REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8102190691 DOC.DATE: 81/02/11 NOTARIZED: NO DOCKET #
FACIL:50-335 St. Lucie Plant, Unit 1, Florida Power & Light Co. 05000335
AUTH.NAME AUTHOR AFFILIATION
UHRIG,R.E. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
EISENHUT,D.G. Division of Licensing

SUBJECT: Forwards info re fire protection mods for facility, in response to NRC 801124 request. Item 6.0 re fire brigade size & training remains open. Items addressed include fire door evaluation & smoke detectors.

DISTRIBUTION CODE: A006S COPIES RECEIVED:LTR 2 ENCL 3 SIZE: 31
TITLE: Fire Protection Information (After Issuance of OP. Lic.)

NOTES:

	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL
ACTION:	CLARK,R.	04	7	7				
INTERNAL:	CHEM ENG BR-A	7	5	5	DIR,DIV OF LIC		1	1
	I&E	06	2	2	NRC PDR	02	1	1
	OELD		1	0	REG FILE	01	1	1
	WAMBACH,T.	10	1	1				
EXTERNAL:	ACRS	09	16	16	LPDR	03	1	1
	NSIC	05	1	1				

FEB 20 1981

TOTAL NUMBER OF COPIES REQUIRED: LTTR 37 ENCL 36

FLORIDA POWER & LIGHT COMPANY

February 11, 1981
L-81-48

Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Mr. Darrell G. Eisenhut, Director
Division of Licensing

Dear Mr. Eisenhut:

Re: ST. LUCIE UNIT 1
Docket No. 50-335
FIRE PROTECTION

Please find attached our responses to the open items concerning fire protection as identified in your letter dated November 24, 1980, except item 6.0, "Fire Brigade Size and Training," which we intend on implementing.

We believe that the provisions of the revised Section 10 CFR 50.48 and new Appendix R are adequately satisfied as described in the attachment. and as such demonstrate that the public health and safety is properly protected.

Very truly yours,

J. A. De Mastry
for

Robert E. Uhrig
Vice President
Advanced Systems and Technology

REU/JEM/mrs

Attachment

cc: Mr. James P. O'Reilly, Region II
Harold F. Reis, Esquire

A006
S 3/3

8102190691

F

RESPONSE TO STAFF
SUMMARY OF REQUIREMENTS
TO RESOLVE "OPEN ITEMS"

3.1.4 UPGRADE EXISTING FIRE PUMPS

NRC CONCERNS:

"In the SER, it was our concern that the existing fire pump installation may not be capable of providing fire suppression water in a fire emergency.

By letter dated October 3, 1979 and March 6, 1980, the licensee provided additional information. The licensee proposed three modifications for upgrading the fire pumps. These modifications are:

I. The first modification will provide the capability for the two fire pumps to automatically start upon a loss of offsite power and a drop of pressure in the fire water distribution system.

The design requirements to be met for this modification are:

1. Upon loss of offsite power, a specified diesel generator loading sequence is followed. The modification will be designed to accommodate proper diesel generator load sequencing.

2. Whenever possible, additional equipment and/or material will be similar to that which was used for the existing installation.

3. Equipment and material will be procured to qualification criteria at least as good as the "surrounding environment or circuitry".

II. The second modification provides for installation of a pressure switch for each fire pump such that if there is a drop of pressure in the distribution system in close proximity to the fire pump, the appropriate fire pump start circuitry will be engaged.

The design bases for this modification are:

1. In addition to the requirements of items I.(2) and I.(3) mentioned above, a setpoint will be used for the pressure switch such that a true drop of pressure is detected, and not surges which may cause false starts.

III. The third modification provides for the removal of the capability to stop the fire pumps from the control room.

The licensee's comparison indicated several instances where the existing fire pump controllers did not meet the requirements of NFPA-20 nor possess other compensating characteristic in lieu of the code requirements.

Based on this information, we conclude that the existing electric motor driven fire pump controllers are not equal in reliability to U. L. listed units conforming to NFPA-20 requirements. The basic arrangement of the control system could allow the fire pumps to be inoperable under some conditions. The resulting loss of fire protection water could negate both automatic and manual fire fighting systems in the plant and is, therefore, not acceptable.

To meet Section III, Paragraph A of Appendix R to 10 CFR Part 50, the licensee should upgrade the existing system as follows:

1. Replace both existing fire pump controllers with new controllers approved by U. L. and meeting all the requirements of NFPA-20.

2. Both electric fire pump power supplies should be available on loss of off-site power under all conditions, including ESFAS conditions. Each fire pump should be powered from a separate emergency diesel generator.

3. Cables for the electric motor driven fire pumps should be rerouted throughout the plant as necessary such that cables for redundant pumps are not located in the same fire area (where a fire area is to taken to be an area completely enclosed within fire barriers of the appropriate rating)."

FPL RESPONSE:

All the modifications identified in Section I, II and III were implemented prior to October 30, 1980. With regard to Item 1 of the additional requirements, attached is the matrix we transmitted as Attachment B to our letter of October 3, 1979, Number L-79-280, which supported our contention that the Class 1E fire pump controllers installed at St. Lucie Unit #1 meet or exceed the intent of NFPA-20. We further indicated that the installation of NFPA-20 controllers would in fact degrade the existing installation. In order to load a component on the diesel generator buses at St. Lucie, we are required

by the FSAR that the electrical breaker associated with that component meet as a minimum Class 1E requirements. Class 1E electrical equipment must meet all applicable sections of IEEE 323, IEEE-344 and the QA/QC requirements for safety-related equipment (10 CFR 50, Appendix B) which by far exceed the requirements in NFPA-20.

Please note that all safety-related pumps require Class 1E controllers at our facility as well as throughout the nuclear industry. Also, operating history has demonstrated the reliability of Class 1E controllers.

If we are required to replace our existing controllers as stipulated, we would have to remove the capability (see Item I, above) to automatically load the fire pumps on the diesel generators. Florida Power and Light Company considers this item closed.

