APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Inspection Report: 50-445/92-49
50-446/92-49

Operating License: NPF-87
Construction Permit: CPPR-127
Expiration Date: August 1, 1995

Licensee: TU Electric
Skyway Tower
400 North Olive Street
Lock Box 81
Dallas, Texas 75201

Facility Name: Comanche Peak Steam Electric Station (CPSES), Units 1 and 2

Inspection At: Glen Rose, Texas

Inspection Conducted: November 16-20, 1992

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EXECUTIVE SUMMARY

November 16-20, 1992, four NRC inspectors and two contract specialists from Brookhaven National Laboratories performed a prelicensing, inspection of the licensee's docketed commitments and exceptions taken to Title 10 CFR Part 50, Appendix R; Appendix A to Branch Technical Position APCSP 9.5.1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976"; and NRC Generic Letters 81-12, 83-33, 86-10, and 88-12. The inspection also included an evaluation of the approved Comanche Peak Steam Electric Station Fire Protection Program as implemented for Unit 2. These commitments and programs were evaluated as documented in the Final Safety Analysis Report (FSAR) through Amendment 86 and the Fire Protection Report, Revision 6, and as approved in NUREG-0797, "Safety Evaluation Report Related to the Operation of Comanche Peak Steam Electric Station, Units 1 and 2," (SER) through Supplement 25.

The principal objectives of the inspection were to selectively assess the design of features for detection, suppression, and containment of fires; selectively assess the design, implementation, and fire protection of features engineered to achieve a postfire safe shutdown; assess the adequacy of and the licensee's ability to implement its postfire safe shutdown procedures; assess the operational readiness of plant personnel, hardware, and procedures necessary to support the ability to achieve a postulated fire induced remote shutdown; and assess the effectiveness and implementation of the fire protection program for Unit 2.

The inspection team reviewed operational, maintenance, and surveillance procedures; engineering calculations and drawings; and other supporting documentation which is detailed in Attachments 2 and 4 to the inspection report. The team also field verified a substantial portion of the as-installed fire detection, suppression, and containment features; emergency lighting; oil collection capability; and achievement of separation criteria. The team performed an assessment of the ability of operations personnel to execute a remote shutdown and the ability of the fire brigade to respond to a simulated plant fire.

In that portion of the inspection which focused on commitments to Appendix R requirements and the design and implementation of features to satisfy those requirements, the team found most aspects to be adequate, with the supporting engineering design and analyses generally thorough and comprehensive. Specifically, the team found that the licensee's systems and shutdown methodology fully supported the requirements for alternative and dedicated shutdown capability as prescribed by Sections L.1 and L.5 of Appendix R. With the exception of those items identified as unresolved items, the licensee was found to have developed sound methods and strong supporting documentation to address the potential effect of fire on all cables and circuits necessary to assure operability of systems and equipment relied on to achieve safe shutdown as required by Section III.G of Appendix R. The team found the reactor plant in general to be extensively protected by fire detection, suppression, and containment equipment, which was of sound design with the exception of those items identified as unresolved and inspection followup items. Further, those areas which may require remote manual operations during a shutdown from outside the control room were extensively equipped with emergency lighting to

facilitate manual actions as well as access and egress to those areas. The team found the licensee had developed strong preventive maintenance and testing programs for equipment and associated instrumentation, controls, and circuitry required to achieve a postfire safe shutdown.

There were significant issues identified by the team in that portion of the inspection which focused on commitments to and implementation of Appendix R requirements. These issues have been designated as unresolved items and are summarized below:

- The team found that the application of the licensee's existing testing and maintenance programs for breakers and relays, which were technically comprehensive, was limited in scope and did not bound or encompass all circuits necessary to achieve a postfire safe shutdown. Unresolved Item 445;446/9249-01.

- The team found the licensee's high impedance fault study associated with Generic Letter 86-10, "Implementation of Fire Protection Requirements," to be inconsistent with standard industry practice. Specifically, the number of simultaneous cable faults assumed for low voltage power supplies in safe shutdown circuitry was considered low and, therefore, did not provide sufficient assurance that potentially affected panels would remain operable Unresolved Item 445;446/9249-02

- The team found that the licensee had not addressed fire induced short circuiting of safety-related motor-operated valves (MOVs) from a control room fire, which could possibly render the valves inoperable from the remote shutdown panel. The team found that the licensee's procedure for remote shutdown assumes that an automatic turbine trip occurs upon reactor trip, whereas Westinghouse WCAP 11331, Section 4.4, postulates a scenario where the automatic function may be disabled and an uncontrolled cooldown may be initiated prior to remote manual operations being taken. Unresolved Item 445;446/9249-03.

- The team found that the licensee's established maintenance and testing programs for emergency lighting for areas requiring remote manual operations during a remote shutdown scenario and access and egress thereto may not be sufficient to ensure that the 8-hour duration requirement of Appendix R, Section J, is met. Particularly, the team was concerned that the lead-acid batteries may be subject to accelerated derating in areas of elevated ambient temperatures. Unresolved Item 445;446/9249-05.

- The team questioned the licensee's selection of suppression sprinkler heads designed to activate at 212°F in areas where the highest ambient temperature where they are applied is 104°F. Also, the team questioned whether the positioning of certain sprinkler heads for automatic cable tray suppression meets industry standards. Unresolved Item 445;446/9249-09.

- The team found that the design and layout of a water curtain and associated suppression equipment in the essential chiller equipment room, which forms the basis for a deviation from Section III.G.2 of Appendix R as documented in Supplement 12 of the Safety Evaluation Report, may not be acceptable. The specific concerns were that suppression equipment may be actuated in the area unaffected by fire and render the alternate chiller inoperable and, because of the physical installation and lack of draft stops, some sprinkler heads in the water curtain could fail to actuate, resulting in the failure to develop the designed water curtain effect. Unresolved Item 445;446/9249-11.

In addition to the unresolved items for that portion of the inspection which focused on commitments to and implementation of Appendix R requirements, the team identified the following for inspection followup:

- The team performed an assessment of the licensee's ability to implement Procedure ABN-803B, Revision 01, "Response to a Fire in the Control Room or Cable Spreading Room." The assessment was not comprehensive or timed due to physical limitations within the plant at the time. The assessment uncovered numerous deficiencies with the procedure primarily related to identification and labeling of components. Weaknesses in communications necessary to execute the procedure were also identified. Inspection Followup Item 446/9249-04.

- A station blackout drill, necessary to assess the adequacy of emergency lighting in areas requiring remote operations and access and egress thereto, was not able to be performed due to ongoing testing and completion activities. Inspection Followup Item 446/9249-06.

- The team identified a concern in that some smoke detection equipment may not be optimally located to provide early identification of potential fires due to air currents which may develop. Inspection Followup Item 446/9249-07.

