Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge, New Jersey 08038

Nuclear Department

TITLE: JUSTIFICATION FOR CONTINUED OPERATION OF SALEM UNITS 1 AND 2 WITH OUTSTANDING FIRE PROTECTION CONCERNS

1.0 PURPOSE

This Safety Evaluation has been prepared to justify the continued safe operation of Salem Unit No. 1 and No. 2 in light of recent fire protection findings.

2.0 SCOPE

This Safety Evaluation is applicable to the operation of both Salem Unit No. 1 and Salem Unit No, 2.

3.0 REFERENCE

3.1 Appendix R to 10CFR50, Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979, Sections III.G, III.J, III.L and III.0.

3.2 USNRC Generic Letter 81-12, "Fire Protection Rule (45 FR 76602, November 19, 1980)", dated February 20, 1981.

3.3 Licensee Event Report 87-009-03, "Appendix R Criteria Non-Conformance".

3.4 Incident Report 87-343, "Appendix R 10CFR50 Review"

3.5 Incident Report 87-356, "Penetration Seal Lacking Adequate Material Depth" (Note: 4 separate incidents)

3.6 Incident Report 87-360, "Inoperable Fire Barrier"

3.7 Incident Report 87-348, "Breaker Coordination

3.8 Incident Report 87-352, "Alternate Shutdown UHF Radio Communication System Power Supply Loss"

3.9 Incident Report 87-354, "Units 1 & 2 Auto-Acuation CO2 Systems for the 1A, 1B, 1C, 2A, 2B, 2C Diesel Generator/Control Rooms"

3.10 Letter from C. A. McNeill to the US NRC, dated September 18, 1987

3.11 Appendix R Breaker Coordination Study, draft September 18, 1987

3.12 FIRE HAZARDS ANALYSIS AND CALCULATIONS, REV. 2 dated September 9, 1987

3.13 Safety Evaluation SGS/MSE-067 "Emergency Diesel Generator - Operation in CO2 Environment" dated October 16, 1980

4.0 DISCUSSION

In January, 1987, a Comprehensive Fire Protection Improvement Program was initiated for Salem Unit No. 1 and Unit No. 2. During the course of the improvement program and the NRC's recent inspection of Salem Unit No. 2, several deficiencies were identified. These deficiencies were summarized in a letter to the USNRC dated September 18, 1987 and are listed below:

(a) With respect to common power source associated circuits, a draft evaluation performed for Salem Units No. 1 and No. 2 indicates that breaker coordination may not exist at several voltage levels.

(b) The penetration seal program has determined that the test documentation available to justify the installed configuration of penetration seals in rated fire barriers does not adequately envelope all types and configurations of seals in the units.

(c) A postulated fire in the Relay Room could result in Control Room evacuation and adversely impact the communication system's operability.

(d) The Fuel Oil Storage Room 1(2)FA-DG-84D contains redundant cabling for the "B" and "C" train Diesel Generators.

(e) The Upper Electrical Penetration Area 1(2)FA-EP-100G contains redundant cables affecting room coolers and by association the Diesel Generator Fuel Oil Transfer Pumps.

(f) The CO2 Equipment Room 1(2)FA-DG-84F contains redundant cabling for the Diesel Generators, the Service Water System and the Diesel Generator Fuel Oil Transfer Pumps.

(g) In the Auxiliary Building, Elevation 64' 1(2)FA-AB-64B, a single panel contains cabling for redundant Residual Heat Removal Room Coolers.

(h) The Pipe Tunnel designated Fire Area 12FA-PT-84 contains redundant cabling for all trains of the Unit 2 Service Water System including pump power cabling.

(i) The CO2 system for each Diesel Generator Room is actuated by the fire protection system which could be subjected to a single fire-induced failure.

(j) Post-fire emergency lighting units were unavailable. (The lighting unit discrepancy was not addressed in the letter to the NRC, however, during the inspection the issue was discussed).