Item 2 of the additional requirements exceeds the design criteria specified in BTP APCSB 9-5-1, Appendix A, Regulatory Guide 1.120, Revision 1 and 10 CFR 50, Appendix R. As specified in Section A4, Page 2, Appendix A to BTP APCSB 9.5-1:

> "Postulated fires or fire protection system failures need not be considered concurrent with other plant accidents or the most severe natural phenomenon."

Regulatory Guide 1.120, Revision 1, Section C.1.d(1), indicates:

> "Fires need not be concurrent with non-fire-related failures in safety systems, other plant accidents, or the most severe natural phenomena."

In 10 CFR 50, Appendix R, the allowable fire damage limit is both trains for equipment necessary for mitigation of consequences following design basis accidents. This infers that fires need not be considered during design basis accidents.

Considering the above, there is no need to load the fire pumps on the diesel generators in the presence of an ESFAS signal. We would like to point out that capability to manually load the pumps on the diesel generators is always maintained. In addition, the diesel generators are fully loaded assuming ESFAS conditions, and there is insufficient capacity to allow automatic loading of the fire pumps.

Florida Power and Light Company feels that we have satisfied all specified regulatory requirements in this area and we consider this item closed.

The intent of Item 3 of the additional requirements is met by our present design. In outside areas, power and control cables for each fire pump are routed in separate underground duct banks. In inside areas, spacial separation is maintained between cables associated with each of the fire pumps in accordance with safety-related separation criteria. Additionally, the cables are protected from exposure fires with Flamemastic 71A.

Florida Power and Light Company considers this Item closed.

3.6 FIRE DOOR EVALUATION

NRC CONCERN:

"In the SER, it was our concern that the fire doors separating fire areas or fire zones may not be adequate to prevent a fire from propagating from one area to another.

By letter dated August 24, 1979, the licensee provided a listing of the safe shutdown related fire areas with the fire loading in BTU/FT^2 for each area. It also contained a discussion concluding that upgrading or the installation of new fire doors is not necessary with the exception of the doors between the diesel generator rooms. The addition of three hour fire doors between the diesel generator rooms was previously required, and was identified in modification 3.14.2 of the SER.

The licensee did not indicate the location of fire doors, the rating of the barrier it is installed in, and the type of door presently installed. In addition, the licensee has justified the lack of fire doors in some areas on the low fire load calculated for the area. The calculated fire load does not include the combustible cable insulation and jacketing in the area, nor does it include a reasonable amount of transient combustibles that might be expected in each area as a result of maintenance operations. Therefore, we concluded that the licensee's response is not acceptable.

To meet the recommendation of Section D.1(j) of Appendix A to BTP APCSB 9.5-1 and the requirements of Section III, Paragraph G of Appendix R to 10 CFR Part 50, the licensee should protect door openings in all fire barriers enclosing safety-related fire areas with doors, frames and hardware that have been approved by a nationally recognized testing laboratory. The fire rating for such fire door installations shall be equivalent to that required for the barrier up to a maximum of a three hour rating."

FPL RESPONSE:

The size, location and type of doors and openings for safe shutdown related fire areas are provided in the applicable paragraphs of Section 7.0 and 8.4 of Florida Power and Light Company's report, "Fire Protection - A Reevaluation of Existing Plant Design Features and Administrative Controls", submitted 3/31/77.

Each of these openings was evaluated not only from the standpoint of fire load, but from an assessment on the potential for fire spread based on conservative design basis fire considerations and in situ fire protection. Cable insulation was not included in our fire load based on the capability of Flamemastic 71A, which is summarized in Section 3.1 of the referenced report and demonstrated by the Sandia test effort (see Attachment 2). Transient combustibles were included in the combustible inventory consistent with normal maintenance and operating requirements. Our assessment on quantity was based on the strict administrative controls utilized when combustible materials are required during maintenance activities. (Note that no definitive criteria has ever been provided for "a reasonable amount of transient combustibles".) As noted in the attachment to our letter dated August 24, 1979, Number L-79-235, the predominant combustible in enclosed safe shutdown fire areas is typically paint coatings. These coatings were conservatively included in our design basis fires considerations for each area.

Based on the extremely low fire loads in safe shutdown fire areas and the detailed design basis fire evaluations provided in the fire portection reevaluation report, upgrading or installation of fire doors beyond those currently installed would not result in any additional benefit to nuclear safety or to the health and safety of the public.

Florida Power and Light Company's position is that no further modifications are required.

3.7 VENTILATION DUCT PENETRATIONS

NRC CONCERN:

"In the SER, it was our concern that a fire could propagate from one fire area to another via the unprotected ventilation ducts.

By letter dated August 24, 1979, the licensee provided a listing of the fire areas of the plant which are safe shutdown related and with the fire loading in BTU/FT^2 for each area. No mention of upgrading was made by the licensee.

The licensee did not indicate where existing ventilation duct penetrations are located, the type and size of these penetrations and the fire rating of the penetrations. In addition, the licensee justified the lack of fire dampers in some areas on the low fire load calculated for the area. The calculated

fire load did not include the combustible cable insulation and jacketing in the area; nor did it include a reasonable amount of transient combustibles that might be expected in each area as a result of maintenace operations. Therefore, we concluded that the licensee's protection of ventilation ducts is not acceptable.

To meet the recommendations of Section D.1(j) of Appendix A to BTP APCSB 9.5-1 and the requirements of Section III, Paragraph G of Appendix R to 10 CFR Part 50, the licensee should protect penetrations for ventilation systems, in all fire barriers enclosing safety-related fire areas, by fire dampers and associated hardware that have been tested and approved by a nationally recognized testing laboratory. The fire rating for such fire damper installations shall be equivalent to that required for the barriers up to a maximum rating of three hours."

FPL RESPONSE:

The size and location of HVAC penetrations in safe shutdown related fire areas are provided in the applicable paragraphs of Section 8.4 of Florida Power and Light Company's fire protection report (see reference in item 3.6 above).

Each of these penetrations was evaluated not only from the standpoint of fire load, but from an assessment on the potential for fire spread based on conservative design basis fire considerations, in situ fire protection and fire resistance determinations on the ventilation ductwork (see Section 5.9.2 of the referenced report). Our positions on the combustible inventory in each safe shutdown related fire area are provided in our response to item 3.6 above.

