving equipment unavailability comparable to the Browns Ferry Fire are quite infrequent (see Section 3.3 of (NUREG-0050)). The review Group believes that steps already taken since March 1975 (see Section 3.3.2) have reduced this frequency significantly."

"Based on its review of the events transpiring before, during and after the Browns Ferry fire, the Review Group concludes that the probability of disruptive fires of the magnitude of the Browns Ferry event is small, and that there is no need to restrict operation of nuclear power plants for public safety. However, it is clear that much can and should be done to reduce even further the likelihood of disabling fires and to

improve assurance of rapid extinguishment of fires that occur. Consideration should be given also to features that would increase further the ability of nuclear facilities to withstand large fires without loss of important functions should such fires occur."

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

In summary, it is our conclusion that the operation of the facility, pending resolution of the incomplete items and the implementation of all facility modifications, does not present an undue risk to the health and safety of the public based on our concurrence with the Browns Ferry Special Review Group's conclusions identified above, giving due consideration to the Commission Policy Statement as well as the significant improvements in fire protection already made at the facility since the Browns Ferry Fire. These include establishment of administrative controls over combustibles material 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 licensee 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 environment impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environment impact and pursuant to 10 CFR Section 51.5(d)(4) that an environment impact statement, or negative declaration and environment 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 amendments do not involve a significant increase in the probability or consequences of accidents previously considered and do not involve a significant decrease in a safety margin, the amendments do 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 these amendments 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 the safety evaluation report (SER). Their report, "Fire Protection Evaluation - St. Lucie Nuclear Power Plant" dated March 9, 1979, and followup letter dated July 10, 1979, discuss several matters which have been addressed in the SER. The consultants' report and followup letter contain recommendations which have, for the most part, been implemented during our evaluation. The consultants' recommendations which we have not adopted, along with our basis, therefore, are as follows:

1. Consultants' Comments: Valve Supervision

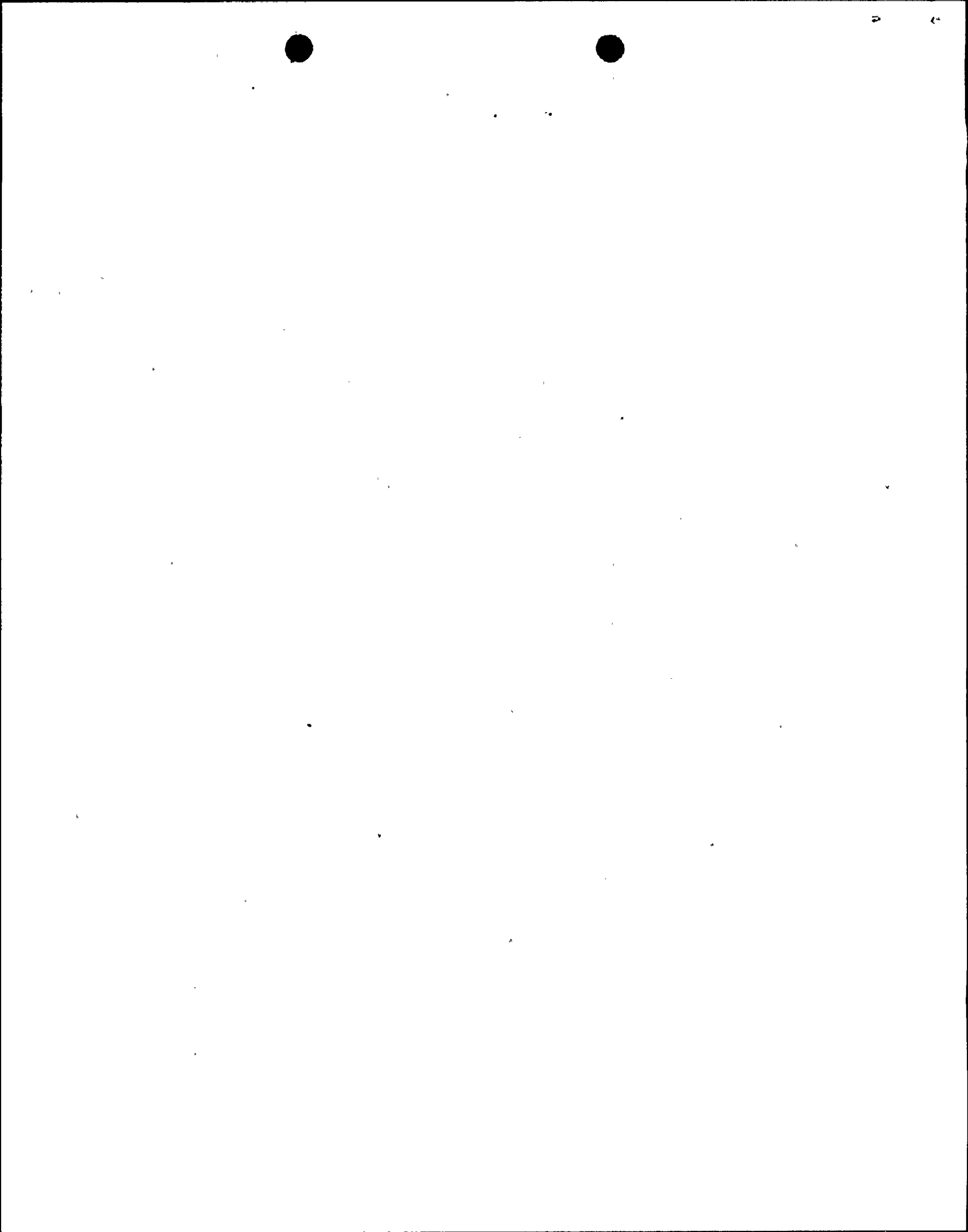
We recommend that electrical valve supervision be provided on all valves controlling fire water systems and sectionalizing valves. The present proposal of administrative controls of locks is unacceptable. See letter dated July 13, 1977 to Mr. R. L. Ferguson from Mr. R. E. Hall.

