

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-352/84-47

Docket No. 50-352

License No. CPPR-106 Priority - Category B

Licensee: Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Facility Name: Limerick Generating Station, Unit 1

Inspection At: Limerick, Pennsylvania

Inspection Conducted: August 27-31, 1984

Inspectors: *S. V. Pullani*
S. V. Pullani, Fire Protection Engineer

9-19-84
date

for *S. V. Pullani*
A. G. Krasopoulos, Reactor Engineer

9-19-84
date

Also participating and contributing to the report were:

R. Eberly, Chemical Engineering Branch, NRR

A. Fresco, Mechanical System Specialist, BNL

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Approved by:

Clifford J. Anderson
C. J. Anderson, Chief
Plant Systems Section

9/21/84
date

Inspection Summary:Inspection on August 27-31, 1984 (Inspection Report 50-352/84-47)

Areas Inspected: Special, announced team inspection of the safe shutdown capability of the plant in the event of a fire and the licensee's fire protection prevention program. The inspection involved 188 inspector hours on-site and 76 inspector hours in-office by the team consisting of 5 inspectors.

Results: No violations or deviations were identified. Seven items remained unresolved at the end of inspection.

DETAILS

1. PERSONS CONTACTED

1.1 Philadelphia Electric Company (PECO)

- * J Burke, Quality Assurance (QA) Auditor
- R. Cronin, Mechanical Engineer
- * J. Doering, Operations Engineer
- * C. Endriss, Regulatory Engineer
- * D. Groves, Engineer-Fire Protection
- E. Firth, Training Coordinator
- * G. Leitch, Superintendent
- * G. Lauderback, QA Engineer
- S. Macainsh, QA Site Supervisor
- T. Mc Elwain, Auditor
- G. Miller, Training Instructor
- * M. Morgan, Procedure Development Engineer (General Physics)
- * A. Mount, Fire Protection Assistant
- * E. Sproat, Electrical Project Engineer

1.2 Bechtel Power Corporation (BPC)

- * J. Langhirt, Electrical Group Supervisor
- * B. Walrod, Nuclear Engineer

1.3 Nuclear Regulatory Commission (NRC)

- * C. Anderson, Chief, Plant Systems Section
- R. Borchardt, Reactor Inspector
- * J. Wiggins, Senior Resident Inspector
- N. Fioravante, Auxiliary Systems Branch (by telephone)

* Denotes those present at the exit meeting on August 31, 1984.

2. PURPOSE

This inspection was to ascertain that the licensee is in conformance with his previous commitments with respect to the safe shutdown capability of the plant in the event of a fire and the fire protection/prevention program.

3. BACKGROUND

10 CFR 50.48 and Appendix R of 10 CFR 50 became effective on February 17, 1981 for plants licensed prior to January 1, 1979. For plants licensed or to be licensed after January 1, 1979 (Limerick-1 falls under this category), the requirements of 10 CFR 50.48 and Appendix R are invoked by the licensing process which includes a review of the Fire Protection Programs for conformance with the Standard Review Plan (NUREG-0800), Section 9.5.1, dated

July 1981 and its attachment BTP CHEB 9.5-1. These documents include the requirements of a previous NRC guidance, BTP ASB 9.5-1, as well as those of Appendix R.

The review of the licensee's Fire Protection Program is documented in the Safety Evaluation Report (SER), dated March 29, 1984. Based on certain licensee commitments documented therein, the SER closed out 28 confirmatory items and one open item which were previously identified. The one remaining open item concerns lack of fire protection of structural steel which supports 3 hour rated fire barrier assemblies. This item is being followed up and resolved by the licensee.

4. CORRESPONDENCE

All correspondence between the licensee and the NRC concerning compliance with the licensee commitments was reviewed by the inspection team in preparation for the site visit. Several items of correspondence were of particular importance with respect to their impact on the inspection.

On September 30, 1976, the Office of Nuclear Reactor Regulation (NRR) requested a re-evaluation of the fire protection program for the Limerick Generating Station. Attached to that document was Appendix A to BTP ASB 9.5-1. In response to that request, the licensee prepared a Fire Protection Evaluation Report (FPER). The latest revision of the FPER is Revision 6, dated June 1984. The FPER discusses the fire protection program as it relates to nuclear safety and addresses conformance to BTP CMEB 9.5-1 (which superseded BTP ASB 9.5-1) and Appendix R.

The licensee's Fire Protection Program is also described in Section 9.5.1 of the Final Safety Evaluation Report (FSAR).

The licensee commitments discussed in the above referenced documents and in the SER were used by the team as the bases for the inspection.

5. POST-FIRE SAFE SHUTDOWN CAPABILITY

The licensee's safe shutdown analysis provided in the FPER states that systems needed for hot shutdown and cold shutdown are redundant and that one of the redundant systems needed for safe shutdown would be kept free of fire damage through separation, fire barriers, and/or remote shut down capability. The FPER describes five safe shutdown methods designated as methods A, B, C, D and E. For a fire in any fire area, at least one of the methods will be available. For a fire in the control room, cable spreading rooms, or the auxiliary equipment room, method E (also called the remote shutdown method and further discussed in Section 7.2.1) will be available. For other areas in the plant, at least one of the other four methods (A, B, C and D) will be available. The following table summarizes the difference between the four methods.

