

Public Service
Electric and Gas
Company

Steven E. Miltenberger
Vice President -
Nuclear Operations

Public Service Electric and Gas Company P.O. Box 236, Hancocks Bridge, NJ 08038 609 339-4199

April 28, 1988
NLR-N88060

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Attention: Director, Office of Enforcement

Gentlemen:

**RESPONSE TO NOTICE OF VIOLATION
FIRE PROTECTION REQUIREMENTS
SALEM GENERATING STATION - UNIT NO. 2
DOCKET NO. 50-311**

Public Service Electric and Gas Company (PSE&G) hereby replies to the Notice of Violation and Proposed Imposition of Civil Penalty transmitted by your letter dated March 29, 1988. PSE&G has reviewed the occurrences described in the NRC letter related to a failure to provide adequate fire protection features to achieve and maintain safe shutdown conditions, and does not dispute those findings.

The PSE&G response to the subject Notice of Violation is enclosed in Attachment 1. Also enclosed is a check for fifty thousand dollars (\$50,000) made payable to the Treasurer of the United States for payment of the civil penalty.

As recognized in your letter, the majority of these violations were self identified during our comprehensive review of the Salem fire protection program. This review consisted of an in-depth circuit interaction study and route verification of over 4000 cables. Fire protection features were also reviewed. The scope of this review provides assurance that upon completion of the corrective actions, the Salem Station design will meet fire protection requirements.

PSE&G has undertaken several initiatives that should ensure that the fire protection program is maintained in compliance with Appendix R regulations. A management initiative focusing on the design change process has resulted in an organizational restructuring of the Engineering and Plant Betterment (E&PB) Department, revision of design control procedures, and technical and administrative training in the use of these procedures.

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April 28, 1988

The E&PB Department restructuring consolidated the fire protection program responsibility and technical expertise into one group. This group will be the focal point for all fire protection issues. New design control procedures under development will identify design requirements more clearly. Fire protection requirements are addressed as part of the design change process through specific administrative procedures and technical standards. Personnel are being trained in the use of these procedures to ensure that they are understood and implemented. In addition, a comprehensive Fire Protection Programmatic Standard is being developed which identifies all requirements and commitments related to the fire protection program. This programmatic standard will be used in preparation of design change packages and is a controlled document. These actions will provide the mechanisms by which long-term compliance will be achieved and maintained.

Your letter dated March 29, 1988 also requested additional information on the incident reported to the NRC on March 18, 1988, related to a lack of separation of Diesel Generator control cables in the switchgear room. This information is provided in Attachment 2. Information on this incident was previously provided in License Event Report 311/87-06-00.

Should you have any questions, please do not hesitate to contact us.

Sincerely,



S. E. Miltenberger
Vice President and
Chief Nuclear Officer

Enclosure

C Mr. D. C. Fischer
USNRC Licensing Project Manager

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380 Scotch Road
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STATE OF NEW JERSEY)
) SS.
COUNTY OF SALEM)

Steven E. Miltenberger, being duly sworn according to law deposes and says:

I am Vice President and Chief Nuclear Officer of Public Service Electric and Gas Company, and as such, I find the matters set forth in our letter dated _____, concerning Facility Operating License DPR-75 for Salem Generating Station, Unit No. 2, are true to the best of my knowledge, information and belief.



Subscribed and Sworn to before me
this 28th day of April, 1988


Notary Public of New Jersey

DELORIS D. HADDEN
A Notary Public of New Jersey
My Commission Expires March 14, 1990

My Commission expires on _____

ATTACHMENT 1

REPLY TO NOTICE OF VIOLATION AND
PROPOSED IMPOSITION OF CIVIL PENALTY
NRC INSPECTION REPORT NO. 50-311/87-29
PUBLIC SERVICE ELECTRIC AND GAS COMPANY
SALEM GENERATING STATION - UNIT NO. 2

The NRC Notice of Violation dated March 29, 1988, identified four plant conditions at the Salem Generating Station - Unit No. 2 which were determined to be in violation of the requirements of 10CFR50, Appendix R. Three violations were categorized in the aggregate as a Severity Level III violation, while the fourth violation was classified as a Severity Level IV violation. The response to the specific items in the Notice of Violation is included in the following. Additionally, PSE&G is providing further information, via Attachment 2, of our finding of the cable separation discrepancy identified to the NRC on March 18, 1988.