Based on the extremely low fire loads in these fire areas, the detailed design basis fire evaluations provided in the fire protection report, and the fire resistance capability of the installed ductwork, upgrading or installation of fire dampers would not result in any additional benefit to nuclear safety or to the health and safety of the public. In fact, installation of fire dampers in all ventilation penetrations could be detrimental to the safe and efficient operation of the facility based on single failure considerations.

Florida Power and Light Company's position is that no further modifications are required.

3.9 CABLE SPREADING ROOM - FIRE BARRIER

NRC CONCERN:

"In the Fire Protection SER, the concern was that the lack of a fire rated closure in the 18 x 20 foot opening between the Train "B" switchgear room and the cable spreading room could result in a fire in either area spreading to the other area.

By letter dated July 27, 1979, the licensee committed to install a 1-1/2 hour fire rated barrier in the 18 x 20 foot wall opening between the cable spreading room and switchgear room "B". The wall design will meet the requirements of the American Institute of Steel Construction, and Regulatory Guide 1.29, Position C.2. The design of the fire door and its related components will comply with the latest requirements of the American Institute of Steel Construction, the National Fire Protection Association and the FSAR. The wall has not passed the ASTME-119 fire test for the required 1-1/2 hour duration.

We conclude that the proposed wall design is not acceptable since the design has not been tested by a nationally recognized testing laboratory and been shown to have a 1-1/2 hour fire rating when tested in accordance with ASTME-119 procedures.

To meet the requirements of Section III, Paragraph G of Appendix R to 10 CFR Part 50, the licensee should close the 18 x 20 foot opening with construction that has been successfully tested in accordance with ASTME-119 by a nationally recognized testing laboratory for 1-1/2 hours."

FPL RESPONSE:

The cable spreading room fire barrier was installed before October 30, 1980.

The barrier includes one fire door and two fire stops, all of which have equivalent to or better than 1½ hour ratings in accordance with ASTME-119. The remainder of the wall is constructed of layers of 5/8" Type X, U. S. Gypsum gypsum board; one 5/8" layer on one side of the barrier and two 5/8" layers on the other side.

This type of gypsum has been rated by U. L. Designation U411 for two hours in the configuration of two 5/8" layers of gypsum on each side of a 2-1/2" air space.

This gypsum was also tested by Ohio State University and rated for one hour (Test F1174-OSU) in the configuration of one 5/8" layer of gypsum on each side of a 2-1/2" air space.

Although the gypsum portion of the fire barrier has not been specifically tested, we feel the design as installed meets the intent of 1-1/2 hour fire barrier criteria.

Florida Power and Light Company considers this item closed.

3.12.7 SMOKE DETECTORS

NRC CONCERN:

"In the SER, it was our concern that the fire detection capability may not be adequate in the areas which contain:

1. Low Pressure Safety Injection Pumps

2. High Pressure Safety Injection Pumps

3. Containment Spray Pumps

The licensee has not responded to our concerns. To meet Section III, Paragraph F of Appendix R to 10 CFR Part 50, the licensee should install automatic fire detection systems in the above areas. These fire detection systems should be capable of operating with or without offsite power."

FPL RESPONSE:

On Page 4 of the Attachment to our letter of March 6, 1980, Number L-80-76, we provided the following:

"Automatic smoke detectors connected to the main fire alarm system in the control room will be provided for the LPSI, HSPI and Containment Spray Pump areas. Early warning detectors (ionization type) are to be installed in close proximity to the pumps to detect fires in the incipient stage. The fire detection design was performed in accordance with plant design criteria and utilizes components and materials similar to the original design. Both A and B zones were brought into the subject areas which will ensure redundant detection in safety-related areas in accordance with the original system design philosophy and FSAR Section 9.5.1."

Please note that the automatic fire detection system at St. Lucie, including the modifications identified above, is capable of operating with or without offsite power. This modification was implemented well before October 30, 1980.

Florida Power and Light Company considers this item closed.

3.13.13 REACTOR COOLANT PUMP LUBE OIL COLLECTION SYSTEM

NRC CONCERN:

"In the SER, it was our concern that a fire involving the reactor coolant pump lube oil could damage redundant safe shutdown systems.

By letter dated March 6, 1980, the licensee provided design information for modifications designed to prevent potential oil leakage from getting to the reactor coolant loop piping by:

1. Installation of a collection system capable of removing leakage of oil to a safe location.

2. Insuring that insulation installed on the RCP pump casing and loop piping does not have a surface temperature in excess of 150° F.

We find that the licensee's proposed modifications are not acceptable. The licensee has not indicated that the oil collection system will be capable of collecting lube oil from all potential pressurized and unpressurized leakage sites in all reactor coolant pumps' lube oil systems, or that it will drain the oil to a vented closed container.

The licensee should provide an oil containment and collection system which meets the requirements of Section III, Paragraph O of Appendix R to 10 CFR Part 50."

FPL RESPONSE:

The Reactor Coolant Pump Lube Oil Collection System at St. Lucie was designed to meet the following criteria:

1. Capable of collecting lube oil from all potential pressurized and unpressurized leakage sites in the reactor coolant pumps' lube oil systems,

2. Capable of draining lube oil from the collection system at the pumps to a safe location at a rate in excess of the largest anticipated leak in the lube oil systems,

3. Seismically analyzed to insure the system will remain on the Reactor Coolant Pump Motors during Design Basis Earthquake conditions, and

4. Capable of collecting a quantity of lube oil for each Reactor Coolant Pump in excess of the quantity which would require Unit shutdown to investigate (approximately 15 gallons for each pump).

Most of the system was installed during the April 1980 refueling outage. The balance of the system will be installed at the next convenient outage based on the design provided above. The only items not installed to date are the oil level instrument guard piping and the 15 gallon oil collection tanks for three of the four Reactor Coolant Pumps.