- The team found numerous fire barriers and seals designed to achieve separation criteria incomplete. Inspection Followup Item 446/9249-08.

- The team found numerous fire suppression heads which appeared to have been physically obstructed to the point that they would be ineffective. Inspection Followup Item 446/9249-10.

- The team found missing ceiling tiles in the control room and expressed concern that, because of them, adverse air currents would develop which would bypass detection equipment. Inspection Followup Item 445;446/9249-12.

As discussed in Inspection Followup Item 446/9249-06, the procedural deficiencies found in the simulated implementation of Procedure ABN-803B led to a more general concern with respect to the validation of Unit 2 procedures. This will be the focus of a separate prelicensing inspection.

In addition to the identified inspection followup items, the team found that there were neither level indication instrumentation nor administrative controls in place to assess and dispose of lube oil in the reactor coolant pump lube oil collection system (RCPLOCS). An error was found in a calculation supporting the design of the RCPLOCS tank capacity.

In that portion of the inspection which focused on the licensee's implementation of the approved Fire Prevention/Protection Program, the team concluded that the licensee had maintained an overall effective fire protection program and that it was being effectively implemented for Unit 2, with some exceptions due to the physical status of the plant. Appropriate procedural controls existed for the reduction of fire hazards. Satisfactory procedures were established, either in final or draft format, for the preventive maintenance and testing of fire detection, suppression, and support equipment. A Fire Protection Quality Assurance program was found to be in place and effective in identifying substantive concerns. Fire brigade training and qualifications of personnel were viewed as strengths and actual performance during a drill was satisfactory.

DETAILS

1 INTRODUCTION

A planned prelicensing team inspection was performed of the implementation of the licensee's approved Fire Protection Program as implemented for Unit 2. This effort included the selective evaluation and assessment of its commitments and exceptions taken to Title 10 CFR Part 50, Appendix R, Section III.G, "Fire Protection of Safe Shutdown Capability," Section III.J. "Emergency Lighting," Section III.L, "Alternative and Dedicated Shutdown Capability," Section III.O, "Oil Collection System for Reactor Coolant Pump;" Appendix A to Branch Technical Position (APCSB) 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976;" and NRC Generic Letters 81-12, 83-33, 86-10, and 88-12. These commitments and exceptions are documented in the Final Safety Analysis Report through Amendment 86 and the Fire Protection Report, Revision 6, and have been reviewed and approved in NUREG-0797, "Safety Evaluation Report related to the operation of Comanche Peak Steam Electric Station, Units 1 and 2," through Supplement 25. The inspection team used as guidance a preapproved inspection plan which closely paralleled NRC Inspection Manual Inspection Procedures 64704, "Fire Protection/Prevention Program," and 64100, "Postfire Safe Shutdown, Emergency Lighting and Oil Collection Capability at Operating and Near Term Operating Reactor Facilities." The inspection was principally performance based in that substantial field evaluations of as-built configurations were performed as well as evaluations of the operational readiness of plant personnel, procedures, and hardware. Significant effort was also expended, however, reexamining the licensee's methodologies, engineering analysis, and assumptions supporting its Fire Safe Shutdown Analysis.

2 FIRE PROTECTION OF SAFE SHUTDOWN CAPABILITY

2.1 Overview

The team selectively assessed the licensee's commitments to 10 CFR Part 50, Appendix R, Section III.G., "Fire Protection of Safe Shutdown Capability," Section III.L, "Alternative and Dedicated Shutdown Capability," and Appendix A to Branch Technical Position APCSB 9.5.1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976" by:

- Performing a review of the systems required to achieve and maintain safe shutdown as described in Section 7.4 of the Final Safety Analysis Report and evaluated in Section 7.4 of the Safety Evaluation Report.

- Reviewing the licensee's methodology for protecting electrical circuitry associated with systems and equipment relied upon to achieve fire safe shutdown. The licensee's associated circuit methodology was reviewed for common power supply, spurious operation, and common enclosure vulnerabilities as defined in NRC Generic Letter 86-10, "Implementation of Fire Protection Requirements."

2.2 Systems Required for Safe Shutdown and Shutdown Methodology

2.2.1 Objectives

The team found the CPSES to have the following fire safe shutdown performance goals and associated fire safe shutdown operator functions to achieve these goals:

Fire Safe Shutdown Performance Goals	Fire Safe Shutdown Operator Functions
• Reactor Reactivity Control	• RCS Boron Concentration Control
• Reactor Coolant Inventory Control	• RCS Inventory Control
• Reactor Coolant Pressure Control	• RCS Pressure Control
• Decay Heat Removal	• RCS Temperature Control
	• Secondary Inventory Control
	• Secondary Pressure Control

As indicated by 10 CFR Part 50, Appendix R, Section III L.5, the equipment and systems used to achieve and maintain hot standby conditions must be free of fire damage during accomplishment of the above goals. Additionally, the equipment and systems used to achieve and maintain cold shutdown conditions must be either free of fire damage or the damage must be limited to allow repair of the systems necessary to achieve and maintain cold shutdown conditions from either the control room or emergency control station(s) within 72 hours. The above goals must be achieved with or without offsite power being available.

As indicated by 10 CFR Part 50, Appendix R, Section III.L.1, during postfire safe shutdown, the reactor coolant system process variables must be maintained within those predicted for a loss of normal AC power, and the fission product integrity shall be maintained, i.e., fuel clad damage is unacceptable, and rupture of containment or any primary coolant boundary must not occur.

Safe shutdown as used by CPSES includes the following plant conditions:

- Hot Standby or Hot Shutdown: The reactor coolant system temperature is greater than 200°F and K_{eff} is less than 0.99,
- Cold Shutdown: The reactor coolant system temperature is equal to or less than 200°F and K_{eff} is less than 0.99, and
- Cooldown: The transient condition between hot and cold shutdown.

2.2.2 Analysis and Conclusions

The team reviewed the licensee's designs for fire safe shutdown for reactivity control, reactor coolant system inventory and pressure control, reactor heat removal and secondary side pressure and level control, process monitoring, and support systems, as described in Section 7.4 of the FSAR, and determined the design could support the stated goals and objectives. The team ascertained

that the licensee's shutdown methodology properly identified the components, instrumentation, and systems necessary to achieve and maintain safe shutdown conditions from either within or outside the control room coincident with a loss of normal AC power.

2.3 Associated Circuits

In order to adequately demonstrate that the intent of Section III.G of Appendix R is met, the licensee's analysis must consider the potential effect of fire on all cables and circuits necessary to assure operability of systems and equipment relied on to achieve a given safe shutdown performance goal (e.g., reactor coolant makeup and decay heat removal). Additionally, Section III.G requires that this analysis also include an evaluation of the potential effect of fire initiated cable faults (hot shorts, open circuits, and shorts to ground) on nonessential associated circuits. As defined by NRC Generic Letter 81-12, "Fire Protection Rule," such associated circuits of concern may be categorized into one of three distinct types:

- Circuits associated by Common Power Supply (i.e., nonessential circuits which share a common switchgear, motor control center (MCC), or distribution panel with circuits of equipment relied on to achieve postfire safe shutdown)

- Circuits associated by Common Enclosure (i.e., nonessential circuits which share a common cable tray, conduit, junction box, etc., with required circuits).