I. VIOLATIONS ASSESSED A CIVIL PENALTY

License condition 2.C.10.a requires, in part, that Public Service Electric and Gas Company install concurrently in Salem Unit 2 all modifications to Salem Unit 1 implemented to comply with the requirements set forth in Sections III.G, Fire Protection of Safe Shutdown Capability, III.J, Emergency Lighting, III.L, Alternative and Dedicated Shutdown Capability, and III.O, Oil Collection System for Reactor Coolant Pump of 10CFR Part 50, Appendix R.

- A. 10 CFR Part 50, Appendix R, Section III.G.1 requires that fire protection features shall be provided for structures, systems, and components important to safe shutdown. These features shall be capable of limiting fire damage so that one train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control stations is free of fire damage.

Section III.G.2 requires, in part, that, where cables or equipment, including associated non-safety circuits that could prevent operation or cause maloperation due to induced shorts, of redundant trains of systems necessary to achieve and maintain hot shutdown conditions are located within the same

fire area outside of primary containment, a means of maintaining one of the trains free of fire damage shall be provided.

Contrary to the above, as of September 18, 1987, numerous instances existed at Unit 2 where cables and equipment (of redundant trains of systems necessary to achieve hot shutdown) were located within the same fire area outside of primary containment, and a means of maintaining one of the trains free of fire damage was not provided nor was an alternative or dedicated shutdown capability provided. Specific examples of these failures include the following:

1. Violation

Control cables for the carbon dioxide fire suppression system for the Emergency Diesel Generator (EDG) room were located in the same fire areas (in the vestibule area to the EDG control room and in the relay room) without the required separation. A short circuit could cause this system to actuate and inject carbon dioxide in all three EDG rooms, which in turn could (a) cause overheating and thus prevent the operation of the EDGs, and (b) prevent the operators from entering the area to perform required action to bring the EDGs on line. The EDGs are needed to achieve and maintain hot shutdown in that they provide emergency AC power.

Response to Violation

Public Service Electric and Gas Company does not dispute the violation.

Reasons for the Violation

The root cause of the CO₂ Flooding System susceptibility to a single failure causing an inadvertent discharge to all three EDG areas with ventilation isolation is inadequate design review. Two out of three EDGs are required to safely shut down the plant in the event of a loss of offsite power. The design of the CO₂ Flooding System was inadequate in that a single failure of the system could result in spurious dumping of CO₂ into more than one EDG room.

Corrective Steps That Have Been Taken and Results Achieved

Immediate action was taken upon discovery of the deficiency.

To prevent the inadvertent simultaneous flooding of the three (3) EDG rooms, the automatic actuation feature of the CO₂ Flooding System was disabled. This was accomplished by tagging the detection key lockout switches in the manual mode. In accordance with Technical Specification 3.7.10.3, a fire watch was posted to patrol the EDG area(s) and vestibule area. The fire watch was extended to the vestibule area since a postulated fire in the area could result in a CO₂ actuation and subsequent ventilation isolation to one or more EDG rooms if, in the remote chance, the proper multiple spurious signals occurred. The fire watch provides reasonable assurance that any potential fire damage would be limited to one train of circuits.

Corrective Steps That Will Be Taken to Avoid Recurrence

The automatic CO₂ actuation circuitry will be modified to eliminate the possibility of multiple EDG impacts. Design Change Package 2EC-1609 provides the vehicle for implementation.

The Date Full Compliance Will Be Achieved

The modification is currently scheduled to be completed by July 1, 1988.

2. Violation

Power and control cables for all six service water pumps were located in the same fire area in the Service Water Pipe Tunnel without adequate separation. The operation of at least two of these pumps is needed to supply service water to the EDGs needed to achieve and maintain hot shutdown.

Response to Violation

Public Service Electric and Gas Company does not dispute the violation.

Reasons for the Violation

The root cause of the Service Water (SW) cabling configuration deficiency is inadequate design review. The current design meets the original electrical separation requirements for Salem, however, it does not meet the 10CFR 50 Appendix R requirements. The Appendix R criteria were not previously applied to the SW Piping Tunnel because of its restricted access and confined space.