4.1 With respect to the breaker coordination, Appendix R to 10CFR50 Section III.G and III.L requires protection of redundant safe shutdown cabling, including associated circuits. Postulated fire damage to circuits was to include hot shorts, open circuits and shorts to ground. A definition of associated circuits is provided in Generic Letter 81-12. The definition includes those circuits (safety related and non-safety related) associated with cabling needed for shutdown equipment, by a common power source. For example, the 4KV vital buses provide power to both shutdown equipment (service water pumps) and non-shutdown equipment (containment spray pumps). For the Salem electrical distribution system, the vital power cabling encompasses both safety-related and non-safety cabling. The vital power supplies below the 4 KV level are separated from non-vital power sources. (There is one exception at the 125V DC level which is discussed below) Shutdown equipment is powered strictly from vital power sources and; thus, consideration of breaker coordination for Appendix R is limited to vital cabling.

Appendix R requires protection to the extent that fire damage to the cabling of the non-shutdown equipment will not result in loss of power to redundant shutdown equipment. Protection could be provided by either breaker coordination or physical separation and fire protection measures (cable wrap).

The draft evaluation was performed specifically to evaluate breaker coordination for Appendix R purposes. As such, the evaluation typically addressed only the larger loads on each bus. If coordination was demonstrated on the larger loads, all loads were then considered coordinated by inspection.

The draft evaluation indicates that breaker coordination may not exist for all devices of the following voltage levels: 460V-230V Load Centers, 230V Motor Control Centers; 120V AC Systems; 125V DC Systems; and 28V DC Systems. For the 4KV voltage level, the draft evaluation indicates that breaker coordination exists for equipment when relying upon the Diesel Generators for safe shutdown. During the NRC inspection, it could not be demonstrated that breaker coordination was provided when equipment was powered from offsite sources. However, subsequent evaluations have demonstrated coordination between the 4KV buses and the offsite sources. Appendix R requires consideration of a fire concurrent with a loss of offsite power.

For the 460V-230V Load Centers, the draft evaluation indicates that, with the exception of the larger feeders, coordination exists between the upstream protective devices and the feeder breakers. For the larger feeders, the report indicates that small bands of non-coordination exist. For the 460V level, approximately 20 - 25% of the devices evaluated indicated non-coordination. For the 230V level, approximately 40% of the devices evaluated indicated non-coordination.

For the 230V Motor Control Centers, the draft evaluation indicates that coordination does not exist for the devices evaluated. The report indicates problems with instantaneous elements which do not provide selectivity with the downstream thermal-magnetic or magnetic-only breakers on the MCCs.

For the 120V AC Systems, the draft evaluation indicates that the use of an inverter power supply, with its limited short circuit output, effectively eliminates any coordination concern between the inverter output breaker and the downstream instrument bus. (Note: An instrument bus at Salem is equivalent to a distribution cabinet). However, the same current limiting feature of the inverter causes the clearing time of the downstream devices to be extremely long. Thus, until the protective devices can operate, a fault on one circuit could cause a reduced voltage at the other bus loads.

For the 125V DC and 28V DC Systems, the draft evaluation indicates that coordination exists between the battery output fuse and the downstream breakers on the DC switchgear. Breaker coordination is provided for the non-vital DC switchgear; thus, separating faults in the non-vital cabling from the vital cabling. However, the distribution cabinet breakers are not coordinated to the switchgear feed for the distribution cabinet.

The draft evaluation included some conservative assumptions that are typically utilized for an Appendix R type of evaluation. The coordination calculations did not consider short-circuit levels as a means of providing coordination. Short-circuit levels depend upon cable length and cable size. Since a fire could occur anywhere along the cable, short-circuit levels are not considered. Conversely, that means coordination may indeed exist for specific areas of the plant. In addition, only the larger loads were evaluated. Thus, coordination may exist for other loads.

Each plant area was reviewed to establish the potential for fire-induced circuit problems. Since vital power supplies from the Diesel Generators are credited for post-fire shutdown, cable tray and conduit layout drawings were reviewed to determine the plant areas where a fire could potentially damage redundant vital cabling. If the fire area contains cabling associated with only one vital division of power, safe shutdown could not be impacted by a fire. Safe shutdown can be achieved utilizing two of the three plant's vital power divisions. Attachment I provides a summary of this review by fire area.

For those plant areas where a fire could potentially damage redundant vital cabling, fire watches have been established. If the area is protected by an installed fire detection system, the fire watch will patrol the area hourly. If no detection is present, a continuous fire watch has been established. With the exception of 12 high radiation/high contamination rooms and the pipe alley of each unit, the fire watch is provided throughout the fire area.