- Circuits whose Spurious Operation may adversely impact the achievement of a safe shutdown performance goal.

Acceptable protection alternatives for each type of associated circuit described above have been principally defined by Generic Letter 81-12, with additional clarification provided by Generic Letter 86-10.

During the audit at CPSES, the potential effect of fire on each of the associated circuit configurations described above was evaluated on a sample basis. This assessment included an evaluation of a selected sample of power, control, and instrument circuits for potential fire initiated problems. The specific sample of circuits selected for review was based on an evaluation of components and equipment CPSES proposed for use to achieve the safe shutdown performance goals described in its postfire safe shutdown analysis.

2.3.1 Review of Circuits Associated by Common Power Supply

A common power supply associated circuit concern is found when unprotected circuits are connected to a common power supply (Switchgear, MCC, Distribution Panel, etc.) with equipment required to achieve postfire safe shutdown. In the absence of adequate fire protective barriers or electrical coordination (selective tripping), fire initiated faults on unprotected branch/load circuits may propagate to a loss of the entire power supply due to inadequate

coordination between the upstream feeder protective device and the faulted branch/load protective device(s) (i.e., circuit breakers, relays, fuses, etc.).

2.3.1.1 Coordination of Electrical Protective Devices

Selective tripping of electrical protective devices is necessary to ensure that fire initiated faults will be rapidly isolated by the protective device located nearest the fault prior to the fault current propagating to a trip of any protective device located upstream of the affected power supply.

On a sample basis, the inspectors reviewed the electrical protection provided for power supplies of equipment relied on to achieve safe shutdown in the event of fire. The specific sample of circuits selected for review and the corresponding results of this evaluation are provided as Attachment 2, Table 1.

As indicated in Attachment 2, Table 1, the coordination (selective tripping) of selected power supplies required for safe shutdown was found to be acceptable with the exception of the 118 VAC distribution panel, Train A, Channel III ECDPPC-03 - Fed From Inverter ESELIV-03. Additional investigation and discussions with CPSES representatives determined that the CPSES postfire safe shutdown analysis does not credit the use of this power supply in areas where its load cables may be affected by fire. Its potential loss due to unsatisfactory coordination of feeder and load breakers (i.e., a trip of its upstream feeder breaker prior to a trip of any individual load circuit protective device), therefore, has been considered in the CPSES safe shutdown analysis and found not to affect the plant's ability to achieve safe shutdown.

Based on the results of this review, the coordination/selective tripping capability of power supplies relied on to achieve and maintain safe shutdown was found to be acceptable.

2.3.1.2 Circuit Breaker and Relay Testing and Maintenance

Circuit breakers and relays typically have adjustable settings and trip points. The specific values selected for the setting of these devices is largely based on the results of calculations performed during the plant's coordination study. An established program consisting of surveillance testing and periodic maintenance is, therefore, necessary to provide assurance that the selected settings will not drift or vary considerably over the life of the plant.

CPSES has developed procedures for the test and maintenance of circuit breakers and relays. Based on the team's review of these procedures, they appear to provide sufficient instructions to assure the long-term maintenance of settings established in the plant's coordination study. However, subsequent discussions with CPSES personnel determined that the implementation of these procedures is limited to maintenance and testing of only those power supplies required by Technical Specifications (typically those power supplies with power cables entering containment penetrations). The existing

maintenance and testing program does not appear to adequately bound all power supplies required to achieve postfire safe shutdown.

This issue is considered an Unresolved Item 446/9249-01.

The specific procedures reviewed by the team are listed in Attachment 2, Table 2.

2.3.1.3 High Impedance Faults

As stated in Section 5.3.8 of Generic Letter 86-10, the NRC staff has determined that, to meet the separation criteria of Section III.G, simultaneous high impedance faults (fault currents of a value that is just below the trip point of the protective device on each individual circuit) for all associated circuits located in a given fire area should be considered in the evaluation of safe shutdown capability.

The CPSES postfire safe shutdown analysis was found to consider the potential effect of fire induced high impedance faults. For Unit 2 this evaluation was found to be documented in Calc 2-EE-0052, "Unit 2 Multiple High Impedance Fault Study." A review of this analysis found it to be based on an apparently nonconservative assumption that, given their low probability of occurrence, only a limited number (five were specified) of fire initiated, high impedance faults would be expected to be experienced simultaneously by a single power supply, regardless of the actual number of circuits it powered that were located in a given fire area. Based on this observation, the team considered this assumption to be nonconservative and requested CPSES to determine the percent of the total number of cables this assumption (five cable faults) represents for each power supply required for safe shutdown. The results of this effort determined that for high and medium voltage levels, consideration of five simultaneous cable faults on any one power source is equal to or greater than 31 percent of the connected cables, which is considered sufficiently conservative. However, for low voltage power supplies, which typically have a greater number of loads than high or medium voltage power sources, the consideration of only five cable faults was found to correspond to only 14 percent of all circuits connected to two panels (Panels 2ED1-2 and 2ED2-2).

Generic Letter 86-10 clearly indicates that high impedance faults should be considered for all associated circuits located in a fire area. The percentage of circuits considered in the CPSES analysis for certain low voltage supplies (14 percent) appears to be too small to provide sufficient assurance that the potentially affected panels (2ED1-2 and 2ED2-2) would remain operable. The conservatism of the assumptions related to simultaneous faults of cables associated with lower voltage power supplies is considered an Unresolved Item 446/9249-02.

2.3.1.4 Conclusions and Summary of Findings

The lack of an established test and maintenance program for power supplies relied on to achieve postfire safe shutdown is considered an unresolved item. The nonconservative assumptions which form the basis of the evaluation of high

impedance faults is considered an unresolved item. The coordination/selective tripping capability of power supplies relied upon to achieve and maintain safe shutdown was found to be acceptable.

2.3.2 Review of the Spurious Signal's Associated Circuit Concern

Specific circuits of concern include those which have a physical separation that is less than that required by Section III.G and have a connection to equipment whose spurious operation or maloperation could adversely affect the shutdown capability. This concern is principally comprised of two items:

- The maloperation of required equipment due to fire induced damage to associated cabling. Examples include false motor, control, and instrument readings which may be initiated as a result of fire induced grounds, shorts, or open circuits.

- The spurious operation of safety-related or nonsafety-related components that could prevent the accomplishment of a safe shutdown function.