Shutdown Method	Reactor Makeup	Depressurization	Heat Removal
A	RCIC	ADS	RHR "A" in suppression pool cooling and shutdown cooling modes
B	HPCI	ADS	RHR "B" in suppression pool cooling and shutdown cooling modes
C	RHR "C" in LPCI mode	ADS	RHR "A" in suppression pool cooling and shutdown cooling modes
D	RHR "D" in LPCI mode	ADS	RHR "B" in suppression pool cooling and shutdown cooling modes

To achieve hot shutdown, either the Reactor Core Isolation Cooling System (RCIC) or the High Pressure Coolant Injection System (HPCI) would be available, in addition to the Main Steam Isolation Valves (MSIVs) and Safety Relief Valves (SRVs), Automatic Depressurization System (ADS) valves, the Residual Heat Removal System (RHR) loop A or B, the RHR Service Water System (RHRSW) loop A or B, and the Emergency Service Water System (ESW) loop A or B. Going to cold shutdown from hot shutdown would require the A loops of the RHR, RHRSW, and ESW or the B loops of the RHR, RHRSW, and ESW.

The safe shutdown analysis considered components, cabling, and support equipment for systems identified above that are needed to achieve shutdown. The licensee has provided a cable separation review for all rooms of the plant housing safe shutdown equipment, to ensure that at least one train of this equipment is available in the event of a fire in any of these rooms. The review identified the safety-related equipment and redundant safe shutdown system cabling and discussed the consequences of a fire in each of these rooms. The license's review demonstrated that separation exists between redundant safe shutdown trains.

5.1 Safe Shutdown Procedure Review for Methods A,B,C and D

The licensee has four separate procedures, listed below, corresponding to methods A, B, C and D, for shutdown of the plant from the control room in the event of a fire elsewhere. The team reviewed these procedures for technical adequacy.

- Procedure SE-8, Attachment A, Safe Shutdown Method A, Revision B
- Procedure SE-8, Attachment B, Safe Shutdown Method B, Revision A

- Procedure SE-8, Attachment C, Safe Shutdown Method C, Revision A
- Procedure SE-8, Attachment D, Safe Shutdown Method D, Revision A

General deficiencies of a relatively minor nature common to all four procedures were the following:

- a. When other procedures or modes of operation are referenced, the specific identification numbers of the referenced procedures are not given within the procedures. The licensee agreed to correct the problem.
- b. It is intended by the procedures that certain valve positions must be verified locally, yet the procedures do not clearly state this. The licensee will correct this by inserting an asterisk next to the valves whose position must be locally verified.
- c. The specific locations of valves whose positions must be locally verified are not given in the procedures. The licensee agreed to include the locations.
- d. The specific locations of breakers for power operated valves are not given in the procedures. The licensee agreed to include the locations.

One specific deficiency in the Method D procedure was noted. The basic premise of Method D is that Hot Shutdown is achieved by manual operation from the control room of the ADS valves to depressurize the reactor vessel so that the RHR/LPCI Pumps B and D on Electrical Divisions 2 and 4 can be utilized for suppression pool cooling and reactor vessel water level makeup. However, the ADS valves can only be operated by Electrical Divisions 1 and 3 DC power. The procedure does not sufficiently indicate that, if the Division 1 or 3 diesel generators cannot be utilized to supply power to the corresponding battery chargers and inverters, a temporary jumper cable must be installed between the Divisions 1 and 2 or 3 and 4 Station Batteries to provide DC power to the ADS valves. The minimum expected life of the batteries is 4 hours. Therefore, depressurization could still be accomplished anytime during this 4 hour interval, because the Divisions 1 and 3 batteries are assumed to be available and the cables between the batteries and the ADS valves are fire protected with a 3 hour wrap.

The basic question, aside from inadequate description in the procedure, is whether this need for installation of a temporary jumper cable constitutes a repair required to achieve Hot Shutdown. Such repair is not permissible in accordance with Appendix R, Section III.G.1, and as further clarified by an NRC memorandum (dated July 2, 1982, from Roger J. Mattson to Richard H. Vollmer, on "Position Statement on Allowable Repairs for Alternative Shutdown and on the Appendix R Requirement for Time Required to Achieve Cold Shutdown").

After consultation with the Auxiliary System Branch of NRR, it was determined that the 4 hours of depressurization feasible by the expected battery life is sufficient to initiate cold shutdown and therefore the above mentioned repair need be performed only to achieve cold shutdown. Repairs to achieve cold shutdown is permissible. However, the repair procedures should be in place and the materials required for the repair should be on site. The license agreed to the above conditions.

5.2 Walk-Through of Safe Shutdown Procedures for Methods A, B, C AND D

The team walked through selected portions of procedures for Methods A through D to determine that shutdown could be attained in an orderly and timely fashion. As a result of this walk-through, certain deficiencies were identified.

The procedures for Methods A through D contained virtually all of the same deficiencies that were discovered for Method E, which concerns shutdown from the Remote Shutdown Panel. This is discussed in detail in Sections 7.2.2 and 7.2.3 of this report.