Based on the flash point of the lube oil in the Reactor Coolant Pumps, the only sources of ignition, given an oil leak, are the surfaces of the Reactor Coolant System components and piping. Considering these surfaces are insulated and elevated above floor level, the oil collection system need only drain the lube oil (from a leaking Reactor Coolant Pump Motor) from the collection system to floor level. A small collection tank is included for each pump to collect any anticipated leakage with overflow to the floor. Thus, a vented, closed container with capacity equal to the entire lube oil system is not required. The system, as designed, meets the intent of Appendix R to 10 CFR 50 in that the potential for Reactor Coolant Pump lube oil fires has been eliminated.

Florida Power and Light Company's position is that no further modifications are required.

4.1 SAFE SHUTDOWN SYSTEMS

NRC CONCERN:

"In the SER, it was our concern that the separation between redundant divisions of cables required for safe shutdown may not be adequate to prevent a single fire from affecting both divisions.

Our review determined that the minimum distance separating redundant divisions of safety-related cable trays is 4 feet vertically or 18 inches horizontally. In safety-related areas of the plant, all or most of the cables are coated with a fire retardant material. The licensee relies on administrative controls to limit the presence of transient combustibles, and on manual fire suppression efforts to combat fires, in many areas of the plant which contain redundant safe shutdown systems.

The licensee has not demonstrated that adequate protection features have been provided for cables and equipment of redundant systems important to achieving safe shutdown

conditions to ensure that at least one means of achieving such conditions survives postulated fires.

The licensee should protect the redundant cables in accordance with the requirements in Section III, Paragraph G of Appendix R to 10 CFR Part 50, alternate shutdown capability should be provided when safe shutdown cannot be ensured by barriers and detection and suppression systems because of the exposure of redundant safe shutdown equipment, cabling or components in a single fire area, to an exposure fire, or fire suppression activities, or rupture or inadequate operation of fire suppression systems. The alternate shutdown system should meet the requirements of Section L, Paragraph III of Appendix R to 10 CFR Part 50."

FPL RESPONSE:

Florida Power and Light Company has demonstrated the capability to safely bring the plant to cold shutdown given the design basis fires in each safe shutdown fire area (Reference Florida Power and Light Company's fire protection report).[1] We were able to make this determination due to a number of inherent design features at the facility. These features include:

1. Safe shutdown related cables are separated in accordance with the criteria identified above. (Note: This separation criteria is minimum spacial criteria between trains. Specific "A" and "B" train functions may be separated far in excess of the minimum criteria.) This separation criteria was licensed and accepted by the NRC.

2. All safe shutdown cable trays and trays in safe shutdown fire areas are sprayed with Flamemastic 71A which has been demonstrated to not only protect cable functions under certain fire conditions, but also to prevent fire propagation under extreme fire conditions (see Section 3.1 of our fire protection report[1] and Attachment 2).

3. The areas of large cable concentrations, the cable spreading room and cable loft areas, are not areas where combustibles are stored. In addition, there is no equipment in these areas which would require combustible materials for operation or maintenance.

4. Alarms are provided in the control room which is continuously occupied.

5. Early warning fire detectors are installed in all areas with major cable concentrations.

6. Our fire methodology for determining burn rates and gas and surface temperatures was developed in the fall of 1976. Florida Power and Light Company's technique and results have been shown to be conservative when compared to similar methodology developed by Sandia. Even based on our conservative

[1] FPL's report, "Fire Protection - A Reevaluation of Existing Plant Design Features and Administrative Controls," submitted 3/31/77.

methodology, design basis fires in areas of large cable concentrations were considerably smaller than any used in Florida Power and Light Company or Sandia test efforts. Thus, no cable damage or fire propagation will occur as a result of design basis fires in these areas.

7. Based on our conservative fire methodology and conservative assumptions on suppression capability (i. e., 50% effectiveness), Florida Power and Light Company demonstrated that although the fire could burn till extinguished in each area, the manual suppression capability at the facility is sufficient to extinguish all design basis fires.

To summarize, Florida Power and Light Company considers that St. Lucie satisfies the intent of 10 CFR 50, Appendix R, Section III. G. and that no further modifications are required.

ATTACHMENT 1

MATRIX COMPARING NFPA-20 TO CLASS 1E
REQUIREMENTS

1) Comparison between NFPA-20 1978 requirements for Fire Pump Electric Drive Controllers and PSL-1 Existing System

NFPA-20 Requirements	PSL-1 Existing System
Please note the following:	
"1-8 Definitions. 1-8.1 Controllers. 1-8.1.1 Controller means the cabinet, motor starter, circuit breaker and disconnect switch, and other control devices for the control of electric motors and internal combustion engine driven pumps. 1-8.1.2 Isolating Means is a switch intended for isolating an electric circuit from its source of power. 1-8.1.3 Disconnecting Means is a device, group of devices, or other means (such as a circuit breaker or disconnecting switches) whereby the conductors of a circuit can be disconnected from their source of supply."	
"1-5 Unit Purchase. 1-5.1 The pump, driver, and controller shall be purchased under unit contract stipulating compliance with this standard and satisfactory performance of the entire unit when installed."	As is standard with all plant controllers, including controllers, the controllers were purchased separate from the pumps and drivers. The fire pump controllers were purchased to nuclear grade Class IE control requirements. The testing and quality control requirements for Class IE equipment are much more stringent than NFPA-20 requirements.