2.3.2.1 Isolation of Fire Initiated Spurious Signals

CPSES, Unit 2, has developed various methods to prevent and isolate spurious equipment operations that may occur as a result of fire. Specific examples noted during the inspection include:

- administrative controls
- isolation/transfer switches which incorporate redundant fusing schemes
- fire wrap
- manual operator actions governed by written procedures

The CPSES safe shutdown analysis incorporates the use of computerized logic block diagrams which graphically depict the systems, components, and support equipment which must remain available to achieve a specified safe shutdown performance goal. Computerized cable run data (verified by field walkdowns) was then evaluated to determine potential cable interactions within each fire area. From this listing of identified interactions, CPSES has developed a resolution report for each fire area. For components having the potential to spuriously operate due to fire within a given fire area, such as flow path isolation or diversion valves, the CPSES resolution report typically credits the use of manual operator actions. As discussed in Section 3.2 of this report, all such manual actions have been incorporated into plant procedures. For interactions where reliance on manual operator actions was not feasible, other alternatives, such as fire wrapping of potentially affected cables were implemented.

2.3.2.2 Potential for Spurious MOV Operations

As discussed above, Section III.G of Appendix R requires that protection be provided for fire initiated faults on circuits that could adversely impact the achievement and maintenance of stable safe shutdown conditions. Additionally,

Appendix R safe shutdown criteria require a designated set of safe shutdown equipment to remain operable from the remote shutdown panel after a control room fire.

During a review of plant schematic drawings and control circuit wiring diagrams, the team noted that a postulated fire in the control room or cable spreading room could create a single hot short in the control circuitry of various MOVs, resulting in their spurious operation. Additionally, since the fault would cause the position limit and torque switches to be bypassed, mechanical damage of the valve due to overtorque may occur, thereby rendering it completely inoperable (manually or automatically). This concern has been previously identified by other utilities and has been described in detail by the NRC via Information Notice (IN) 92-18, "Potential for Loss of Remote Shutdown Capability During a Control Room Fire," dated February 28, 1992.

Based on the above, the team requested CPSES to provide its evaluation of the MOV spurious operation concerns described in IN 92-18. In response, CPSES representatives provided the team with a letter dated September 30, 1992, from J. E. Woods (Stone and Webster Engineering Corporation) to R. W. Braddy (TU Electric), Subject: "NRC Information Notice 92-18 Unit 2 Position." The team's review of this letter found it to state, in part, that IN 92-18 applies to CPSES in that thermal overload protection is not provided to deenergize MOVs under overload conditions. However, the letter was also found to conclude that, before any hardware modifications can be implemented, further analysis has to be made to determine the probability of a control room fire and that TU project management agreed with the Nuclear Utility Management and Resource Council (NUMARC) position that, since an exposure fire in the control room necessary to create the type of circuit fault described (i.e., hot short) is such a low probability event, no further action is necessary. This NUMARC position was found to be specifically described in its letter dated August 13, 1992, from W. H. Rasin (NUMARC) to NUMARC Administrative Points of Contact, which states, in part:

> "The likelihood of the combination of a control room fire that is not detected and suppressed in conjunction with a hot short in the specific circuits during the period of interest is judged to be very low."

By cover letter dated July 28, 1992, from J. E. Woods (Stone and Webster) to R. W. Braddy (TU Electric), Stone and Webster Engineering provided CPSES with a technical evaluation of this concern for applicability to CPSES. The following is a summary of key comments and recommendations contained in this letter:

- CPSES MOV protection design is similar to the Washington Power Supply System Plant (WNP-2), i.e., all Class 1E thermal overload protection devices are bypassed for trip under all plant conditions

- The concerns expressed in NRC IN 92-18, i.e., potential mechanical and/or electrical damage to MOVs sufficient to prevent reactor operators from manually operating the valve, are valid for CPSES.

- Approximately 53 MOVs are affected.

- The control circuitry for the MOVs should be rewired internal to the MCC compartments so that the torque and limit switches in the valve operators are electrically connected downstream of the contacts located in the MCC.

Sections III.G and III.L of Appendix R require each plant to demonstrate the achievement and maintenance of stable shutdown conditions in the event of a major fire in either the Control Room or Cable Spreading room. Specifically, Section III.L.7 states, in part, "The 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 will not prevent operation of the safe shutdown equipment." Additionally, Appendix R evaluations use a deterministic rather than probabalistic approach. This means that, in a typical Appendix R evaluation, it is assumed that a fire will occur regardless of the level of fire protection provided for a given fire area. The potential consequences of the fire, such as hot shorts, open circuits, and faults to ground on any unprotected circuits located within the area are then evaluated to assess the plants' ability to achieve and maintain stable cold shutdown conditions in the event of their occurrence.

Based on the above, it did not appear to the team that the CPSES stated position, with regard to the potential for spurious operation of MOVs as a result of a control room or cable spreading room fire, meets the intent of the safe shutdown criteria contained in Sections III.G and III.L of Appendix R to 10 CFR Part 50. Therefore, this issue is considered an Unresolved Item 446/9249-03.

2.3.2.3 High/Low Pressure Interfaces

High/Low Pressure interfaces were examined to determine if the applicant has provided sufficient protection to prevent fire induced spurious signals from initiating an uncontrolled loss of reactor coolant.

The High/Low pressure interfaces of concern at CPSES and their corresponding method of control are listed in Attachment 2, Table 3.

Based on the above, the CPSES method of protection for preventing an uncontrolled loss of reactor coolant inventory through High/Low pressure interface valves was found to be acceptable.

2.3.2.4 Conclusions and Summary of Findings

Based on the licensee's position regarding the potential for fire initiated short circuiting rendering MOVs required for safe shutdown inoperable, the team could not conclude the licensee met the intent of Sections III.G and III.L of Appendix R. The issue remains unresolved.

Other than the above, CPSES has developed sound methods to prevent and isolate spurious equipment operations that may occur as a result of fire, and the

CPSES method of protection for preventing an uncontrolled loss of reactor coolant through High/Low pressure interface valves was found to be acceptable.

2.3.3 Review of the Common Enclosure Associated Circuit Concern

Fire induced damage to nonessential circuits that are associated by common enclosure with circuits required to achieve and maintain safe shutdown may create circuit faults in electrically unprotected cables. Such faults could be of sufficient magnitude to create secondary fires. If such secondary fires were to occur in an enclosure which contained cables required for safe shutdown, the successful achievement of safe shutdown would be adversely affected.

The evaluation of this concern at CPSES was based on an examination of a random sample of nonessential cables found to be routed in a common enclosure with circuits required for safe shutdown. The sample chosen and results of the evaluation are provided as Attachment 2, Table 4. This examination included a review of the size, type, and construction of each nonessential cable selected. This information was then evaluated to determine the adequacy of electrical protection provided.