The licensee has indicated that they will make all of the revisions for Methods A through D that were indicated as necessary for Method E. However, their intention is to maintain Methods A through D as guidelines only, and not actual plant procedures, to be used in conjunction with the normal plant and trip procedures. Pending review of the revised documents, the NRC team finds this to be acceptable as long as adequate cross referencing to specific procedures is incorporated.

In addition, a revised Method D will be submitted, clarifying in detail exactly how and when the temporary jumper cable will be utilized. This matter will be submitted for further NRC review.

The procedural deficiencies discussed in Sections 5.1 and 5.2 together constitute an unresolved item, pending licensee actions to correct them and their reviews by NRC (50-352/84-47-01).

6. INSPECTION METHODOLOGY

The inspection team examined the licensee's capabilities for separating and protecting equipment, cabling and associated circuits necessary to achieve and maintain hot and cold shutdown conditions. This inspection sampled selected fire areas which the licensee had identified as being in compliance with BTP CMEB 9.5-1 and Appendix R.

The following functional requirements were reviewed for achieving and maintaining hot and cold shutdown:

- Reactivity control
- Pressure Control
- Reactor coolant makeup
- Decay heat removal
- Support systems
- Process monitoring

The inspection team also examined the licensee's capability to achieve and maintain hot shutdown and the capability to bring the plant to cold shutdown condition in the event of a fire in areas where remote shutdown capability is provided. The examination included a review of the drawings for the remote shutdown capability and review of the procedures for achieving the remote shutdown. Drawings were reviewed to verify electrical independence from the areas of concern. Procedures were reviewed for general content and feasibility.

Also inspected were fire detection and suppression systems and the degree of physical separation between redundant trains of Safe Shutdown Systems (SSSs). The team review included an evaluation of the susceptibility of the SSSs for damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems.

The inspection team examined the licensee's fire protection features provided to maintain one train of equipment needed for safe shutdown free of fire damage. Included in the scope of this effort were fire area boundaries, including walls, floors and ceilings, and fire protection of openings such as fire doors, fire dampers, and penetration seals.

The inspection team also examined the licensee's fire protection/prevention programs including administrative controls, fire brigade training, and quality assurance.

7. INSPECTION OF PROTECTION PROVIDED TO SAFE SHUTDOWN SYSTEMS

The team reviewed the protection provided to SSSs in selected fire areas for compliance with BTP CMEB 9.5-1/Appendix R. The team did not identify any violation, deviations, or other unacceptable conditions. This conclusion is based on the following:

7.1 Protection in Various Fire Areas

7.1.1 Reactor Enclosure, Elevations 177' and 201', RHR Pumps B and D and RHR Heat Exchanger B Compartment (Fire Area 31)

The RHR system is required for both hot and cold shutdown under Methods C and D. It is required only for cold shutdown under Shutdown Methods A and B. Therefore, any fire which damaged redundant trains of the RHR system would severely jeopardize safe plant shutdown.

This area contains smoke detectors which activate audible-visual annunciation in the control room. An inspection of this compartment did not reveal any redundant components located within. The compartment contains RHR Pumps B and D, RHR Heat Exchanger B and two unit coolers (one required) for each RHR pump, a total of four unit coolers. There are no A or C components except for dampers associated with a steam line break in the RHR line and utilized during the Reactor Steam Condensing Mode of RHR operation. These dampers are not required for safe shutdown under the Appendix R requirements.

The area is enclosed by 3 hour rated fire barriers with the exception of 115 square feet of unrated metal blowout panels in the ceiling. This matter is discussed in the licensee's FPER, Section 5.4.3 and has been reviewed and accepted by NRR.

No violations of Section III.G.2 of Appendix R were identified during the inspection.

7.1.2 Reactor Enclosure, Elevations 177' and 201', RHR Pumps A and C and RHR Heat Exchanger A Compartment (Fire Area 32)

This area contains the RHR equipment which is redundant to that contained in Fire Area 31, described previously. Specifically, RHR Pumps A and C, RHR Heat Exchanger A and two unit coolers for each RHR pump are located within the compartment, as well as some ESW flow transmitters required for leak detection.

The compartment is not exactly identical to Fire Area 31, but the arrangement of the major components is practically the same. The area contains smoke detectors which activate audible-visual annunciation in the control room. It is also enclosed by 3 hour rated fire barriers and 150 square feet of unrated metal blowout panels in the ceiling. This is also discussed in the applicants FPER Section 5.4.4 and has been reviewed and accepted by NRR.

The loss of the ESW flow transmitters does not affect ESW operation. There are no B or D components in this fire area.

No violations of Section III.G.2 of Appendix R were identified during the inspection.

7.1.3 Reactor Enclosure, Elevation 177, RCIC Compartment (Fire Area 33)

This area is located in the southwest corner of the Reactor Enclosure. The components required for safe shutdown that are located in the area are the RCIC pumps and turbine and the RCIC compartment unit coolers.

Fire area 33 is protected by detectors and a pre-action sprinkler system. There is a 3 hour barrier protecting the fire area with some exceptions addressed by the NRR safety evaluation. The RCIC system is used for Shutdown Method A and no Shutdown Method B or D raceways were found in the area.