2) NFPA-20 Requirements	PSL-1 Existing System
7-1.1 General.	
"7-1.1.1 All controllers shall be specifically listed for electric motor driven fire pump service."	Since the controllers for both fire pumps were purchased to nuclear grade Class IE requirements the equipment is certainly acceptable for fire pump service.
(a) Any controller selected shall have a short circuit rating at least equal to the available short circuit current for the circuit in which it is used.	Please note that Table 7-4.2.9 does not exist. Using Table 7-4.2.10, the recommended circuit breaks interrupting rating is 22,000 amperes symmetrical based on a 1500KVA transformer at a secondary voltage of 480 volts. The existing circuit breaker meets these requirements.
(b) Short circuit current at the controller shall be determined by using Table 7-4.2.9 when the installation meets the criteria established in the notes to the table. Otherwise a short circuit study must be made to establish the ayailable short circuit current at the controller in accordance with IEEE 141, Electric Power Distribution for Industrial Plants or IEEE 241, Electric Systems for Commercial Buildings. (See Appendix C.)	
7-1.1.2 All controllers shall be completely assembled, wired, and tested by the manufacturer before shipment from the factory.	Because the circuit breakers are a part of the nuclear grade Class IE load centers, the breakers were purchased, manufactured and tested to Class IE quality assurance requirements. Therefore, we believe a better product was obtained than if purchased as industrial grade.
7-2 Location.	
*7-2.1 Controllers shall be located as close as is practical to the motors they control and shall be within sight of the motors.	The fire pumps' circuit breakers and control circuitry are located in the Reactor Auxiliary Building (RAB), a reinforced concrete structure, and are a part of safety-related load centers which meet 7-2.2. To ensure the integrity and protection of the power supply, it is located in the RAB. The fire pumps are located adjacent to their water supply for obvious reasons. Therefore, it is not feasible to meet 7-2.1. However, a local control station with start/stop capabilities for each pump exists at the pump.
7-2.2 Controllers shall be so located or so protected that they will not be injured by water escaping from pumps or pump connections. Current carrying parts of controllers shall be not less than 12 inches (305 mm) above the floor level.	

3)

NFPA-20 Requirements	PSL 1 - Existing System
7-3 Construction	
7-3.1 Equipment. All equipment shall be suitable for use in locations subject to a moderate degree of moisture such as a damp basement.	As previously stated, the circuit breakers and control circuitry are located in a reinforced concrete building which precludes a "damp basement" and "falling drops of water." The above are in a seismically qualified steel cabinet which is attached to the concrete floor.
7-3.2 Mounting. All equipment shall be mounted in a substantial manner on a single noncombustible supporting structure.	
7-3.3 Enclosure. The structure or panel shall be securely mounted in an enlosure(s) which will protect the equipment against mechanical injury and falling drops of water striking the enclosure from the downward vertical.	
7-3.4.3 Bus bars and other wiring elements of the controller shall be designed on a continuous duty basis.	Equipment meets these requirements as a minimum.
7-3.5 Protection of Auxiliary Circuits. Circuits which are depended upon for proper operation of the controller shall not have overcurrent protective devices connected in them.	Circuitry must be protected against overcurrent to prevent damage and the possibility of fire. If power is lost to the pump, the control room is immediately notified by bus undervoltage relays. Control power is not required to maintain operation of the pumps. However, if control power is lost, the breakers have the capability of being manually closed or tripped. Due to the total separation (electrical and physical) loss of one pump due to actuation of overcurrent devices will not affect operability of the other pump. Since NFPA-20 does not require redundant pumps or any continuous manning of facilities an argument does exist for running the only pump to destruction in the hope that the fire will be put out before pump failure. This is not true for a redundant pump installation. Additionally, removal of over current protection from the fire pumps would require they be removed from the emergency (diesel generator supplied) busses due to nuclear safety concerns. This would eliminate the fire water system in the event of a loss of off site power.

4)	NFPA-20 Requirements	PSL-1 Existing System
	7-3.6 External Operation. All switching equipment for manual use in connecting or disconnecting, or starting or stopping the motor shall be externally operable as defined in NFPA 70, National Electric Code (see Appendix C).	The circuit breakers can be manually operated externally to the cubicle.
	7-3.7 Wiring Diagrams and Instructions. 7-3.7.1 A wiring diagram shall be provided and permanently attached to the inside of the controller enclosure. 7-3.7.2 All the field wiring terminals shall be plainly marked to correspond with the wiring diagram furnished.	A wiring diagram is not provided inside the controller enclosure. If wiring revisions are necessary, plant personnel experienced with this equipment have necessary drawings available. All terminals and cables (except for manufacturer's cables) are plainly marked. It should be noted that both operations and maintenance activities at a nuclear plant, on equipment powered from safety related (Class IE) busses, is quite strictly controlled by the existing NRC mandated QC/QA program: This is not true for most of the facilities covered by NFPA-20.
	7-3.8 Marking. Each motor control device and each switch and circuit breaker shall be marked to plainly indicate the name of the manufacturer, his designated identifying number and the electric rating in volts, horsepower, amperes, frequency, phases, etc., as may be appropriate. The markings shall be so located as to be visible after installation. *7-3.9 Instructions. Complete instructions covering the operation of the controller shall be provided and conspicuously mounted on the controller,	Nameplates for ratings of equipment are provided where necessary. Instruction manuals are not required for operation of the breaker because operations personnel are knowledgeable in the electrical and manual operation of the breaker.

5)	NFPA-20 Requirements	PSL-1 Existing System
	7-4 Components	
	7-4.1 Isolating Means. The isolating means shall be a manually operable motor circuit switch or a molded case switch, either having a horsepower rating equal to the motor horsepower.	See circuit breaker section (7-4.2.)
	Exception 1. A molded case switch having an ampere rating of not less than 115 percent of the motor full load current, and also suitable for interrupting the motor locked rotor current shall be permitted.	
	Exception 2. This isolating means is not required on limited service controllers.	
	7-4.1.1 The isolating means shall be externally operable (see 7-3.6).	
	7-4.1.2 The ampere rating of the isolating means shall be at least 115 percent of the nameplate current rating of the motor.	
	"7-4.2 Circuit Breaker (Disconnecting Means). The motor branch circuit shall be protected by a suitable magnetic trip-type circuit breaker, connected directly to the load side of the isolating means and conforming with the following requirements: .	The design philosophy at PSL-1 for motors greater than 100hp, whether nuclear safety-related or non-safety related, was to utilize stored energy circuit breakers versus magnetic type motor starters. In this design, the stored energy circuit breaker replaces the need for an isolating means and motor starter. The fire pump breakers are fed from a safety related load center and are capable of being loaded onto the emergency diesel generators.
	Exception: The circuit breaker for a limited service controller need not be a magnetic trip type. (See 7-7.2.)	The fire pump motors' circuit breakers were purchased to nuclear grade Class IE requirements and provide for locked rotor and instantaneous short circuit protection in accordnace with NFPA-20. These breakers open and close via stored energy, thus once closed, the breakers will remain closed upon loss of control power. This design is more reliable than the magnetic starter recommended by NFPA-20 since once control power is lost, power to the motor is also lost. In addition, the circuit breaker has the capability of being manually opened or closed, thereby increasing system reliability.