Fire watches are restricted from the high radiation/high contamination rooms for ALARA considerations. For the volume control tank room of each unit, the fire watch will not enter the room; however, the area around the room is covered by an hourly fire watch. The room itself contains no vital cabling; thus a fire in the room would need to propagate beyond the room before the potential exists to adversley affect shutdown capability. The room boundaries although not rated fire boundaries, do provide a degree of separation between the redundant and separated power cabling. Similarly, the Spent Resin Storage Tank Rooms, the CVCS Holding Tank Rooms 13 and 23, and the pipe alleys of both units will not have a fire watch patrol. These rooms do not contain vital cabling.

For the CVCS Hold-up tank rooms 11, 12, 21, and 22, TV cameras and remote monitors have been installed to monitor the rooms. The fire watch will observe the camera's monitor as part of the patrol for the area. By October 15, 1987, a smoke detector will be installed in the exhaust ductwork common to CVCS Hold-up tank rooms 21 and 22. By October 20, 1987, a smoke detector will be installed in the exhaust ductwork common to CVCS hold-up tank rooms 11 and 12.

For the letdown heat exchanger rooms, the fire watch will be limited to areas around the rooms. The rooms are provided with fire detection and are closed with water tight doors for high-energy line break concerns.

In addition, the containment building temperature will be monitored in the Control Room on an hourly basis in lieu of a fire watch. The operators have been instructed on specific actions to be taken if containment temperatures rise. The containment buildings are limited access areas during plant operations. The major fire hazards inside containment consist of charcoal filters, the reactor coolant pump lube oil systems, and electrical cables routed in various locations throughout the containment, and which are concentrated at the electrical penetration area. Protection for these hazards is as follows:

(a) Charcoal Filters - Automatic deluge system, Strip detectors.

(b) RCP Lube Oil System - Oil collection system, ionization detectors, water spray system.

(c) Electrical Cables - Radiant energy shields.

In addition, detection is located in each containment fan coil unit. Due to the limited access to this area during plant operation, the introduction of transient combustibles or ignition sources is considered extremely remote. The major in-situ hazards are protected by suppression and/or detection systems. Electrical fault initiated fires would not be expected to propagate beyond the point of origin due to the use of IEEE 383 qualified cables. For the above stated reasons, the likelihood of fire occurrence is considered remote. Hourly fire watch patrols of these areas would not significantly enhance the level of fire protection.

Fire watch patrols throughout the remaining plant areas are considered an adequate interim compensatory measure for several reasons. The Technical Specifications permit continued plant operation in the event of an inoperable fire barrier where fire watches are provided. Inoperable fire barriers present a situation similar to the current issue, where redundant equipment in two separate fire areas could be threatened by a single fire. Additionally, fire watch patrols provide surveillance of affected areas for hazardous conditions not normally detected by installed fire protection systems. Such conditions include:

- Obvious activities by plant personnel that could increase the fire hazard in the area;
- Conditions likely to cause a fire, such as spills of flammable liquids or major malfunctioning of equipment;
- Conditions likely to adversely affect fire protection, such as blocked access routes;
- Major accumulations of transient combustible materials.

In addition, the units are the subject of a daily walkdown by the onsite dedicated fire protection operators (fire brigade members). The presence of fire watch patrols also provides personnel in the affected areas to ensure prompt notification of fire occurrence and to provide first aid fire fighting activities until the arrival of the dedicated site fire brigade. The fire watch provides reasonable assurance that fire damage will be limited to only one train of redundant vital cabling.

4.2 The penetration seal program has determined that the test documentation available to justify the installled configuration of penetration seals in rated fire barriers does not adequately envelope all types and configurations of seals in the units.

Fire test reports used for original plant construction document the qualification of various types and configurations of penetration seals. Preliminary field walkdowns have shown that some of the existing seals fall within the scope of these test reports. The remainder of the seals are similar, but exceed some of the tested parameters such as width of block-out, number of penetrating items, diameter of conduit, number of cable trays, etc. To assure that these configurations provide adequate fire resistance, a penetration seal improvement program has begun. The end result of this program will be to examine each required penetration seal in the plant, and correlate it to a tested configuration or an engineering evaluation to justify its adequacy.