2.3.3.1 Conclusions

Based on the above, the CPSES method of protection for nonessential circuits which share a common enclosure with required circuits was found to be acceptable.

3 ALTERNATIVE SHUTDOWN CAPABILITY

3.1 Overview

The team addressed alternate shutdown capability principally by:

- assessing the adequacy of licensee Procedure ABN-803B, "Response to a Fire in the Control Room or Cable Spreading Room," and the licensee's ability to implement the procedure;
- assessing the adequacy of instrumentation and controls necessary for remote shutdown; and,
- assessing the licensee programs for ensuring and maintaining operability of alternate shutdown transfer and control functions.

3.2 Procedures

Procedure ABN-803B, "Response To A Fire In The Control Room Or Cable Spreading Room," Revision 0, effective date May 25, 1992, provides the operator actions for performing alternate shutdown in the event of a fire in the cable spreading room or the control room that forces evacuation of the control room. The following rooms/areas are included in the alternate shutdown procedure:

Room No.	Description
X-134	Unit 2 Cable Spreading Room
X-133	Unit 1 Cable Spreading Room
X-135	Unit 1/Unit 2 Control Room and Protection Racks
X-136	Unit 2 Computer Room
X-137	AO Office
X-139	Shift Supervisors Office
X-140	Unit 1/Unit 2 Control Room corridor
X-141	Restroom
X-142	Locker Room
X-144	Kitchen
X-146	Clerk's Office
X-147	Unit 1 Computer Room
X-148	Hallway
X-148A	N. Office Area
X-148B	S. Office Area
X-149A	TSC
X-148C&D	Unit 1/Unit 2 Process Rack Room

3.2.1 Procedure Review

Procedure ABN-803B is based on the fire safe shutdown baseline scenario contained in WCAP-11331, "Comanche Peak Steam Electric Station Thermal/Hydraulic Analysis Of Fire Safe Shutdown Scenario."

The licensee's analysis of the baseline scenario assumes that the i. ,tiating event was a fire in the control room or cable spreading room which resulted in manual reactor trip followed by turbine trip. Other assumptions included loss of offsite power and, thus, RCP trip and loss of main feedwater. Additionally, the steam dump, primary and secondary power-operated relief valves (PORVs), pressurizer heaters, charging and letdown, auxiliary feedwater, and seal injection flow were all assumed to be unavailable. The analysis used operator corrective actions based on actual plant experience necessary to complete the task.

Procedure ABN-803B requires the following minimum operator staff to complete the procedure steps to achieve hot standby conditions:

- Unit 2 supervisor at the remote shutdown panel (RSP) directing the operators,
- Reactor Operator at the RSP performing Attachment 1, "Reactor Operator Actions To Achieve Hot Shutdown,"
- Relief Reactor Operator at the Shutdown Transfer Panel performing Attachment 2, "Relief Reactor Operator Actions To Achieve Hot Shutdown,"
- Auxiliary Operator 1 at the Operations Locker (TB 810' Normal Switch Gear) to perform Attachment 3, "Auxiliary Operator No. 1 Actions To Achieve Hot Shutdown," and

- Auxiliary Operator 2 at the RSP to perform Attachment 4, "Auxiliary Operator No. 2 Actions To Achieve Hot Shutdown."

Procedure A&N-803B contains attachments in addition to those identified above which facilitate completion of the procedure. Attachment 13 is a procedure timeline that demonstrates procedure compliance with the WCAP 11331 analysis. Attachment 13 is used by the unit supervisor to assist the reactor operator in tracking operator actions.

Section 4.4 of WCAP 11331 provides a transient analysis of seven spurious operational scenarios:

- stuck open pressurizer PORV,
- stuck open steam generator PORVs,
- spurious head vent operation,
- auxiliary feedwater system misalignment,
- spurious safety injection system operation,
- main feedwater and turbine do not trip at reactor trip, and
- backup heaters fail on.

The licensee's analysis of WCAP 11331 demonstrated that, with the exception of the spurious case scenario where a failure to obtain a main feedwater and turbine trip upon manual reactor trip may occur, all other postulated spurious cases demonstrated that no challenge to core cooling would be predicted to occur.

Paragraph 4.4.6, page 67, of WCAP 11331, reports the results of the analysis of a failure of main feedwater and turbine trip at reactor trip. The analysis found that:

> "Due to the nature of this transient, specific results will not be provided here. Transient response to this event was demonstrated to be similar to a large steamline break. The ability of the plant to recover from this scenario assuming the limited amount of equipment available during the limiting case fire has not been demonstrated. Further evaluation of this transient to determine whether this transient needs to be considered as a spurious event is recommended."

The licensee did not provide the team with objective evidence that a further evaluation of a failure of main feedwater and turbine trip at reactor trip had been conducted.

Additionally, the team found that the licensee's analysis and procedure assumes that an automatic turbine trip will occur in response to the manual reactor trip initiated by the operators prior to evacuating the control room. If a fire induced failure prevents an automatic turbine trip following the reactor trip, the plant will experience an uncontrolled cooldown until the turbine is tripped or the main steam isolation valves are shut. The licensee did not provide the team with objective evidence that the postulated failure of the automatic turbine trip will not occur. Since the operator's manual action outside the control room to isolate the turbine is shutting the main

steam isolation valves, an uncontrolled cooldown of the reactor coolant system may occur for 4-5 minutes until the MSIVs are shut. The failure to consider that an automatic turbine trip may not occur and a subsequent uncontrolled cooldown may ensue is considered part of Unresolved Item 446/9249-03, which is discussed in paragraph 2.3.2.2. The inspectors noted that the 4-5 minutes allowed for shutting the MSIVs may not be conservative. This time interval assumes that the control room is evacuated at the time of the reactor trip. If the control room is not evacuated immediately, then the time for MSIV closure may be extended.

3.2.2 Procedure Walkdown

Two walkdowns of Procedure ABN-803B were conducted:

- An integrated procedure walkdown to the hot standby condition was conducted with an NRC representative observing each operator performing steps in the procedure.

- The team member reviewer conducted a walkdown of the entire procedure.

The following deficiencies were noted during the integrated procedure walkdown to the hot standby condition:

- Communications at the RSP were unsatisfactory. The portable radios were "cutting out" such that the operators had to use two different units and frequently repeat transmissions. Auxiliary Operator 1 experienced similar communications problems.

- Attachment 11, "RCS Pressure - Temperature Limit Curves," Attachment 14, "Pressurizer Level Temperature Correction Curve," and Attachment 15, "SG 1 & 2 Level Temperature Correction Curve," were mounted with duct tape at the RSP rather than being permanently posted.

- When valves were required to be positioned to intermediate positions or throttled, specific positioning guidance was not given (i.e., open the valve two turns, etc.).