Several field chosen raceways were selected for safe shutdown requirements and none were found that would impair safe shutdown. No violations of Section III.G.2 of Appendix R were found.

7.1.4 Reactor Enclosure, Elevation 177, HPCI Compartment (Fire Area 34)

This area is located on the west side of the Reactor Enclosure. The components required in this area are the HPCI pump and turbine and the HPCI compartment unit coolers and instrumentation rack.

Fire area 34 is protected by detectors and a pre-action sprinkler. With some exceptions addressed by the NRR safety evaluation, there are 3 hour barriers protecting this fire area. The HPCI system is used as part of Shutdown Method B. If this area was destroyed by a fire, Methods A, C and D would be available for safe shutdown.

No A, C or D raceways needed for shutdown were found in this area; no violations of Section III.G.2 of Appendix R were found.

7.1.5 Reactor Enclosure, Elevation 217, Safeguard System Isolation Valve Area (Fire Area 43)

This fire area almost completely surrounds the primary containment. There is a 20 foot combustible free zone that separates the east and west sides of this fire area. There are many safe shutdown components and cables in this area. Valves and cables from the HPCI, RCIC and RHR systems are in here, as well as HPCI instrumentation.

There are several detectors in this area and the area is protected by 3 hour barriers with exceptions that were addressed by the NRR safety evaluation. The east side of this area depends on shutdown method C and the west side depends on shutdown method D. Many cables and components were selected to verify that the licensee had provided the required protection for raceways and components of Shutdown Methods C and D.

It was noted that valves HV-C51-1F048A and B had to be manually operated and were not accessible. The licensee agreed to provide permanent ladders for these valves. It was also noted that on page 5-81 of the FPER, Revision 6, that only an electrical fire was postulated and not an exposure fire that would destroy all unprotected cables and components. The licensee demonstrated that an exposure fire had been analyzed, but that the FPER was not up-to-date. The licensee agreed to revise it. No other safe shutdown concerns were found in this area.

7.1.6 Reactor Enclosure, Elevation 217' (Fire Area 44)

This fire area surrounds fire area 43 and is divided into two twenty-foot combustion free zones. There are water curtain suppression systems within these combustion free zones.

Most of the components of all 4 safe shutdown methods have cables running through fire area 44 and many of the components themselves are in this area. However, in the west zone there are no components or cables used for Safe Shutdown Method D except those that are protected. The same is true for Shutdown Method A components and cables on the east Zone. Many sample raceways were selected and verified to assure that the protection methods were as noted in the FPER.

No violations of Section III.G.2 of Appendix R were found.

7.1.7 Diesel Generator and Support System Areas (Fire Areas 79, 44W, 44E, 7 and 13)

In checking out isolation devices and associated circuits for the diesel generators, it was noted that the components for Shutdown Method A were protected and that those for Shutdown Method B were not protected as stated in the FPER, Revision 6. However, the licensee had other documentation that confirmed the change from B to A and committed to change the FPER accordingly.

No examples of violations of Section III.G.2 of Appendix R were found.

7.2 Remote Shutdown Capability

7.2.1 Remote Shutdown Provisions

FSAR Section 7.4.1.4 and FPER Section 5.2.3 describe the design and capability of the remote shutdown panel. The design objective of the remote shutdown panel is to achieve and maintain cold shutdown in the event of an evacuation as a result of a fire that disables three areas in the control structure (the control room, the cable spreading, and the auxiliary equipment room). The RCIC, SRVs, RHR, RHRSW and ESW systems can be controlled from the remote shutdown panel to achieve cold shutdown, should a fire disable the three areas. To ensure the availability of this remote shutdown panel in the event of a fire in the above three areas, transfer switches are provided to transfer, to the remote shutdown panel, enough equipment to provide the capability to go to cold shutdown. These transfer switches provide electrical isolation between the above three areas and the remote shutdown panel.

The remote shutdown panel provides the safe shutdown capability for the three areas and is not considered as the alternative or dedicated shutdown method as defined in Appendix R. However, the design objectives of the remote shutdown panel complies with the performance goals outlined in the requirements of Section III. L of Appendix R (BTP CMEB 9.5-1, Section C.5.c). Reactivity control will be accomplished by a manual scram before the operator leaves the control room. The RCIC system will provide reactor coolant makeup, and the RHR system and the SRVs will be used for reactor decay heat removal. Reactor vessel water level, reactor vessel pressure, suppression pool water level and temperature, RCIC pump turbine

speed, and RHR system flow are shown on the instrumentation available at the remote shutdown panel which also includes instrumentation and control of support functions needed for the shutdown equipment.

The licensee had developed the required procedure for remote shutdown. The following 2 sections discuss the inspection with respect to the remote shutdown procedure.

7.2.2 Remote Shutdown Procedure Review

The team reviewed licensee procedure SE-8, Attachment E, Safe Shutdown from the Remote Shutdown Panel, Revision A.

The scope of review was to ascertain that the remote shutdown could be attained in a safe and orderly manner, to determine the level of difficulty involved in operating equipment, and to verify that there was no dependence on repairs for achieving hot shutdown. For purpose of the review, a repair would include installing electrical or pneumatic jumpers, wires or fuses to perform an action required for hot shutdown.