The penetration seals form a component of the Salem Defense-in-Depth philosophy. Under this philosophy the amount of combustibles and ignition sources in an area are controlled by Administrative Procedures. To supplement this, manual fire suppression equipment such as portable fire extinguishers and fire hoses are provided at strategic plant locations. In areas where there is a greater fire hazard, automatic suppression and detection systems are also provided. Finally, rated fire barriers are provided to limit the extent of potential fires. The penetration seals have not been shown to be generally degraded or inoperable. Note, individual seals observed degraded are declared inoperable and appropriate repairs instituted. The primary uncertainty lies with the configuration tested versus that actually installed. Normally, penetration seals comprise only a small percentage of the surface area of a fire barrier. Considering the overall Defense-in-Depth philosophy, the penetration seals involve only a small percentage of one element of the overall fire protection scheme. Thus, with the existing seals, in conjunction with the Defense-in-Depth philosophy reasonable assurance is provided that significant fires will not occur, and any potential fires will be controlled such that the plant could be safely shutdown. For additional conservatism, hourly fire watch patrols have been instituted in any plant areas with a combustible loading exceeding one-hour.

4.3 With respect to the Communications System, Appendix R to 10CFR50, Section III.L requires the capability to safely shutdown independent of the Control Room and Relay Rooms. A fire in the Relay Room could result in Control Room evacuation due to the loss of control and monitoring capability.

Alternate shutdown procedures, AOP-EVAC, require use of the UHF Radio Communication System to support communications from the Hot Shutdown Panel (213) to the remote operators located throughout the plant, in order to facilitate bringing the plant to hot shutdown. Contrary to this capability, the potential exists for a postulated fire in the Relay Room to damage the power supply which is located in the Relay Room, thereby causing the repeater system to be in operable.

The alternate shutdown procedures address worst case conditions, specifically Technical Specification manning. Generally more personnel are available onsite and could be utilized to supplement inadequate radio coverage. In addition, limited sound powered phone coverage is available. The Communication System will be modified to be independent of the Control Room and Relay Room. In the interim, a fire watch has been established in the Relay Room. Thus, reasonable assurance is provided to achieve safe shutdown.

4.4 The Fuel Oil Storage Room 1(2)FA-DG-84D contains redundant cabling for the "B" and "C" train Diesel Generators, specifically 2BDD-B, 2BDDA-B, 2CDD-C, 2CDDA-C and 2CGN-C respectively. (Note: Only Unit 2 cabling is listed here.) The cables are separated by approximately 22' with the major intervening combustible being the fuel oil storage tank. The cables are enclosed in conduit with 2BDD-B being protected with a one-hour wrap. Thermal type fire detectors provide fire detection capability. The CO2 flooding system and a water deluge system provide diverse and redundant automatic suppression capabilities. Section III.G of Appendix R requires one-hour fire protection along with detection and automatic suppression.

As stated in the Fire Hazards Analysis (FHA), the major combustible is the fuel oil storage tank, which:

"has a capacity of 30,000 gallons. The rate of combustion of the fuel oil is limited by the oxygen supply. With an assumed surface burning rate of 10,000 BTU/Min/Ft2, which is typical for a free burning liquid petroleum fire, the initial volume of oxygen in the room (2,812 Ft3) could support combustion for approximately 8 seconds.

The design basis fire for this area assumes that a fire originates in the stored fuel oil within the tank as a result of a transient ignition source. The temperature of the stored fuel oil would be well below flash point; initiation and propagation of a fire in fuel oil is very unlikely.

The CO2 flooding system and water deluge system will provide rapid suppression of a fire occurring in the area.

Additionally, fire dampers installed in the supply and exhaust air ducts are designed to be shut either by actuation of the CO2 system or by fusible-links. These dampers will shut, with or without actuation of the CO2 suppression system, to restrict air from entering the room. Depletion of the available oxygen will aid in the rapid suppression of a fire originating in the area."

Conduit 2BDDA-B will be completely protected with a one-hour fire barrier throughout the area. In the interim, the existing separation along with detection and redundant and diverse automatic suppression provides reasonable assurance that a fire would not damage redundant cabling.

4.5 The Upper Electrical Penetration Area 1(2)FA-EP-100G contains redundant cabling associated with Room Coolers and the Diesel Generator Fuel Oil Transfer Pumps. These cables run from the Safeguards Equipment Cabinets (SECs) to the Vital Ventilation Control Centers via an Auxiliary Equipment Cabinet.