- The reactor operator delayed completion of the procedure while awaiting reports that actions had been completed by other operators. The procedure allowed continuing without delay. The unit supervisor directed the reactor operator to continue.

- The Relief Reactor Operator failed to verify that station service water was being supplied to the diesel generator.

- Where procedures, equipment, ladders, and tools are required, these items must be dedicated for safe shutdown use and installed in place in the plant.

- Transfer Switch 2-HS-6710B, SFTY CH WTR CHLR BYP LOCKOUT, on the shutdown transfer panel has switch positions of NORM and BYP. All other switches

are labeled CR and HSP and Attachment 2, Step 4, directs the operator to place the switches from the CR to HSP position.

During the system reviewer's walkdown of Procedure ABN-803B, numerous discrepancies were identified. Examples include:

- typographical errors,
- differences in component identification in the procedure and labels in the plant,
- component location errors, and
- absence of required tools such as T-Handle wrenches, ladders, etc.

These discrepancies are listed in Attachment 3 of this report.

The walkdown of Procedure ABN-803B also identified that an additional cold shutdown repair kit is required. A cold shutdown repair kit is currently stored on site, but this kit is required for Unit 1 safe shutdown. Licensee representatives stated that CPSES will purchase an additional cold shutdown repair kit, including an air compressor, as well as 500 inches of tubing for supplying either unit.

The incorporation of an additional cold shutdown repair kit, and correction of the procedural and walkdown identified deficiencies is considered an Inspection Followup Item 446/9249-04.

3.3 Alternative Shutdown Instrumentation

10 CFR 50, Appendix R, Sections III.G.3 and III.L, require that, if the licensee elects to establish alternative safe shutdown capability, provisions be provided for direct reading of process variables necessary to perform and control the reactor shutdown function. The required instrumentation must provide the following information:

- pressurizer pressure and level,
- reactor coolant hot leg and cold leg temperatures - T_{hot} and T_{cold},
- steam generator pressure and level,
- source range flux monitor,
- level indication for all tanks used during the shutdown process, and
- diagnostic instrumentation for shutdown systems.

The instrumentation available at the RSP for a control room or cable spreading room fire is listed in Attachment 2, Table 5.

These instruments were protected from fire damage. Other instruments may be operable depending on fire location and damage. The licensee's procedure specifies that these instruments be designated by a red "FIRE" tag on the RSP. During the inspection, the team found that Instrumentation 2-NI-0A-3,

F-2EA1-L, and V-2EA1-L did not have the required red "FIRE" tags installed. This issue is included in Inspection Followup Item 446/9249-04.

The instrumentation as provided meets the intent of Appendix R, Sections III.G.3 and III.L.

3.3.1 Remote Shutdown Panel

The remote shutdown panel contains instrumentation and controls for both Trains A and B components. Train A controls are isolated from the control room by switches at the shutdown transfer panel and Train B isolation switches are located at the RSP. A fire at the RSP could damage both Trains A and B controls located on the RSP; however, since the shutdown transfer panel is not located with the RSP, Train A controls will be available in the control room.

The controls available at the RSP for a control room or cable spreading room fire are listed in Attachment 3, Table 6.

These controls were protected from fire damage. Other controls may be operable depending on fire location and damage. The licensee's procedure specifies that these controls be designated by a red "FIRE" tag on the RSP. During the inspection, the team found that Controls 1/2-APRH1F, CS-BT2EB13-L, 2-HC-2325, 2-HC-2326, 2-HC-2327, and 2-HC2328 did not have the required red "FIRE" tags installed. This issue is included in Inspection Followup Item 446/9249-04.

The controls on the RSP supported the performance of Procedure ABN-803B.

3.4 Operability of Alternate Shutdown Transfer and Control Functions

The team determined that the licensee had incorporated the operability of alternate shutdown transfer and control functions into the final combined Draft Technical Specifications. Technical Specification 3.3.3.2.1 requires the monitoring instrumentation specified in Table 3.3-5 to be OPERABLE for Modes 1, 2, and 3. Technical Specification 3.3.3.2.2 requires the remote shutdown transfer switches and controls of system components required for: (1) reactivity control, (2) reactor coolant system pressure control, (3) decay heat removal, (4) reactor coolant system inventory control, and (5) support systems required for the above functions to be OPERABLE.

Technical Specification 4.3.3.2.1 provides surveillance requirements for the monitoring instrumentation, and Technical Specification 4.3.3.2.2 requires each remote shutdown transfer switch and power and control circuit required by Technical Specification 3.3.3.2.2 to be demonstrated OPERABLE at least once per 18 months by verifying its capability to perform its intended function(s). The licensee had developed Procedures OPT-108B, Revision 01, "Remote Shutdown Instrumentation Check," and OPT-216B, Revision 01, "Remote Shutdown Operability Test," to satisfy these surveillance requirements. The team reviewed these procedures, focusing on the scope of instrumentation and controls tested by the procedures, to determine if all instrumentation and controls identified in Table 7.4-1 of the FSAR, as required for safe shutdown, were addressed. No discrepancies were noted.

3.5 Conclusions and Summary of Findings

Numerous discrepancies such as typographical errors, differences in component identification in the procedure and labels in the plant, component location errors, and absence of required tools such as T-Handle wrenches, ladders, etc., were found in Procedure ABN-803B, "Response to a Fire in the Control Room or Cable Spreading Room."

A safe shutdown repair kit as required by Procedure ABN-803B, "Response to a Fire in the Control Room or Cable Spreading Room," Attachment 6, is required for Unit 2.

The licensee did not provide the team with objective evidence that an evaluation of a failure of main feedwater and turbine trip at reactor trip had been conducted. The licensee's analysis and procedure assumes that an automatic turbine trip will occur in response to the manual reactor trip initiated by the operators prior to evacuating the control room. If a fire induced failure prevents an automatic turbine trip following the reactor trip, the plant will experience an uncontrolled cooldown until the turbine is tripped or the MSIVs are shut. The licensee did not provide the team with objective evidence that the postulated failure of the automatic turbine trip will not occur. Since the operator's manual action outside the control room to isolate the turbine is shutting the MSIVs, an uncontrolled cooldown of the reactor coolant system may occur for 4-5 minutes until the MSIVs are shut. The limited systems and equipment available to recover from the uncontrolled cooldown may be inadequate. This was identified as an unresolved item.

The controls and instrumentation available at the RSP and the shutdown transfer panel supported were adequate to support safe shutdown and appropriate maintenance and surveillance programs had been established.

4 EMERGENCY LIGHTING

4.1 Overview

In addition to the assessment of emergency lighting installed to Support ABN-803B, the team further evaluated safe shutdown emergency lighting for layout and coverage, operability testing, and battery discharge testing. The team had planned to perform selective blackout testing, in conjunction with the licensee, but the physical status of the plant prevented this activity from being done.