Corrective Steps That Have Been Taken and Results Achieved

Immediate action was taken upon discovery of the deficiency. A continuous fire watch was established at the entrance to the SW Pipe Tunnel. The fire watch periodically walked down the length of the tunnel.

A fire detection system was provided for the pipe tunnel as part of Design Change package 2EC-2251A. The installation was completed in February 1988.

Corrective Steps That Will Be Taken to Avoid Recurrence

Public Service Electric & Gas Company considers this item resolved.

The Date Full Compliance Will Be Achieved

Compliance with the rule is subject to the NRC's approval of PSE&G's exemption request. It is anticipated that all exemption requests will be submitted to the NRC by June 15, 1988.

3. Violation

Power feeds from two ("B" and "C") EDGs to the 4160 volt switchgear were located in the same area in the Fuel Oil Storage Room without adequate separation. Power from at least two out of the three EDGs is needed to achieve and maintain hot shutdown in that they provide the emergency AC power source.

Response to Violation

Public Service Electric and Gas Company does not dispute the violation.

Reason for the Violation

The root cause of the EDG cabling deficiency is inadequate design review. The cabling configuration was not included in the fire protection upgrade made pursuant to the issuance of 10CFR 50 Appendix R. Subsection III(G) of Appendix R identifies acceptable cable separation and fire barrier options that ensure one redundant train of systems necessary to achieve and maintain hot shutdown remains free from fire damage during a postulated fire. Protection provided for the cable configuration did not completely incorporate one of these options.

Corrective Steps That Have Been Taken and Results Achieved

This area had been subject to fire watch coverage prior to discovery of the deficiency.

Corrective Steps That Will Be Taken to Avoid Recurrence

Conduit 2BDDA-B was completely protected with a one hour barrier throughout the area. This was accomplished as part of Design Change Package 2EC-2248. Implementation of this design change insures availability of the 2A and 2B EDGs.

The Date When Full Compliance Will Be Achieved

Full compliance has been achieved.

4. Violation

Power cables for both fuel oil transfer pumps ("A" and "B") were located in the same fire area in the carbon dioxide equipment room without adequate separation. The operation of the transfer pumps is needed to achieve and maintain hot shutdown in that they provide fuel oil for the EDGs, which in turn provide the emergency AC power source.

Response to Violation

Public Service Electric and Gas Company does not dispute the violation.

Reasons For the Violation

The root cause of the CO2 Equipment Room cabling deficiency is inadequate design review. The cabling configuration was not included in the fire protection upgrade made pursuant to the issuance of 10CFR 50 Appendix R. Subsection III(G) of Appendix R identifies acceptable cable separation and fire barrier options that ensure one redundant train of systems necessary to achieve and maintain hot shutdown remains free from fire damage during a postulated fire. The cable configuration did not completely incorporate one of these options.

Corrective Steps That Have Been Taken and Results Achieved

Immediate action was taken upon discovery of the deficiency. A fire watch was established.

Area wide detection was installed as part of Design Change Package 2EC-2251A.

Corrective Steps That Will Be Taken to Avoid Recurrence

One train of the subject cabling has been completely protected with a one hour barrier. This was accomplished as part of Design Change Package 2EC-2248 on April 21, 1988.

The Date Full Compliance Will Be Achieved

Compliance with the rule is subject to the NRC's approval of PSE&G's exemption request. It is anticipated that all exemption requests will be submitted to the NRC by June 15, 1988.

- B. 10CFR Part 50, Appendix R, Section III.L.7, requires that, for alternative and dedicated shutdown capability, safe shutdown equipment and systems for each fire area shall be known to be isolated from associated non-safety circuits in the fire area so that hot shorts, open circuits, or shorts to ground in the associated circuits will not prevent operation of the safe shutdown equipment.

Violation

Contrary to the above, as of September 18, 1987, for alternative and dedicated shutdown capability, the safe shutdown equipment and systems for each fire area were not known to be isolated from associated non-safety circuits in the fire area so that hot shorts, open circuits, or shorts to ground in the associated circuits would not prevent operation of the safe shutdown equipment. Specifically, an analysis had not been performed to verify that adequate breaker coordination existed to ensure that the safe shutdown systems were adequately isolated from the associated non-safety circuits in the fire area.

Response to Violation

Public Service Electric and Gas Company does not dispute the violation.