During a Loss of Offsite Power, the SECs connect the Diesel Generators to the vital buses and sequentially start required safeguards equipment. During the automatic SEC loading sequence, safeguards equipment not required in the short term is blocked from automatically operating to avoid overloading the Diesel Generators. Upon completion of the automatic loading sequence, the plant operator resets the SECs allowing control of additional equipment needed to assist in the safe shutdown of the plant in the long term. This equipment includes the RHR Room Coolers, the Charging Pump Room Coolers, and the Diesel Generator Fuel Oil Transfer Pumps. This equipment receives signals from the SECs via cables 2RP65-AT, 2A13YC2B-AT, 2RP129-BT, 2B13YC2B-BT, 2RP148-CT and 2C13YC2B-CT which run from 2A, 2B, and 2C SECs to 2A, 2B, and 2C Ventilation Control Centers in Fire Area 2FA-EP-100G. (Note: Only Unit 2 cabling is listed.)

A fire occurring in the Upper Electrical Penetration Area could damage these cables thereby creating the possibility of not powering this equipment when called upon. The RHR and Charging Pump Room Coolers ensure that ambient room temperature does not exceed RHR Pump or Charging Pump design limits. The Diesel Generator Fuel Oil Transfer Pumps transfer oil from the Diesel Generator Storage Tanks to the Diesel Generator Day Tanks.

Due to the recent interim modifications to the electrical controls for the Diesel Generator Fuel Oil Transfer Pumps described in LER 272/87-010-00, only one Diesel Generator Fuel Oil Transfer Pump would be affected by the postulated fire.

A localized fire detection system is installed in the area, above all the major equipment. The detectors have been installed in the area where there is the potential for a fire to start or spread. The redundant Vital Vent Control Centers located in this area are separated by approximately 35' with negligible intervening combustibles. There is a very limited amount of installed combustible material in this area. All the cabling in this area is routed in conduit. The cables are only exposed for short distances between the component and where the conduit ends. There is also lubricating oil (approximately 1 to 2 quarts) in the casings for several of the pumps and compressors in the area. The total quantity of oil is approximately 15 gallons. The total quantity of combustibles in Fire Area 1FA-EP-100G is 4,831 BTU/Ft2.

Conduit 2RP65-AT will be completely protected with a one-hour fire barrier throughout the area. In addition, an hourly fire watch has been established. The separation, limited combustibles and the fire watch provide reasonable assurance that a fire would not damage redundant cabling.

4.6 The CO2 Equipment Room 1(2)FA-DG-84F contains cabling for various shutdown systems including the Diesel Generators, Service Water System and the Diesel Generator Fuel Oil Transfer pumps, as listed below: (Note: Only Unit 2 cabling is listed)

RACEWAY	CABLE NUMBER	DEVICE NUMBER
2A008	2B15Y-B	2B2 SERVICE WTR INTAKE 230V CC
	2B15YR2-BT	24 SERV WTR VENT FAN
		2SWV10
	2B8D2B-BT	24 SWP
		24SW24
	2B8YR2-BT	22 SERV WTR VENT FAN
		2SWV8
	2SW8-BT	2SW26
2A045	2C3D2B-CT	25 SWP
		25SW24
	2C8D2B-CT	26 SWP
		26SW24
	2C8Y-C	2C SERVICE WTR INTAKE 230V CC
	2C8YS2-CT	23 SERV WTR VENT FAN
		2SWV10
		2SWV3
		2SWV4
		2SWV6
		2SWV9
	2CCDC8-CT	2SWV10
		2SWV3
		2SWV4
		2SWV6
		2SWV9
	2SW2-CT	22SW17
		23SW20
	2SW6-CT	24SW20
2A054	2C3D-C	25 SWP
		25SW24
	2C8D-C	26 SWP
		26SW24
2A056	2C3D2B-CT	25 SWP