4.2 Layout and Coverage

In addition to the manual operation station checked as part of the Procedure ABN-803B drill, the team randomly sampled 30 additional areas that would require manual operations for a fire in Area AA-S. All but one emergency lantern was installed and appeared to be appropriately configured. The one missing, located on the 790' elevation of the safeguards building in Room 74 was accounted for in the design change process. The lantern had been removed in accordance with Design Change Authorization 103667 due to interference problems and was in the process of being reconfigured.

Engineering drawings for emergency lighting coverage (E2-0900 series drawings) were reviewed for layout and coverage and it was found the plant was well equipped with emergency lighting to perform manual remote operations.

The team found that the licensee predominantly utilizes two types of emergency lanterns for its safe shutdown lighting. They are designated Types E15 and E16. The former is a 6 volt, 12 watt halogen lantern manufactured by Emergi-Lite and the latter is a 12 volt, 36 watt florescent lantern manufactured by Halophane Company, Inc. Each unit's batteries are of the wet lead-acid type.

4.3 Testing and Preventive Maintenance

The team member found that testing of the lanterns consists of prerequisite Test XCP-EE-24, Revision 4, "Fixed Battery Pack Operated Emergency Lantern Units," in which an 8-hour discharge test is performed after the lantern is determined to be fully charged. During preoperational testing, Procedure 2CP-PT-71-03, "Battery Panels-Preoperational Test," Revision 1, is performed in which the lanterns are operated for a short interval and the illumination levels and battery capacity are initially recorded. The illumination levels and battery capacity after 8-hours are then forecast based on data obtained during the testing interval and laboratory data previously performed by Stone & Webster Engineering Corporation.

After the lighting is accepted by operations, however, the testing is reduced to a simple operational check, in which the battery and light assemblies are visually inspected and determined to activate and the lantern aim adjusted, if necessary, on a quarterly basis in accordance with Procedure STA-677, Revision 2, "Preventive Maintenance Program," and Procedure MSE-PO-5306, Revision 3, "Emergency Lighting Inspection."

The battery packs are then changed out at 3-year intervals, with the exception of those in containment, which are replaced on a refueling outage interval. After battery replacement, the 8-hour discharge test is not reperformed.

NRC IN 90-69, "Adequacy of Emergency and Essential Lighting," notified licensees of a plant transient at the Palo Verde Nuclear Generating Station which was complicated by the failure of emergency lighting. The IN suggests, although not a regulatory requirement, that as-found, 8-hour discharge testing is appropriate for safe shutdown emergency lighting. The team found that the licensee had reviewed the IN but determined that its existing preventive maintenance programs were adequate to demonstrate the 8-hour capability of its safe shutdown emergency lighting.

The team found from the Halophane literature that the lanterns are rated for normal operation at ambient temperatures 50-90°F. The literature indicates that:

- in emergency lighting applications, Underwriters Laboratory (UL) requires a minimum of 90 minutes operation (Appendix R is more restrictive and requires 8-hours).

- after each year in service a battery can expect to experience a 10-15 percent capacity loss and will not meet the UL requirements after 3 years of life.

- ambient temperature also has a significant effect on the battery life and life expectancy of the wet lead-acid batteries supplied by Halophane at 131°F is only 6-9 months.

The team did not find similar data in the Emergi-Lite technical literature, but it is assumed the batteries are of equivalent design.

The licensee employs wet lead-acid battery emergency lighting in areas where ambient temperatures are greater than 90°F. Two specific examples are the main steam penetration areas on the 873'-6" level of the safeguards building, where ambient temperatures are expected to be 104°F (Reference Drawings M1-3000 and E2-0912) and the 808' elevation of the reactor building where ambient temperatures are expected to be 120°F (Reference Drawings M2-3000 and E2-0933). Given the elevated temperatures and manufacturers recommendations for meeting the less restrictive UL requirements, it is not clear that the licensee's preventive maintenance programs can assure that the lanterns can continue to meet the Appendix R, 8-hour illumination requirements between battery replacement, and it is not understood why an 8-hour discharge is not performed upon battery replacement. The adequacy of the licensee's emergency lighting testing requirements is considered an Unresolved Item 446/9249-05.

4.4 Blackout Testing

Due to the physical status of the plant and ongoing testing activities, selective blackout testing could not be performed to assess the adequacy of illumination of emergency lighting. The performance of blackout testing, in conjunction with the licensee, is considered Inspection Followup Item 446/9249-06.

4.5 Conclusions and Summary of Findings

The team found Unit 2 well equipped with emergency lighting to support manual operations required for fire safe shutdown. An unresolved item was identified concerning the ability of emergency lighting units in areas of elevated ambient temperatures to sustain 8-hour illumination. Inspection followup will be conducted to assess the adequacy of illumination of the emergency lighting.

5 PHYSICAL VERIFICATION OF FIRE PROTECTION FEATURES

5.1 Overview

The team performed a walkdown of Unit 2 fire protection features provided to protect certain Unit 2 plant areas important to assuring reactor safety or important to achieving and maintaining safe shutdown conditions. The walkdown used a performance based approach and engineering judgement to evaluate these

fire protection features. This walkdown focused on determining if the plant fire protection features were adequate to rapidly detect, confine, and control a postulated fire condition.

The team reviewed the fire protection features provided for the following areas:

5.2 Safeguards Building - Elevation 773'-0"

Fire Area 2SA:

- containment spray pump room
- residual heat removal pump room
- safety injection pump room

Fire Area 2SB:

- containment spray pump room
- residual heat removal pump room
- safety injection pump room

Automatic smoke detection was installed in all of the above safety-related pump rooms. In the safety injection pump rooms the smoke detector was installed on the ceiling above the chiller unit. The self-contained chiller unit starts coincident with the starting of the respective pumps. Once the chiller starts, the air flow condition is predominately through the chiller, with the supply air discharging from the bottom of the unit onto the pump motor. When the chiller is operating, the ceiling air flow pattern appears to be stagnant. This condition could cause a delay in early detection of a fire condition if one were to occur during those times these pumps are operating. The fire detection Design Basis Document ME-104, Section 2.0, states "The system arrangement, installation and maintenance has been provided in accordance with National Fire Protection Association (NFPA) Standard 72D, "Standard for Proprietary Protective Signaling Systems," 1975 edition and NFPA 72E, "Standard for Automatic Fire Detectors." NFPA 72E, Section 6-4, "Heating, Ventilation, and Air Conditioning (HVAC)," Paragraph 6-4.1 provides the following guidance: "in rooms, buildings, etc. where forced ventilation is present, detectors shall not be located where air from supply diffusers could dilute the fire gases before they reach the detector. Detectors shall be located to favor air flow towards return openings. This may require additional detectors, since placing detectors only near return air openings may leave the balance of the area with inadequate protection when the air handling unit is shut down." As a result of the team's concern, the licensee intends to perform an engineering walkdown of the total plant fire detection system. This walkdown will focus on evaluating HVAC air flow conditions and what impact these conditions may have on the early warning detection capability of installed smoke detection devices. This is identified as Inspection Followup Item 446/9249-07.