Reason For Violation

The root cause of the breaker coordination deficiency is inadequate design review. The original electrical distribution system design provided a limited degree of breaker coordination. This condition resulted in coordination that lacks selectivity over the entire range of available short circuit current. This limitation in selectivity was due in part to the inherent design characteristics of the hardware of the 480V/240V switchgear.

Corrective Steps That Have Been Taken and Results Achieved

As a result of the confirmation of indeterminant breaker coordination, PSE&G made a "four hour report" to the NRC. Additionally, each plant fire area was reviewed to establish the potential challenge to breaker coordination when two or more redundant trains of vital cabling were exposed to a postulated Appendix R fire. An adequate level of compensatory action was then instituted as required (fire watches) thereby allowing continued operation in conformance with Safety Evaluation S-C-M200-NSE-0709, which was submitted to the NRC on October 3, 1987. Reduction of these fire watches can only be accommodated via the installation of hardware modifications or via further analyses and subsequent revision of Safety Evaluation S-C-M200-NSE-0709.

Corrective Steps That Will Be Taken to Avoid Recurrence

With respect to the requirements delineated in Safety Evaluation S-C-M200-NSE-0709, which identifies the necessary level of compensatory measures required for Salem, fire watches continue to be utilized as a means of interim protection in fire areas not in conformance with the requirements of 10CFR50 Appendix R.

A review with respect to the distribution system modifications implemented in December 1987 will be done to verify 10CFR50 Appendix R compliance. This will be accomplished via revision to Safety Evaluation S-C-M200-NSE-0709.

The Date Full Compliance Will Be Achieved

Compliance is subject to the results of the aforementioned review. This review is scheduled to be completed by December 15, 1988.

- C. 10 CFR Part 50, Appendix R, Sections III.L.1 and III.L.3, require that an alternative or dedicated shutdown capability provided for a specific fire area shall be able to achieve and maintain hot standby conditions and that procedures shall be in effect to implement this capability.

Violation

Contrary to the above, as of September 18, 1987, adequate procedures were not in effect to ensure that hot standby conditions could be achieved and maintained using an alternate shutdown capability from outside the control room in the event of a fire in the relay room. The procedures were deficient in that they relied on radio communications between operators to perform the shutdown tasks, and these radio communications could be lost in the event of a fire in the relay room because the power source for the radio transmitter is located in that room.

Response to Violation

Public Service Electric and Gas does not dispute the violation.

Reason for the Violation

The root cause of the UHF Communication System design deficiency is inadequate design. Although the design was reviewed by NRR and identified as "immune to the effects of an exposure fire in the Relay Room" in Safety Evaluation Report Supplement 6 dated May 1981, it was determined to be unacceptable during the recent NRC Appendix R Fire Protection Audit. 10CFR 50 Appendix R requires if the levels of equipment and cable separation specified in Subsection III G(2) cannot be met, alternative and dedicated shutdown capability must be established. Since the Salem Control and Relay Room designs do not meet these separation requirements, an Alternative Shutdown procedure (AOP-EVAC-1/2) was established in accordance with 10CFR 50 Appendix R Subsection III(L). The UHF Communication System is necessary to perform this procedure in a timely manner. However, its power supply could become inoperable due to a postulated fire in the Relay Room and subsequent evacuation of the Control Room.

Corrective Steps That Have Been Taken and Results Achieved

Upon discovery of the UHF Communication System design deficiency, fire watches were established in the Salem Relay Rooms.

Corrective Steps That Will Be Taken to Avoid Recurrence

The UHF Communication System will be modified to be independent of the Control and Relay Rooms. This will be accomplished via Design Change Package 2EC-2300.

Date When Full Compliance Will Be Achieved

Design Change Package 2EC-2300 is currently scheduled for completion by July 1, 1988.

- II. 10CFR50, Appendix B, Criterion V requires, in part, that activities affecting quality be prescribed by documented procedures of a type appropriate to the circumstances.

Violation

Contrary to the above, as of September 18, 1987, Abnormal Operating Procedure No. AOP-EVAC-2 "Control Room

Evacuation Due to Fire in the Control Room or Relay Room," was inadequate in that the Comments/Contingency Actions column of the procedure provided numerous erroneous references to the Fire Hazard Books and Sections.