The following deficiencies were noted and resolution achieved as described:

- a. When other procedures or modes of operation are referenced, the specific procedures' identification numbers are not given within the procedure. The licensee agreed to incorporate the necessary changes.
- b. It is not clear that it is intended that certain valve positions must be verified locally.
- c. The specific locations of valves whose positions must be locally verified are not given in the procedure. An asterisk will be shown for those valves for which local position verification is absolutely necessary because the cables are not fire-protected.
- d. The specific locations of breakers for power-operated valves are not given in the procedure. The licensee agreed to incorporate the necessary changes.

7.2.3 Remote Shutdown Procedure Walk-Through

A procedure walk-through was conducted with two plant operators to determine the practicality and technical accuracy of the previously referenced procedure. During this walk-through, several significant problems were revealed.

The first relates to the licensee's basic philosophy regarding the nature of this procedure. The applicant describes the purpose as follows:

"This document provides guidance in equipment available for placing the unit in a safe shutdown condition in the event shift supervision decides to shut down the plant because of a fire. This document is to be used in conjunction with the normal plant and trip procedures."

Therefore, the licensee does not consider this to be a plant procedure, which would then mandate significant detail to be included. The NRC team did not find this acceptable.

One of the significant deficiencies involved how to enter into the procedure for shutdown at the Remote Shutdown Panel (RSP). The licensee stated that the immediate operator actions to be taken such as reactor trip, main steam isolation valve actuation, and turbine trip are covered by the normal plant and trip procedures. These actions can only be performed from the control room prior to evacuation in case of a fire. The team did not find this to be an acceptable procedural arrangement.

There are two operators required for the operations. Upon performing the above-mentioned actions in the control room, the operators would also try to notify the load dispatcher and also verify the position of the control rods before leaving the control room. None of the above was stated in the remote shutdown procedure. These actions were not precisely timed, but it appears that it would not take more than 5 minutes to accomplish them. The procedure requires one operator stationed at the RSP and another to be at various locations such as the Diesel Generator Compartment, the 4 KV Switchgear Rooms and areas where local valve position indication is required. Redundant communications systems consist of a distributed antenna network, the public address system and a dedicated telephone at the RSP. At the time of the inspection, only the public address system was available.

Other deficiencies noted involved the sequences of the procedural actions listed in the procedure, e.g., Reactor Level Control is listed after Electric Power Requirements. Specifically, when using the Remote Shutdown Panel, the primary means of reactor level control is the RCIC system which is not dependent on AC power so that verifying the operation of or starting the diesel generators should not be immediately necessary. The primary concern at this point should be reactor level control.

Another deficiency of a similar nature was the sequence of initiating the RHR loop versus the RHR Service Water loop which provides cooling water to the RHR Heat Exchanger. The procedure directs the RHR pump a to be started for Suppression Pool Cooling before taking actions to initiate the Service Water to the RHR Heat Exchanger.

The section on Electric Power Requirements contained some confusing statements or inadequate information. For example, it begins by making statements such as:

"Division 1 AC power will be available".

"Division 2 AC power will be available".

The intention is actually to state that those divisions have been protected from any fire which requires use of the Remote Shutdown Panel. The procedure can not guarantee that the diesel generators associated with those divisions will have started. Another statement pertained to the operation of certain bypass switches at the 4 KV Switchgear Room. From the description given, the PECO operator accompanying the NRC team could not ascertain the function of the bypass switches or their associated breakers.

Many of the warning statements, such as "WITH RSTS (Remote Shutdown Transfer Switches) IN EMERGENCY: RCIC WILL NOT AUTOMATICALLY INITIATE, RCIC WILL NOT AUTOMATICALLY ISOLATE, ETC.", were placed several steps after the directive to actuate the transfer switches. The team's position is that these warnings should be placed immediately after the procedural action or prior to taking another procedural action which could be affected by them, whether or not the operator has prior knowledge of the warning.

Inadequate or confusing information appeared in more than one area of the procedure. For example, in the section describing the purpose of the procedure, it does not indicate which specific plant and trip procedures it is to be used in conjunction with (See the statement at the beginning of this section).

The licensee agreed to correct all of the described deficiencies by superseding the subject procedure SE-8, Attachment E, and incorporating it into Procedure SE-1. "Plant Shutdown from Outside the Control Room". The latter procedure is currently designed for the situation of uninhabitability of the Control Room. It does not assume any damage to control room equipment caused by a fire or the concurrent loss of offsite power. These aspects will be incorporated into a new revision. While the NRC team has not performed any evaluation of the current SE-1 procedure, from a cursory inspection, it appeared to be a procedure which is sufficiently detailed and organized for safe plant operation. Pending NRC review of the new procedure, it appears that this action will satisfy the concerns discussed above.

The licensee also stated that a general statement will be made to indicate that the sequence of steps should be performed in the order required for the specific situation. This pertains to the concentration on reactor level control before electric power availability, as discussed earlier. A statement will be included that the particular electrical divisions have been protected from a fire, as opposed to saying that they will be available.

A commitment was also made that all necessary procedures and drawings will be stored in the Remote Shutdown Panel room. The operators will be given the correct keys to enter the room. One of the operators did not have the correct keys during the walk-through.