6)

NFPA-20 Requirements	PSL-1 Existing System
7-4.2.1 No other overcurrent protective devices shall be in the motor circuit on the load side of the circuit breaker [See 6-3.4 for rating and setting of overcurrent devices in the circuit on the line side of the circuit breaker. See NFPA 70, National Electrical Code, Sections 430-37 and 240-20(a) for the number of overcurrent units required for circuit protection devices (see Appendix C).]	The existing circuit breakers meet sections 7-4.2.1 through 7-4.2.6. The fire pump's full load current is 275 amperes versus the breaker's continuous rating of 600 amperes.
7-4.2.2 The circuit breaker shall have one pole for each ungrounded branch circuit conductor.	
7-4.2.3 The circuit breaker shall be externally operable.	
7-4.2.4 The circuit breaker shall trip free of the handle.	
7-4.2.5 The circuit breaker rating shall be not less than 115 percent of the rated full load current load of the motor.	
7-4.2.6 The circuit breaker shall permit normal starting of the motor without tripping.	
7-4.2.7 The circuit breaker shall provide locked rotor and instantaneous short circuit protection.	The circuit breaker provides for locked rotor and instantaneous short circuit protection and various other valves depending upon the time-current trip setting relationship. The breaker is set to trip between a minimum of 8 and 20 seconds for locked rotor conditions.
(a) For a squirrel cage induction motor, the circuit breaker shall be:	
1. Of the time delay type having a tripping time between 8 and 20 seconds at locked rotor current (this is approximately 600 percent of rated full load current for a squirrel cage induction motor).	
2. Calibrated in amperes up to and set at 300 percent of the motor full load current.	

7) NFPA-20 Requirements	PSL-1 Existing System
7-4.2.8 The overcurrent sensing elements of the circuit breaker shall be of the nonthermal type. Exception: Ambient temperature compensated thermal elements may be used.	The overcurrent sensing elements are of the nonthermal type.
*7-4.2.9 The interrupting rating of the circuit breaker shall be equal to or greater than the available short-circuit current for the circuit in which it is used. When the available short-circuit current at the line terminals of the controller exceeds the interrupting rating of the largest available breaker, the circuit breaker used shall be protected with current limiting fuses (bolted type Class J or L) coordinated with the circuit breaker so that the short-circuit currents within the circuit breaker rating are interrupted by the circuit breaker only. These fuses shall hold locked rotor current of the motor continuously [for further detail see ANSI C37.27 (see Appendix C).] Coordinated in this sense means that the characteristics of 7-4.2.7 shall be provided by the circuit breaker alone, and the fuse shall not permit peak let-through current in excess of 2.3 times the 240 volt rms symmetrical interrupting rating of the circuit breaker. The crossover point of the fuse curve shall be to the left of the intersection of the interrupting rating of the circuit breaker on the instantaneous trip clearing time curve of the circuit breaker. The current limiting fuses shall be mounted in the controller panel and connected between the isolating means and the circuit breaker (See Fig. A-7-4.2.9.)	Using NFPA-20 Table 7-4.2.10, the recommended circuit breaker interrupting rating is 22,000 amperes based on a 1500KVA transformer at a secondary voltage of 480 volts. The existing circuit breaker is rated for 22,000 amperes symmetrical. This exceeds the available short circuit current.
7-4.2.10 The circuit breaker interrupting rating shall be selected by using Table 7-4.2.10 when the installation meets the criteria established in the notes to the Table. Otherwise, a short-circuit study must be made to establish the available short-circuit current at the controller in accordance with IEEE 141, Electric Power Distribution for Industrial Plants or IEEE 241, Electric Systems for Commercial Buildings. (See Appendix C.)	

8)

NFPA-20 Requirements	PSL-1 Existing System
7-4.3 Motor Starter	See reply to section 7-4.2.
7-4.3.1 The motor shall be of the magnetic type with a contact in each ungrounded conductor.	
7-4.3.2 For electrical operation of reduced voltage starters, timed automatic acceleration of the motor shall be provided. The period of motor acceleration shall not exceed 10 seconds.	
7-4.3.3 Starting resistors shall be designed to permit one five second starting operation in each 80 seconds for a period of not less than one hour.	
7-4.3.4 The operating coil for the main contactor shall be supplied directly from the main power voltage and not through a transformer (for controllers of 600 volts or less).	
*7-4.4 Alarm and Signal Devices on Controller. A pilot lamp (6w or 7w, 115-125 volt, candelabra base) shall be connected to a pair of power supply conductors directly on the line side of the motor starter (load side of the circuit breaker) to indicate that the circuit breaker and test link are closed and that power is available at the controller for starting. The lamp shall be accessible for replacement.	Indicating lights are a part of the breaker cubicle to inform personnel that either the breaker is open or closed, and therefore that control power is available. Meters are available on the Load Center to inform personnel that power is available.

9)	NFPA-20 Requirements	PSL-1 Existing System
	7-4.5 Alarm and Signal Devices Remote from Controller. When the pump room is not constantly attended, audible or visual alarms powered by a source, not exceeding 125 volts, shall be provoided at a point of constant attendance. These alarms shall indicate the following:	Audible and visual alarms are provided via the annunciator system in the control room to indicate if the fire pumps are running or the local control switch is in the stop position. Power for these items is provided from the safety-related power supplies of 125 vdc. Loss of power to the breaker is detected immediately by bus under voltage relays and alarmed in the control room.
	(a) Controller has operated into a motor running condition. This alarm circuit shall be energized by a separate reliable supervised power source, or from the pump motor power, reduced to not more than 125 volts.	
	*(b) Loss of line power on line side of motor starter, in any phase. This alarm circuit shall be energized by a separate reliable supervised power source.	
	7-4.6 Controller Alarm Contacts for Remote Indication. Controllers shall be equipped with contacts (open or closed) to operate circuits for the conditions covered in 7-4.5.	Alarm contacts for indication of pump running is obtained from the motor's breaker.
	7-5 Starting and Control.	
	*7-5.1 Automatic and Nonautomatic.	
	7-5.1.1 An automatic controller shall be operable also as a nonautomatic controller.	The fire pump installation meets the requirements of sections 7-5.1.1 and 7-5.1.2.
	7-5.1.2 A nonautomatic controller shall be actuated by manually initiated electrical means and by manually initiated mechanical means.	