RACEWAY	CABLE NUMBER	DEVICE NUMBER
		25SW24
	2C8D2B-CT	26 SWP
		26SW24
	2C8Y-C	2C SERVICE WTR INTAKE 230V CC
	2C8YS2-CT	23 SERV WTR VENT FAN
		2SWV10
		2SWV3
		2SWV4
		2SWV6
		2SWV9
	2CCDC8-CT	2SWV10
		2SWV3
		2SWV4
		2SWV6
		2SWV9
	2SW2-CT	22SW17
		23SW20
	2SW6-CT	24SW20
2A064	2C3D2B-CT	25 SWP
		25SW24
	2C3YBW-C	22SW21
	2C3YBW2-CT	22SW21
	2C8D2B-CT	26 SWP
		26SWP24
	2C8Y-C	2C SERVICE WTR INTAKE 230V CC
	2C8YS2-CT	23 SERV STR VENT FAN
		2SWV10
		2SWV3
		2SWV4
		2SWV6
		2SWV9
	2CCDC8-CT	2SWV10
		2SWV3
		2SWV4
		2SWV6
		2SWV9
	2SW2-CT	22SW17
		23SW20
	2SW6-CT	24SW20

RACEWAY	CABLE NUMBER	DEVICE NUMBER
CONDUIT	2A3YBS-A	21SW21
	2A3YB2-AT	21SW21
	2C3YBW-C	22SW21
	2C3YBW2-CT	22SW21
	2A4YG-A	21 FUEL OIL TRANSFER PUMP
	2B4YG-B	22 FUEL OIL TRANSFER PUMP
	2B3D-B	23 SWP
		23SW24
	2B8D-B	24 SWP
		24SW24
	2ADD-A	2A DIESEL GENERATOR
	2ADDA-A	2A DIESEL GENERATOR
	2AGN-A	2A DIESEL GENERATOR

The combustible loading in the area consists primarily of IEEE-383 qualified electrical cables for a loading of approximately 25,000 BTUs/Ft2. If this quantity of combustibles were totally consumed in a fire, it would result in an equivalent fire severity of 19 minutes. No other fire hazards are located in the area. Portable fire extinguishers and manual hose reels are readily available for protection of this area.

Cabling required to meet minimum system operability requirements will be protected with a one-hour barrier throughout the area. The following raceway and conduits will be protected: 2A008, 2A4YG-A, 2B3D-B, 2B8D-B, 2ADD-A, 2ADDA-A and 2AGN-A. In the interim, an hourly fire watch has been established. Note that loss of any one cable tray or conduit would not prevent shutdown. Thus, reasonable assurance exists that a fire would not prevent safe shutdown.

4.7 In the Auxiliary Building, elevation 64' 1(2)FA-AB-64B a single panel contains cabling for redundant Residual Heat Removal (RHR) Room Coolers. The Auxiliary Building HVAC Electrical Panel 119 contains solenoid valves SV-783 and SV-784 and associated cabling controlling the operation of Nos. 21 and 22 RHR Room Coolers. These solenoid valves are de-energized when either RHR Pump is required to run. RHR Pump Room HVAC dampers 2ABV27 and 2ABV28 fail open when the solenoid valves are de-energized, thereby increasing circulation of building ventilation air in the room when either RHR Pump is operating. If a fire occurred in this area, it is possible to hot short the cabling to both RHR Room Coolers and blow the control fuses in the control circuits. This would result in the loss of both RHR Room Coolers.

The above described discrepancy does not impact the capability to achieve and maintain hot standby. While maintaining hot standby, procedures to implement repairs could be performed and/or temporary ventilation established. A long-term Appendix R modification is being evaluated. In the interim, an hourly fire watch has been established. Thus, there is reasonable assurance that cold shutdown conditions could be achieved.

4.8 The Pipe tunnel designated Fire Area 12FA-PT-84 contains redundant cabling for all trains of Unit 2 Service Water System including pump power.

The Pipe Tunnel is located below grade directly beneath the Water Storage Tanks at elevation 88'-8". The tunnel and tank areas are located adjacent to the west side of the Auxiliary Building. The Pipe Tunnel consists of approximately 8,840 square feet of floor area (260' long by 34' wide by 9' high). The area is constructed entirely of reinforced concrete with a minimum fire rating of 3 hours. There is no exposed structural steel within the tunnel. Except as noted below, the floor/ceiling separating the Pipe Tunnel from the Water Storage tanks area is 3 - hour rated. There are three 8' -6" X 3' -9" steel hatches in the ceiling of the Pipe Tunnel.

The only combustible in the area is cable insulation with the in-situ combustible loading in the Pipe Tunnel being approximately 8,236 BTUs/FT2. The postulated in-situ fire duration is 6 minutes. Manual fire fighting equipment, in the form of hoses from a nearby yard hydrant, is readily available.