The procedural deficiencies discussed in Sections 7.2.2 and 7.2.3 together constitute an unresolved item, pending licensee actions to correct the deficiencies and their review by NRC (50-352/84-47-02).

7.3 Protection for Associated Circuits

Appendix R, Section III.G, requires that protection be provided for associated circuits that could prevent operation or cause maloperation of redundant trains of systems necessary for safe shutdown. The circuits of concern are generally associated with safe shutdown circuits in one of three ways:

- Common bus concern
- Spurious signals concern
- Common enclosure concern

The associated circuits were evaluated by the team for common bus, spurious signal, and common enclosure concerns. Power, control, and instrumentation circuits were examined for potential problems. A sampling basis was used in making the examination, since many circuits were involved and a determination of cable routing took considerable time. The samples were selected based on the most important components used in Methods A, B, C and D of safe shutdown.

7.3.1 Common Bus Concern

The common bus concern is found in circuits either safety related or non-safety related where there is a common power source with shutdown equipment and the power source is not electrically protected from the circuit of concern.

The team examined, on a sampling basis, the protection for several circuits including coordination of fuses, circuit breakers, and relays. The samples selected for the coordination review were as follows:

- RHR Pumps A, B, C and D
- ESW Pumps A and B
- ADS DC Solenoid Valves Series 113
- Valves HU 51-IF-007A and HU 51-IF 047A

The licensee is considering performing relay settings for 4KV relays at each refueling outage and 13KV relay settings every 5 year. No unacceptable conditions were identified.

7.3.2 Spurious Signals Concern

The spurious signal concern is made up of 2 items:

- False motor, control, and instrument indications can occur such as those encountered during 1975 Browns Ferry fire. These could be caused by fire initiated grounds, short or open circuits.
- Spurious operation of safety related or non-safety related components can occur that would adversely affect shutdown capability (e.g., P.H.R./RCS isolation valves).

No spurious signal concerns were identified after reviewing the following items:

a. Current Transformer Secondaries

The licensee had analyzed for spurious signals resulting from a fire instigated opening of current transformer secondaries and no problems were found. For diesel generator relays, the current transformer secondaries are routed from the diesel generator room to the control room and the 4 KV switchgear room. This routing was reviewed and was protected in a satisfactory manner. The FPER was found to be in error as to the shutdown method being used, but the licensee stated that this would be corrected in revision 7 of the FPER.

b. High Low Pressure Interfaces

The licensee had previously analyzed high low pressure interfaces and documented this analysis in Revision 6 of the FPER, in table A-13 and pages 6-5 and 6-6. The method of protection against a high-low interface problem is to wrap the cable of the valves involved.

c. General Fire Instigated Spurious Signals

The licensee has made an analysis of spurious signals with the object of protecting at least one of the redundant shutdown methods A, B, C or D. This analysis appears in the cable print out binders (E-1550), fire barrier review drawings, the color coded fire area drawings, the safe shutdown sequences diagrams, and the FPER Revision 6. Many components and cables were preselected and field checked for spurious signal concerns. The problems found were ones of inconsistency in documentation and were not problems that involved safety. The licensee agreed to revise the FPER to correct the documentation problem.

7.3.3 Common Enclosure Concern

The common enclosure concern is found when redundant circuits are routed together in a raceway or enclosure and they are not electrically protected or when fire can destroy both circuits due to inadequate fire penetrations.

A number of circuits selected for this concern were all found to be electrically protected. In addition, the licensee stated that non-safety related circuits were never routed from one train to another. The field review of circuits did not show any discrepancies with this statement.

No unacceptable conditions were identified.

8. GENERAL FIRE PROTECTION FEATURES

The team examined the general fire protection features in the plant which were provided to maintain one train of safe shutdown equipment free of fire damage. Included in the scope of this effort were fire area boundaries, including walls, floors and ceilings, and fire protection of openings such as fire doors, fire dampers, and penetration seals. The conditions of hose reel stations, automatic sprinkler systems, water curtains, and detection systems were noted during the various tours made of the plant. In general, the team felt that the licensee was providing fire protection systems as recommended by BTP CMEB 9.5-1 and in accordance with the licensee's FSAR commitments. It was however, noted that many of the fire protection systems are currently not in satisfactory working condition. Many of the automatic sprinkler and water curtain systems are not charged and functional. Some hose reel stations are not provided with complete equipment inventories, including nozzles and spanner wrenches.

It is the team's conclusion that increased management attention is required for the timely completion and implementation of the fire protection program. Housing keeping conditions were observed to be poor, in general. Smoking and trash were frequently noted in areas that have been turned over by construction to the licensee.

Due to the magnitude of completing the fire protection program, and the projected near term fuel-load date, greater management emphasis in the area is desirable. The deficiencies discussed above should be corrected before the operating license. This an unresolved item, pending licensee's corrective actions and their review by NRC (50-352/84-47-03).

9. EMERGENCY LIGHTING

The team reviewed the emergency lighting installed by the licensee in the control room, in the remote shut down panel room, in the emergency diesel generator rooms, and other plant areas such as corridors and stairwells that plant operators may use to perform shut down functions in the event of a control room fire or other emergency.