Response to Violation

Public Service Electric and Gas Company does not dispute the violation.

Reason For Violation

Due to an error in indexing the Fire Hazards Books there was inconsistency in the references called out in Procedure AOP-EVAC-2.

Corrective Steps That Have Been Taken and Results Achieved

The Fire Hazards Book indexes were immediately corrected to reflect the proper references in AOP-EVAC-2. It should be noted that regardless of the above identified errors, the drill was successful.

Corrective Steps That Will Be Taken to Avoid Recurrence

The Fire Hazards Book indexes will be maintained consistent with the AOP-EVAC-2 procedure via the normal procedure change process.

The Date Full Compliance Will Be Achieved

Compliance was achieved on September 19, 1987.

ATTACHMENT 2

During the Region I follow-up inspection conducted on December 15-18, 1987, PSE&G committed to undertake a study to review breaker/relay coordination, for the "as found" electrical distribution system configuration.

During the course of this review, PSE&G identified a design deficiency in fire area 1(2)FA-AB-84A concerning cable (CDC22-CT). This cable provides an alternate source of control and field flashing power to the three Diesel Generators (D/Gs) during a postulated fire that requires alternate shutdown measures. The cable originates from the "C" train 125 Volt Vital Bus, routes through cable trays in the 460V Switchgear Room, and eventually terminates in the C Diesel Generator Control Room. The Nuclear Regulatory Commission (NRC) requirements in the Code of Federal Regulations 10CFR 50 Appendix R Section III.G.3, state that the required alternate shutdown capability is to be "independent of cables, systems, or components in the area, room or zone under consideration". However, contrary to this requirement, the CDC22-CT cable is not physically independent of the ceiling area of the 460V Switchgear Room which is the "zone under consideration".

This event was reported to the NRC on March 18, 1988, at 1340 hours in accordance with Code of Federal Regulations 10CFR 50.72(b)(ii).

Apparent Cause of Occurrence

The root cause of this event has been attributed to a design error.

The subject alternate shutdown power cable was installed per a design change issued in May 1983. However, the design did not fully meet alternate shutdown requirements, as cable CDC22-CT was routed improperly.

Analysis of Occurrence

Salem Units 1 and 2 each have power feed cabling (three independent trains) from the 125V Vital Buses to the 125V Vital Distribution Cabinets. The power feed cabling from the 125V Vital Busses to the 125V Vital Distribution Cabinets are routed through the ceiling area of the 460V Switchgear Room along with the CDC22-CT cable.

The cables supplying normal power to the "A" and "B" Distribution Cabinets are routed in fire wrapped conduit (see attached sketches). The cable supplying normal power to the "C" Distribution Cabinet is not fire protected (not shown). In addition, cable CDC22-CT is routed in the ceiling area of the Switchgear Room and is also not fire protected.

If a fire is postulated at the location of the "B" 125V Vital Switchgear, the "B" Diesel Generator would be rendered inoperable due to the loss of field flashing and control power. This fire could also impact the unprotected CDC22-CT cable. If the fire is postulated to spread beyond the boundary of the marinite wall surrounding the "B" Switchgear, it is possible to cause damage to the normal "C" 125V DC feed. Therefore, only the "A" D/G would remain operable. Safe shutdown during loss of offsite power conditions requires two D/Gs to be operable.

In assessing the impact to safe shutdown the following factors should also be considered. First, the switchgear compartments in the 460V Switchgear Room are separated by a labyrinth of eight foot high marinite wall fire barriers. A fire in a compartment would be unlikely to spread to an adjacent area through combustion on the floor area. Second, the fire loading in the area is due almost entirely to cable insulation (IEEE 383 cable). Third, the area is provided with full area detection. Fourth, the area is provided with fixed suppression in the form of a manually actuated CO₂ flooding system. Fifth, the normal train "A" and train "B" power feeds are fire wrapped throughout the area. Sixth, although the Gas Turbine is not normally taken credit for, a set of feeds (via the normal offsite power) is located outside the Switchgear Room (fire area 12FA-AB-84A). These design features make it highly unlikely that a fire in the area would prevent safe shutdown of the plant.

It should be noted that an hourly roving fire watch has been assigned to the area, in support of other fire protection concerns, since March 1987.