10)	NFPA-20 Requirements	PSL-1 Existing System
	7-5.2 Automatic Controller.	
	*7-5.2.1 Water Pressure Control.. In the controller circuit there shall be provided a pressure-actuated switch having independent high and low calibrated adjustments, and responsive to water pressure in the fire protection system. The pressure sensing element of the switch shall be capable of withstanding a momentary surge pressure of 400 psi (27.6 bars) without losing its accuracy. Suitable provision shall be made for relieving pressure to the pressure-actuated switch, to test the operation of the controller and the pumping unit. (See Fig. A-7-5.2.1.)	The shut-off head on the fire pumps is a maximum of 150 psi. System pressures in excess of this shut-off head are not expected. The maximum pressure to which the pressure switches may be exposed without harmful effect to set point repeatability is 250 psi. Therefore, the requirement of section 7-5.2.1 is met.
	(a) Each controller for multiple pump installations shall have its own individual pressure sensing line.	There are two pressure sensing elements (for the transformer deluge system and plant fire header) which detect low pressure and start the fire pumps. Both controllers (pressure switches) have their own pressure sensing line and provisions are made for relieving pressure for purposes of testing both pressure switches.
	7-5.2.2 Fire Protection Equipment Control. When the pump supplies special water control equipment (deluge valves, dry pipe valves, etc.) and it is desired to start the motor before the pressure-actuated switch(es) would do so, the controller shall be equipped to start the motor upon operation of the fire protection equipment. This equipment shall be a relay of the drop-out type. The relay shall be actuated from a normally closed contact on the fire protection equipment.	The pressure switch for the transformer deluge system uses a normally closed contact for low pressure.

11)	NFPA-20 Requirements	PSL-1 Existing Systems
	"7-5.2.3 Manual Electric Control at Remote Station. When additional control stations for causing nonautomatic continuous operation of the pumping unit, independent of the pressure-actuated switch, are provided at locations remote from the controller, such stations shall not be operable to stop the motor."	The controllers (circuit breakers) are located with the safety related load centers which have the capability of starting/stopping the fire pumps. Adjacent to each fire pump is a local control station with the capability of starting, stopping and engaging the automatic circuitry of the fire pumps. The existing system also has a control switch in the control room with the capability of stopping or engaging the automatic circuitry of the fire pumps. If either switch, local or control room, is placed in the stop position, annunciation is provided in the control room. The use of a stop switch in the control room is the same philosophy utilized for safety-related equipment.
	"7-5.2.4 Sequence Starting of Pumps Operating in Parallel. The controller for each unit of multiple pump units shall incorporate a sequential timing device to prevent any one motor from starting simultaneously with any other motor. If water requirements call for more than one pumping unit to operate, the units shall start at intervals of five to ten seconds. Failure of a leading motor to start shall not prevent subsequent pumping units from starting."	The fire water system is designed to and has operated with both pumps starting at the same time. Therefore, we see no advantage to starting the pumps sequentially. A disadvantage would be slower pressure recovery time. Also, the nuclear facility has more power supplies available than most industrial/commercial facilities and both normal and emergency power supplies are totally separated for the two pumps so simultaneous starting presents no electrical loading problems. Failure of either pump to start will not affect starting of the other pump.

12)	NFPA-20 Requirements	PSL-1 Existing System
	"7-5.2.5 External Circuits Connected to Controllers. With pumping units operating singly or in parallel, the control circuits leaving or entering the fire pump controller shall be so arranged that breakage, disconnecting, shorting of the wires or loss of power to these circuits may cause continuous running of the fire pump but shall not prevent the controller(s) from starting the fire pump(s) due to causes other than these external circuits."	As stated previously, the circuit breaker is a stored energy type of controller. If control power is lost while the pump is operating, the breaker will remain closed thereby supplying power to the motor. The breaker can also be operated manually if control power is lost.
	7-5.3 Nonautomatic Controller.	
	"7-5.3.1 Manual Electric Control at Controller. There shall be a manually operated switch on the control panel so arranged that when the motor is started manually, its operation cannot be affected by the pressure-actuated switch. The arrangement shall also provide that the unit will remain in operation until manually shut down.	The existing system meets these requirements.
	7-5.3.2 Manual Mechanical Control at Controller.	
	(a) The controller shall be equipped with a handle or lever which operates to close the motor-circuit switching mechanism mechanically. This handle or lever shall provide for nonautomatic continuous running operation of the motor(s) independent of any electric control circuits, magnets or equivalent devices, and independent of the pressure-activated control switch. Means shall be incorporated for mechanically latching or holding of the handle or lever for manual operation in the actuated position. The mechanical latching shall not be automatic, but at the option of the operator.	The stored energy circuit breaker is provided with a manual spring charging/breaker closing handle which in one continuous downward pull of the handle, the two closing springs are charged and near the end of the stroke are discharged to fast close the circuit breaker. If the handle is released prior to the discharging of the springs, the handle will return to its initial position.
	(b) The handle or lever shall be arranged to move in one direction only from "off" to final position.	
	(c) The motor starter shall return automatically to the "off" position in case the operator releases the starter handle in any but the full running position.	