No unacceptable conditions were identified except as follows:

Additional Emergency Lighting Required

The team noted that the corridor leading from the door of the Unit 2 control room to the remote shut down panel room was not provided with emergency lights. Also stairwells 3 and 4 in the Reactor Enclosure were not provided with emergency lights. The licensee committed to install the additional emergency lighting fixtures prior to fuel-load, except the lights in the stair cases. These fixtures will be installed by October 15, 1984. This is an unresolved item, pending completion of the above mentioned actions by the licensee and its review by NRC (50-352/84-47-04).

10. FIRE PROTECTION/PREVENTION PROGRAM

The team reviewed documents in the following areas of the program to verify that the licensee has developed adequate procedures consistent with the Fire Protection Evaluation Report (FPER), Final Safety Analysis Report (FSAR), and Proposed Technical Specifications (PTS). The documents reviewed, the scope of review, and the inspection findings for each area of the program are described in the following sections.

10.1 Program Administration and Organization

The team reviewed the following licensee documents:

- Proposed Technical Specifications, Section 6, Administrative Controls
- Procedure A-92, Plant Fire Protection Program Responsibilities, Revision 0.

The scope of review was to ascertain that:

- a. Personnel were designated for implementing the program at site; and
- b. Qualifications were delineated for personnel designated to implement the program.

No unacceptable conditions were identified.

10.2 Administrative Control of Combustibles

The teams reviewed the following licensee documents:

- Procedure A-12.2, Control of Combustible Materials, Revision 0.
- Procedure A-30, Administrative Procedure for Plant Housekeeping, Revision 0.

The scope of review was to verify that the licensee has developed administrative controls which include:

- a. Special authorization for the use of combustible, flammable or explosive hazardous material in safety-related areas;
- b. Prohibition on the storage of combustible, flammable or explosive hazardous material in safety-related areas;
- c. The removal of all wastes, debris, rags, oil spills or other combustible materials resulting from the work activity or at the end of each work shift, whichever is sooner;
- d. All wood used in safety-related areas to be treated with flame retardant;
- e. Periodic inspection for accumulation of combustibles;
- f. Transient combustibles to be restricted and controlled in safety-related areas; and
- g. Housekeeping to be properly maintained in areas containing safety-related equipment and components.

No unacceptable conditions were identified.

10.3 Administrative Control of Ignition Sources

The teams reviewed the following licensee document:

- Procedure A-12, Ignition Source Control, Revision 0

The scope of review was to verify that the licensee has developed administrative controls which include:

- a. Retirements for special authorization (work permit) for activities involving welding, cutting, grinding, open flame or other ignition sources and that they are properly safeguarded in areas containing safety-related equipment and components, and
- b. Prohibition on smoking in safety-related areas, except where "smoking permitted" areas had been specifically designated by plant management.

No unacceptable conditions were identified.

10.4 Other Administrative Controls

The team reviewed the following licensee documents:

- Proposed Technical Specifications, Section 6, Administrative Controls
- Procedure, A-12, Ignition Source Control, Revision 0

- Procedure, SE-8, General Fire Fighting, Revision 0
- Procedure, A-34, Procedure for Preparation of Fire Protection (F) Procedures, Revision 0
- General Employee Training (GET) Lesson Plan (LP) for the Radiation Worker:
GET - LP - 0013, Revision 0 and
GET - LP - 001A, Revision 0
- QA plan - Operations Phase - Fire Protection Program.

The scope of review was to verify that the licensee has developed administrative controls which require that:

- a. Work authorization, construction permit or similar arrangement is provided for review and approval of modification, construction and maintenance activities which could adversely affect the safety of the facility;
- b. Fire brigade organization and qualifications of brigade members are delineated;
- c. Fire reporting instructions for general plant personnel are developed;
- d. Periodic audits are to be conducted on the entire fire protection program; and
- e. Fire protection/prevention program is included in the licensee's QA Program.

No unacceptable conditions were identified, except as follows:

Additional Fire Fighting Strategies Required:

The team reviewed the Fire Fighting Procedures developed by the licensee in accordance with the requirements of 10 CFR 50, Appendix R, Section III.K.12. The inspector noted that the licensee has completed 2 out of an estimated 24 Fire Fighting Procedures. The licensee committed to complete all of these procedures and submit same to NRC prior to fuel-load. This is an unresolved item, pending receipt and review of the Fire Fighting procedures by NRC (50-352/84-47-05)

10.5 Equipment Maintenance, Inspection and Tests

The team reviewed the several surveillance test procedures, on a sampling basis, to determine whether the licensee has developed adequate procedures which established maintenance, inspection, and testing requirements for the plant fire protection equipments. The licensee has plans to write 32 procedures listed below and has issued 17 of them so far. Those indicated by an asterisk (*), 15 in total, are not yet issued.