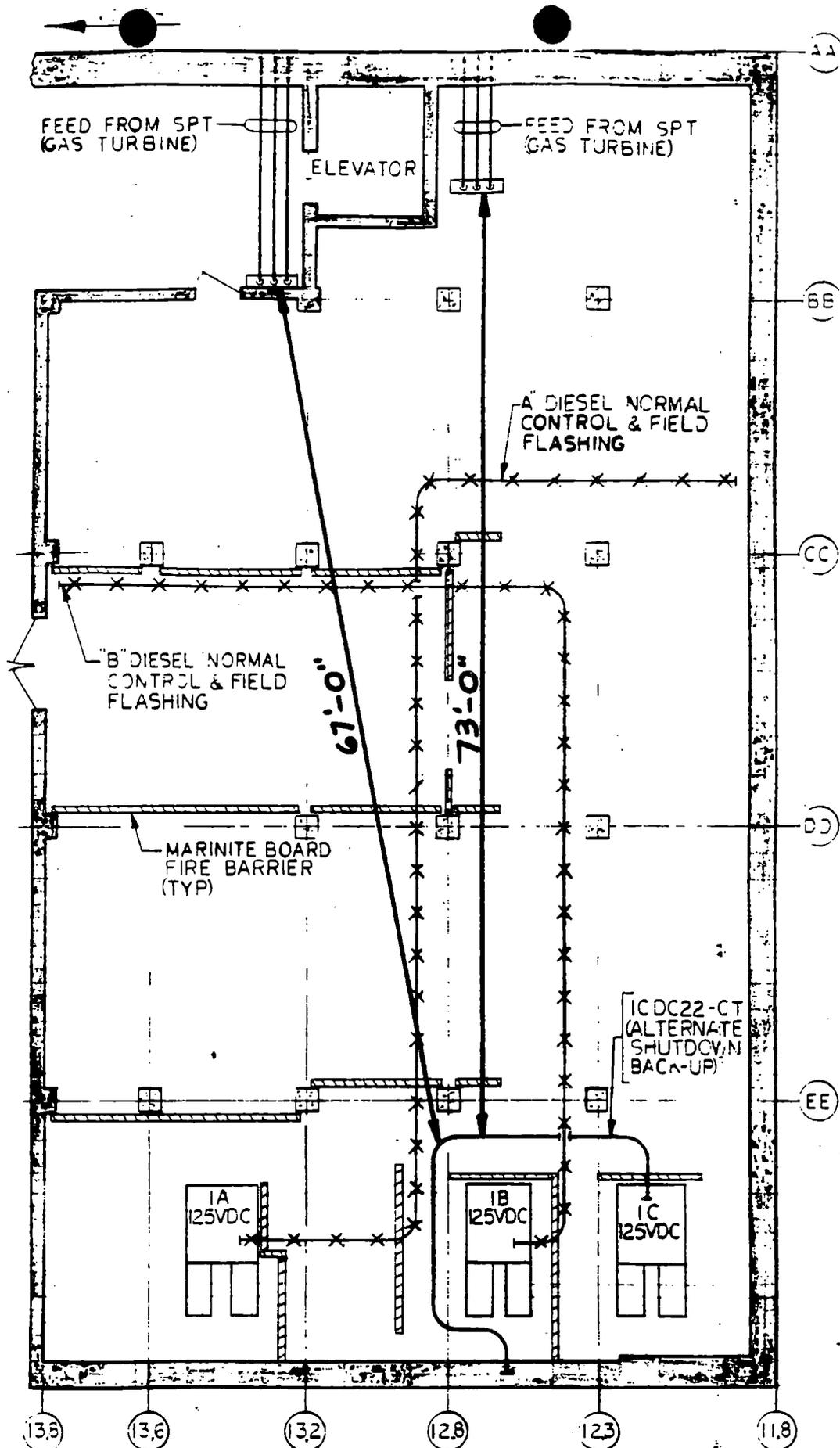
While the 10CFR 50 Appendix R criteria were not strictly complied with, in this case, the existing plant features support a conclusion that a safe shutdown can be achieved.