The closest safe shutdown cables within the area consist of service water valve and pump cables which are a minimum of 15" apart at the southern end of the tunnel. In the remainder of the tunnel, the separation of redundant cables is approximately 5'. The only potential ignition sources in the Pipe Tunnel are the electric motors on the sump pumps. The sump pumps are more than 30' from the southern end of the tunnel and approximately 3' from the nearest cable tray.

A fire detection system will be provided in the tunnel area. In the interim a continuous fire watch has been established at the entrance to the tunnel. The fire watch periodically walks-down the length of the tunnel. Due to the extremely limited access to the Pipe Tunnel, in conjunction with the lack of potential ignition sources, the likelihood of a fire occurring is considered extremely remote. Thus, with the fire watch, there is reasonable assurance fire damage would be limited to one train.

4.9 A concern with spurious actuation of the CO2 systems in the Diesel Generator rooms is presently being investigated. The CO2 system is actuated for each diesel room by the fire protection system. Fire damage to either the fire protection panel in the Relay Room, the panels with in the vestibule area to the Diesel Generator Control Rooms or the cabling between these panels could result in a CO2 actuation in all three diesel generator areas. A previous safety evaluation for a single failure concern assumed loss of a diesel on a CO2 actuation. Present procedure requires a diesel to be declared inoperable should the CO2 actuate.

Pending completion of the investigation the automatic feature of the CO2 system has been disabled. Per the Technical Specification, a fire watch has been established. The fire watch has been extended to cover the vestibule area. Fire damage in the vestibule area could still result in a CO2 actuation to one or more diesel rooms only with multiple spurious signals. The fire watch provides reasonable assurance that fire damage would be limited to one train of circuits.

4.10 During the NRC inspection, it was noted that several emergency lighting units were unavailable. Corrective action is essentially complete thereby restoring all lights to an operable status. In addition, portable emergency lighting units will be made available to operating personnel.

4.11 Each of the discrepancies were evaluated to determine the combined affect on the plant's safe shutdown capabilities. Since the discrepancies for the Fuel Oil Storage Rooms, the Upper Electrical Penetration Area, the CO2 Equipment Rooms, the Pipe Tunnel and the spurious actuation of the CO2 systems represent threats directly to safe shutdown systems, shutdown capability is not further degraded when considering the combined affects of breaker coordination. Since these areas presently contain redundant cabling, a penetration seal concern does not further the impact. The penetration seal concerns do not greatly impact any individual discrepancy since for the most part fire rated walls are not relied upon to separate redundant cabling.

In considering breaker coordination concerns with the RHR Panel 119 discrepancy, a fire in the vicinity of the panel is not of further impact. The RHR panel impacts only cold shutdown capability, breaker coordination represents the limiting concern in this area.

However, considering breaker coordination concerns with a communication and emergency lighting concern does further degrade plant capabilities.

Breaker coordination concerns could increase the number of actions necessary for alternate shutdown. These actions are not presently identified in the procedure and thus may require additional communication between operators. Fire watches are provided in the relay rooms thereby providing reasonable assurance that fire damage would be limited and implementation of this alternate procedure would be unnecessary.

4.12 Because of the impact of fire watches, consideration will be given to the development of post-fire operating instructions for the breaker coordination concerns. These procedures will provide instructions on how to restore power in the event of fire. The CVCS Hold-up Tank Room, the Service Water Bays, and the Fuel Handling Building will be given primary consideration because of the limited breaker impact. Upon development of the procedures, fire watches will be terminated in specific areas.

5.0 CONCLUSIONS

The continued operation of Salem Unit No. 1 and Unit No. 2 is justified on the basis of the above discussion. The use of fire watches pending resolution of the above discrepancies provides reasonable assurance that fire damage will be limited to only one train of redundant vital cabling/equipment. Therefore safe shutdown can be achieved.

Attachment II summarizes the fire areas provided with a fire watch.