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 systems are in the correct position. Valves on other systems in the plant are presently under similar administrative control. The plant Technical Specifications require a monthly check of all valves in the flow path to fire suppression systems. Additionally, standing water as a result of failure of suppression system piping will not damage safety-related equipment due to curbs, drains, mounting of equipment above the 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 for nuclear plants.

2. Consultants' Comments: Fire Water Supply

The fire protection water supply for the plant consists of two 500,000 gallon above ground steel storage tanks. The tanks are filled through an 8-inch connection to the Ft. Pierce municipal water system and are equipped with low level alarms arranged to indicate in the control room when the level reaches 325,000 gallons in either tank. Taps are provided near the bottom of each tank for lines leading to the fire pumps. Taps are also provided for domestic water at the bottom of the tanks. (SER Item 4.3.1.1)



With this arrangement of taps to the fire water supply tanks, it is possible to draw down the level of water in the tanks to a volume less than that which may be required to fight a worst case fire - about 1953 gpm - 3 hours. We recommend that standpipes or elevated taps connected to the domestic water supply at an elevation that will assure at least 300,000 gallons of water in each tank be reserved exclusively for fire protection. An acceptable alternative would be a blind flange bolted on to one of the domestic water taps from one of the supply tanks. We do not recommend accepting locks and chains in place of the blind flange.

Staff Response

The licensee has agreed to assure dedication of one of the city water storage tanks for fire protection use by maintaining the valve to the domestic water pumps from this tank in the locked closed position except for emergency situations and maintenance situations as allowed by the Technical Specifications. The Technical Specifications now require that at least 300,000 gallons of water be maintained in each of the two city water storage tanks. The level of water in each tank is supervised by a low level annunciator that alarms in the control room should the quantity of water in either tank be less than 325,000 gallons. The Technical Specifications also require that the fire suppression water system shall be demonstrated operable by, in part, "...at least once per 31 days verifying that each valve (manual, power operated or automatic) in the flow path is in its correct position..." The licensee has also "agreed to install for the fire pumps the capability to take suction from either of the 500,000 gallon ground storage tanks."

The staff recognizes that Appendix A to BTP 9.5-1 recommends the utilization of standpipes in water supplying tanks that are not solely dedicated to fire protection. However, the staff believes that the (1) modifications and administrative controls proposed by the licensee, (2) water level supervision provided by alarm annunciation in the control room, and (3) Technical Specification requirements, including monthly surveillance of valves (i.e., see response to Item 1 above) will assure that an adequate supply of water will be available to fight a worst case fire for at least 3 hours.

The consultants' recommendations contained in the letter dated July 10, 1979 for which the Commission will be requesting additional information are as follows:

1. Fire Pumps and Controllers

The existing electrically driven fire pump controllers do not meet NFPA No. 20. We recommend that fire pump controllers that are UL listed and meet NFPA No. 20 be provided in order to supply more reliable control systems for the fire pumps. If the licensee claims that his controller

meets NFPA No. 20 and that each of the parts is UL listed, we recommend that the NRC request the licensee to prepare a point-by-point evaluation of their controller to the requirements of NFPA No. 20 and to state which controller parts now are UL listed and which are not.

2. Safety Related Cable Protection

The 19.50' elevation of the auxiliary building contains redundant trains of safety-related, safe shutdown cabling in cable trays located in the intervening space between the roof of fire areas 43, 44, and 54 and the ceiling slab above. All cables in these areas are coated with fire retardant coatings and fire detectors in the area are provided. The DSER addresses the adequacy of fire protection for this area by improvement of manual firefighting capability consisting of the addition of fixed access ladders to these areas. It is our opinion, however, that the utility has not adequately identified the function, routing, and separation of safety-related cables in this area in detail sufficient to judge the effects of a fire. For this reason, it is recommended that a detailed evaluation should be conducted of the cable areas above fire zones 43, 44, and 54 in order to determine if the existing fire protection provisions are adequate or if additional protection is required.

3. Duct Penetrations

The DSER recommends that the licensee evaluate the duct penetrations in barriers enclosing safety-related systems; and where safe shutdown could be effected by open duct penetrations, provide smoke or fire dampers. As written, this item does not provide the opportunity to review the licensee's evaluation by the staff and report the adequacy of the duct penetrations. We recommend that this be done. (Note: The information supplied in answer to questions 9, 10, 18, 19, 20 in the licensee's response dated September 29, 1978 and Article 5.9.2 of the revised FHA do not supply an area-by-area analysis.)