Corrective Action

The CDC22-CT cable will be re-routed in accordance with 10CFR 50 Appendix R criteria. The Unit 1 cable re-route will be

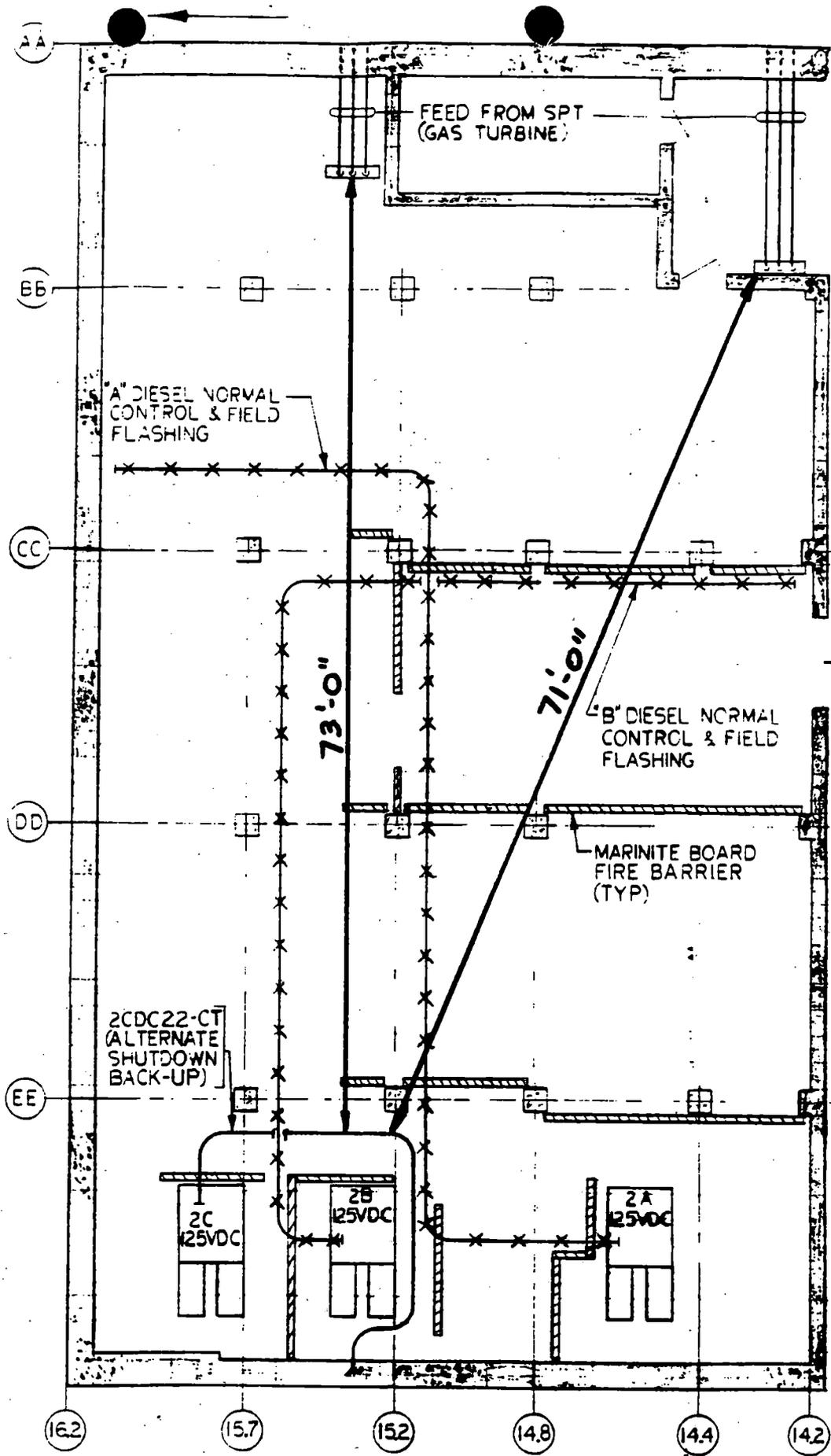
completed during the next refueling outage, currently scheduled to begin in April, 1989. The Unit 2 cable re-route will be completed during its fourth refueling outage, currently scheduled to begin in September, 1988.

The hourly roving fire watch will be continued until completion of cable re-routing and satisfaction of the other fire protection concerns.



NO. 1 UNIT CONTROL AREA
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NO.2 UNIT CONTROL AREA
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SCALE: NONE