6.0 SIGNATURES

Nicholas C. Fiorentino 10/14/87
Originator Date

J Barnhill 10/15/87
Verifier Date

C.W. Lukhard 10/15/87
Group Head Date

C.W. Lukhard 10/15/87
Group Head Date
Systems Analysis

WSD [signature] 10/15/87
Manager - Plant Engineering Date

T. K. Miller 10/15/87
Manager - Nuclear Engineering Services Date

Pell Fuhrt 10/16/87
SORC Chairman Date

ATTACHMENT I - VITAL CABLING SURVEY

FIRE AREAS CONTAINING NO VITAL CABLING:

12FA-AB-100J	1(2)FA-AB-ST1
1FA-AB-64C	2FA-AB-ST5
1(2)FA-AB-EL1	1(2)FA-DG-84E
12FA-AB-EL2	

FIRE AREAS CONTAINING CABLING FOR ONE VITAL POWER DIVISION:

1(2)FA-AB-100B-1	1(2)FA-DG-100E-1*
1(2)FA-AB-100B-2	1(2)FA-DG-100F
1(2)FA-AB-100B-3	1(2)FA-DG-100F-1
1(2)FA-AB-64A-1	1(2)FA-DG-84G
1(2)FA-AB-100D	1(2)FA-DG-84H
1(2)FA-AB-100D-1*	12FA-AB-84A
1(2)FA-AB-100E	PIPE TRENCH

FIRE AREAS CONTAINING REDUNDANT CABLING:

12FA-AB-122A	1(2)FA-AB-64B	1(2)FA-MP-78I
1(2)FA-AB-100A	1(2)FA-AB-45A	1(2)FA-PP-92K
1(2)FA-AB-84A	1(2)FA-AB-45B	1(2)FA-RC-78
1(2)FA-AB-122B	1(2)FA-DG-84F	1(2)FA-FH-100
1(2)FA-AB-64A	12FA-AB-100A	12FA-SW-90A
1(2)FA-AB-100C	1(2)FA-EP-100G	12FA-SW-90B
1(2)FA-AB-84B	1(2)FA-PP-100H	12FA-PT-84
1(2)FA-AB-84C	1(2)FA-EP-78C	1(2) Turbine Bldg.
		Service Bldg.

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* Takes into account existing cable wrap.

ATTACHMENT II - FIRE WATCH SUMMARY

FIRE AREA*	BREAKER COORDINATION	FIRE WATCH COVERAGE DUE TO PENETRATION SEAL	COMMUNICATION	ADDITIONAL CABLE WRAP	CO2 CONCERN
12FA-AB-122A	X				
1(2)FA-AB-100A	X	X	X		
1(2)FA-AB-100B-1					
1(2)FA-AB-100B-2					
1(2)FA-AB-100B-3					
1(2)FA-AB-84A	X	X			
1(2)FA-AB-64A	X	X			
1(2)FA-AB-64A-1					
1(2)FA-AB-122B	X				
1(2)FA-AB-100C	X				
1(2)FA-AB-84B	X				
1(2)FA-AB-84C	X				
1(2)FA-AB-64B	X				
1(2)FA-AB-45A	X				
1(2)FA-AB-45B	X				
1(2)FA-DG-100D					X
1(2)FA-DG-100D-1					X
1(2)FA-DG-100E					X
1(2)FA-DG-100E-1					X
1(2)FA-DG-100F					X
1(2)FA-DG-100F-1					X
1(2)FA-DG-84D		X			
1(2)FA-DG-84E		X			
1(2)FA-DG-84G					
1(2)FA-DG-84H					
1(2)FA-DG-84F	X		X		
12FA-AB-100J					
1FA-AB-64C		X			
1(2)FA-AB-EL1					

* As listed in the FHA

ATTACHMENT II - FIRE WATCH SUMMARY

FIRE AREA*	FIRE WATCH COVERAGE DUE TO BREAKER COORDINATION	PENETRATION SEAL	COMMUNICATION	ADDITIONAL CABLE WRAP	CO2 CONCERN
12FA-AB-EL2					
1(2)FA-AB-ST1					
2FA-AB-ST5					
12FA-AB-84A					
12FA-AB-100A	X	X			
1(2)FA-EP-100G	X			X	
1(2)FA-PP-100H	X				
1(2)FA-EP-78C	X	X			
1(2)FA-MP-78I	X				
1(2)FA-PP-92K	X				
1(2)FA-RC-78	X				
1(2)FA-FH-100	X				
12FA-SW-90A	X				
12FA-SW-90B	X				
12FA-PT-84	X				
PIPE TRENCH					
U1 TURBINE BLDG.	X				
U2 TURBINE BLDG.	X				
SERVICE BLDG.	X				

* As listed in the FHA