13)	NFPA-20 Requirements	PSL-1 Existing System
	7-5.4 Methods of Stopping. Shutdown shall be accomplished by the following methods:	
	1. Manual--operation of reset pushbutton on outside of controller enclosure which, in the case of automatic controllers, shall return the controller to full automatic position.	The existing system meets these requirements.
	2. Automatic shutdown after automatic start (optional)--if controller is set up for automatic shutdown after starting causes have returned to normal, a running period timer set for at least one minute running time for each ten horsepower of motor rating (but which need not exceed seven minutes) shall be used.	After the fire pumps are started, they must be manually shut down.

NFPA-20 Requirements	PSL-1 Existing System
14)	
In addition to your request for information pertaining to the electrical controllers, FP&L believes that the following information will be of interest to the NRC Staff Review Team.	
*6-3 Power Supply Lines.	
*6-3.1 Type of Lines. The lines between the power plant(s) and the pump room shall be of such number, so arranged and so located that there will be small chance of an interruption of service to the motor(s), due to accident to the lines.	The raceway provided for control and power to the pump/motors' controllers and motor termination points are designed with the requirements of 6-3.1 in mind. The same philosophy is utilized for safety-related cables.
6-3.2 Pump Room Wiring. All wiring in the pump room shall be in rigid metal conduit, electrical metallic tubing or liquid-tight flexible metal conduit.	The existing system meets the requirements of Section 6-3.2.
6-3.3 Capacity of Lines.	
6-3.3.1 Each line between the power supply circuits at utility plants, substations or plant load distribution centers and ahead of fire pump feeder circuits shall be sized in accordance with NFPA 70, National Electrical Code, Article 430, Part B, Motor Circuit Conductors; Section 230-2, Exception 1; Section 230-44 and Section 230-82, Exception 5. (See Appendix C.)	The existing system meets these requirements as a minimum.
6-3.3.2 Each line installed in the fire pump feeder circuit shall be sized at 125 percent of the sum of the full load current(s) of the fire pump and jockey pump motor(s) plus the current of the necessary associated fire pump installation electrical accessories. [See NFPA 70, National Electrical Code, Section 230-90(a), Exception 5 (see Appendix C).]	The cable used in power and control circuitry was purchased to nuclear grade Class 1E requirements. The cables ahead of and in the fire pump feeder circuits are conservatively sized to meet or exceed NFPA-20 requirements. For example, the power feed between the circuit breaker and the motor is sized approximately 50% greater than required by NFPA-20.
The fire pump feeder circuit conductors shall be physically routed outside of the building(s), excluding the switch room (when involved) and the pump room. When the fire pump feeder conductors must be routed through buildings, they shall be buried or protected with two inches (51 mm) of concrete or equivalent in order to be judged "outside of the building" according to NFPA 70, the National Electrical Code, Article 230-44. (See Appendix C.)	

15)	NFPA-20 Requirements	PSL-1 Existing System
	"6-3.3.3 The voltage at the motor shall not drop more than five percent below the voltage rating of the motors when the pumps are being driven at rated output, pressure, and speed, and when the lines between power station(s) and motors are carrying their peak loads."	The existing system meets the requirements of sections 6-3.3.3 and 6-3.3.4 as a minimum.
	"6-3.3.4 Where squirrel-cage motors are used, the capacity of the generating station(s), the connecting lines, and the transformers shall be ample to keep the voltage from dropping more than 15 percent below normal voltage under motor starting conditions."	
	6-3.4 Power Supply Protective Devices.	
	"6-3.4.1 When power supply protective devices (fuses or circuit breakers) are installed in the power supply circuits at utility plants, substations, or plant load distrubtion centers ahead of the fire pump feeder circuits, such devices shall not open at the sum of the locked rotor currents of the fire pump motor(s) and the maximum plant load currents."	The existing system meets the requirements of sections 6-3.4.1 and 6-3.4.2.
	"6-3.4.2 When power supply protective devices (fuses or circuit breakers) are installed in the fire pump feeder circuit, such devices shall not open at the sum of the locked rotor currents of the fire pump motor(s) and the necessary associated fire pump installation electrical accessory currents." [See also NFPA 70, the National Electrical Code, Section 230-90(a), Exception 5. (See Appendix C).]	

ATTACHMENT 2

FLORIDA POWER AND LIGHT COMPANY'S
SUMMARY OF THE SANDIA TESTS
WITH REGARD TO
FLAMEMASTIC 71A

FLORIDA POWER AND LIGHT COMPANY'S

SUMMARY OF THE SANDIA TESTS
WITH REGARD TO
FLAMEMASTIC 71A

The full scale two-tray coating fire tests conducted by Sandia were established to determine if flame propagation would occur between trays as a result of a fire in the bottom tray. The Sandia test method is probably the most severe test method used to date because of the conservative test conditions, e. g. 1.) Open ladder cable trays, 2.) Very low cable fill percent because of figure eighting of cables in order to obtain heat and air venting openings, 3.) Used the worst of the unqualified cables, 4.) Used two 70,000 btu/hr burners and 5.) Both burners aligned to directly impact the coated cables a distance of 4.75 inches away.

In the Flamemastic 71A, non-IEEE 383 cable test, it took 10 minutes to ignite the cables in the bottom tray. Following this, the cables in the bottom tray burned for 26 minutes before self-extinguishing and achieved a maximum temperature of only 1260^{0}F. The cables in the top tray did not short, did not burn, were undamaged and achieved a maximum temperature of only 167^o F. In conclusion, the same coating system (Flamemastic 71A), with the same application technique, on cables similar to those at Turkey Point and St. Lucie passed the Sandia test.

Please note that a larger exposure fire than that used in the test would not have caused propagation of flames to the upper tray, but would have only ignited the lower tray sooner.

Further and contrary to the Staff's position, Flamemastic 71A also effectively seals in the combustible inventory associated with the cable insulation. The very severe Sandia fire test of the Flamemastic 71A coated non-IEEE 383 cables discussed above yielded a weight loss of only 7-1/2 pounds. This loss is attributable to burned cable insulation and pyrolized organic binder in the Flamemastic 71A and in total has a heat release equivalent of approximately two changes of street clothing. This small amount of energy spread over the fire areas in question will have an insignificant affect on temperatures.