- * Procedure ST-1-022-323, Halon System Operability Verification
- * Procedure ST-5-022-800-0, FSWS Diesel Driven Pump Fuel Analysis
- Procedure ST-6-022-251-0, FSWS Motor Driver Pump Flow Test, Revision 1
- Procedure ST-6-022-252-0, FSWS Diesel Driven Pump Flow Test, Revision 1
- * Procedure ST-6-022-320-0, FSWS Operability Verification
- Procedure ST-6-022-351-0, Low Pressure CO₂ Inventory, Revision 0
- * Procedure ST-6-022-353-0, Halon System Inventory,
- Procedure ST-6-022-450, Fire Suppression Water System Valve Line up verification, Revision 0
- Procedure ST-6-022-451, Low Pressure CO₂ Line up verification, Revision 0
- * Procedure ST-6-022-453-0, Halon System Line up verification
- Procedure ST-6-022-600-0, FSWS Flush
- Procedure ST-6-022-760-0, Fire Water Valve Exercise Test, Revision 0
- Procedure ST-6-022-910-0, FSWS Diesel Driven Pump Weekly Battery Inspection, Revision 0
- Procedure ST-6-022-911-0, FSWS Diesel Driven Pump Quarterly Battery Inspection, Revision 0
- Procedure ST-6-022-912-0, FSWS Diesel Driven Pump 18 Month Battery Inspection, Revision 0
- * Procedure ST-7-022-250-0, FSWS Flow Test
- Procedure ST-7-022-329-0, Station Fire Hose Operability Verification, Revision 0
- * Procedure ST-7-022-325-0, Yard Fire Hydrant and Fire Hose Operability Verification
- Procedure ST-7-022-370-0, Fire Door Daily Position Check, Revision 0
- * Procedure ST-6-022-320-0, FSWS Operability Verification
- * Procedure ST-7-022-374-0, Electrically Supervised Fire Door Weekly Position Check
- * Procedure ST-7-022-550-0, Triennial Fire Drill
- * Procedure ST-7-022-600-0, Fire Door Channel Functional Test
- * Procedure ST-7-22-730-0, FSWS Air/Water Nozzle Flow Test
- * Procedure ST-022-9200, Fire Rated Assembly Inspection
- * Procedure ST-7-022-921-0, Fire Damper Inspection
- * Procedure ST-7-022-922-0, Sealed Fire Penetration Inspection
- Procedure ST-7-022-950-0, FSWS Spray and Sprinkler Visual Inspection, Revision 0
- Procedure ST-7-022-951-0, Fire Hose Station Visual Inspection, Revision 0
- Procedure ST-7-022-952-0, Fire Hose Station Refuel Inspection, Revision 0
- Procedure ST-7-022-953-0, Hose Cart Visual Inspection, Revision 0
- Procedure ST-7-022-954-0, Yard Fire Hydrant Visual Inspection, Revision 0

No unacceptable conditions were identified except as follows:

Surveillance Testing Procedures not Available for Review

The licensee indicated that the 15 procedures have not been issued but exist at various stages of development. The licensee committed to submit these procedures to NRC for review prior to fuel-load.

This is an unresolved item, pending receipt and review of the surveillance testing procedures identified above with an asterisk. (50-352/84-47-06)

10.6 Fire Brigade Training

The team reviewed lesson plans and training records of the fire brigade to ascertain that the fire brigade training is current.

The scope of review was to verify that the licensee had developed administrative procedures which included:

- a. Requirements for announced and unannounced drills;
- b. Requirements for fire brigade training and retraining at prescribed frequencies;
- c. Requirements for at least one drill per year to be performed on a "back shift" for each brigade;
- d. Requirements for local fire department coordination and training; and
- e. Requirements for maintenance of training records.

No unacceptable conditions were identified, except as follows:

Inadequate Fire Brigade Training Program

The team noted that, although all of the fire brigade members had the required "hands-on" training within the last 12 months, not all have participated in a quarterly drill. In addition fire brigade regular meetings or periodic refresher training sessions required by Appendix R, Section III.I, have not been held or scheduled.

The licensee committed to develop procedures that fully comply with the above mentioned section of Appendix R and to establish a surveillance program that monitors the training received by each fire brigade member. This program and training activities will be completed prior to fuel-load. This is an unresolved item, pending review of the licensee actions by NRC (50-352/84-47-07).

10.7 Fire Protection Program QA Audits

The inspector verified that the licensee has a program to conduct QA audit of the Fire Protection Program in accordance with the Technical Specification, Sections 6.5.28 e,f,h,i and j.

No unacceptable conditions were identified.

11. UNRESOLVED ITEMS

Unresolved items are matters for which more information is required in order to ascertain whether they are acceptable, violations, or deviations. Unresolved items are discussed in Sections 5.1, 5.2, 7.2.2, 7.2.3, 8., 9., 10.4, 10.5, and 10.6.

12. CONCLUSIONS

The team did not identify any violation or deviation. However, seven unresolved items were identified during the inspection. These items remained unresolved at the end of inspection either due to lack of information or incomplete licensee actions. Most of these items are related to revision or completion of plant procedures in the fire protection area. The remaining items need, for their resolution, addition or completion of certain fire protection hardware. The licensee was informed that all items are required to be completed before fuel-load except that the installation of emergency lights in certain staircases may be completed by October 15, 1984, as discussed in Section 9. of this report.

13. EXIT INTERVIEW

The inspection teams met with the licensee representatives, denoted in Paragraph 1, at the conclusion of the inspection on August 31, 1984. The team leader summarized the scope and findings of the inspection at that time.

At no time during this inspection was written material provided to the licensee by the team.