The team visually inspected the fire area barrier separating Fire Area 2SA from 2SB. The penetration seals associated with this fire barrier had not

been fully completed. Final walkdown of this barrier will be performed during a subsequent NRC inspection and is considered Inspection Followup Item 446/9249-08.

5.3 Safeguards Building - Elevation 790'-6"

Fire Area 2SA:

- valve isolation tank room

Fire Area 2SB:

- motor-driven auxiliary feedwater (AFW) pump rooms
- corridor area
- valve isolation tank room
- chemical additive tank room

Fire Area 2SC:

- turbine-driven AFW pump room

In the motor-driven AFW pump rooms, the smoke detectors were appropriately distributed with a detection device in each beam pocket. The fire area barrier walls separating the turbine AFW pump from the motor-driven AFW pumps and the corridor area was visually inspected. The installation of the fire rated penetration seals associated with these barriers had not been completed. Final inspection of the fire barriers separating the turbine-driven AFW pump from Fire Area 2SB will be performed during a subsequent NRC inspection and is part of Inspection Followup Item 446/9249-08.

The licensee has committed to install automatic fixed water fire suppression systems in safety-related areas of the plant where a high fire hazard exists; where redundant safe shutdown equipment or cabling outside the containment building is located in the same fire area and is not separated by a 3-hour fire barrier; and where there is a congestion of cabling (e.g., tray stacks of four trays or more). The coverage of the sprinklers installed in portions of Fire Area 2SB were visually inspected. Based on this visual inspection, concerns were identified with respect to the selection and application of sprinklers. The sprinklers installed throughout the plant at the ceiling and at levels below the ceiling had a thermal actuation setpoint of 212°F. Generally, all the plant areas provided with sprinkler protection were air conditioned. These plant areas could be viewed as having an average maximum ceiling temperature (75-90°F) environmental profile similar to that of a typical air conditioned commercial building. Under these conditions, the guidance of NFPA 13, "Standard for the Installation of Sprinkler Systems," Section 3-16.6, Temperature Ratings, Table 3-16.6.1, indicates that for ceiling temperatures less than 100°F the sprinkler temperature actuation setpoint should be in the range 135°F to 170°F.

The licensee indicated that the maximum peak ceiling temperature for the general areas outside the containment in the safeguards building is 104°F

(reference TU Electric Drawings M2-3000, sheets 3, 4, 5, and 6, Environmental Data Outside the Containment). The licensee indicated that they followed the guidance of NFPA 13 and, since the peak ceiling temperature exceeded 100°F at CPSES, the licensee selected sprinklers for their facility with a temperature actuation setpoint in the 175°F to 225°F range. The licensee's use of a 212°F rated sprinkler yields an actuation threshold of 108°F as compared to a 61°F actuation threshold for the 165°F rated sprinkler, which would be used in a commercial building under similar conditions.

Fire development, based on the type of combustibles present in a nuclear power plant, is considered to be slow. Under such conditions, due to the increased thermal energy required to activate the 212°F sprinklers, an increase in fire damage and fire temperatures can be expected. Using the NFPA 13 temperature guidance as the basis for establishing the thermal actuation setpoints for the sprinklers installed at significant distances below the ceiling (e.g., intermediate level sprinklers and the cable tray thermally actuated water spray nozzles) would indicate that the thermal actuation setpoint should be within the range of 135°F-170°F. The licensee's basis for establishing the thermal setpoints of the sprinklers and cable tray water spray nozzles is identified as Unresolved Item 446/9249-09.

The licensee augmented the ceiling level sprinklers with automatic fixed cable tray suppression systems in areas where cable congestion is present. This cable tray suppression coverage is an extension of the sprinklers provided for area coverage. The current layout of these systems, for horizontal tray stacks, has the nozzles arranged in a "vertical stand-off" fashion, spaced 6-12 inches away from the tray side rails. The nozzles are on only one side of the tray stack and are offset 6-12 inches above the horizontal plane of the trays. In addition, the top of the tray is protected by nozzles positioned over the midline of the top tray. These nozzles are provided with baffles to prevent "cold solder" effects. The licensee indicated that the design basis for these systems is to confine a fire to the congested tray array. The licensee applied certain aspects of NFPA 15, "Water Spray Fixed Systems For Fire Protection," to the design of the cable tray suppression systems. The licensee indicated that they designed these systems to apply a water spray application density of 0.15 gpm per Ft^2. Section 4-4.1.4, Cable Trays and Cable Runs, addresses the application of an open nozzle system, which is actuated by automatic detection devices which are sufficiently sensitive to rapidly detect a smoldering or slow-to-develop flame condition. The team noted that the distribution of the nozzles, if they were of the open type, appears to be adequate to achieve the objectives of the NFPA 15. The team expressed a concern related to the system response to a smoldering or slow-to develop flame condition. The current system design uses thermally actuated spray nozzles which do not meet the intent of the performance based thermal actuation guidance provided in NFPA 15. This is another example of the concerns associated with Unresolved Item 446/9249-09.

In the corridor (Fire Area 2SB4) the team identified two areas where equipment (e.g., cable trays, piping, HVAC ducting) in the overhead appeared to overlap, creating an obstruction to the ceiling level sprinklers in excess of 48 inches. As a result of the team's concerns, the licensee indicated it would perform an engineering walkdown of the plant sprinkler systems. This

walkdown will focus on evaluating obstructions to sprinklers and their impact on the sprinkler system's ability to apply water directly to a fire. This is identified as Inspection Followup Item 446/9249-10.

5.4 Safeguards Building - Elevation 808'-0" and 810'-6"

Fire Area 2SA:

- boron injection tank

Fire Area 2SB:

- corridor area
- radioactive penetration area

Fire Area 2SD:

- electrical penetration area

During the walkdown of the electrical penetration area (Fire Area 2SD9), the team noted additional areas where it appeared that the ceiling level sprinklers were obstructed by equipment in the overhead. This is another example of the concerns identified by Inspection Followup Item 446/9249-10.

The team reviewed the 2-hour fire resistive gypsum board wall and damper assembly enclosure provided for Stairwell 2-085C. The wall assembly enclosing the stairwell is supported by a fire proof tube steel frame. This tube steel frame supports the gypsum board panels, the tornado dampers and the fire dampers (see Unit 2 Design Change Authorization 34969, Revision 6, for the tube steel frame design details). The gypsum board wall panels were constructed in accordance with UL fire resistive Design U411 (see TU, Unit 2, Specification CPES-A-2020, Revision 0, "Gypsum Construction"). The team viewed the fire damper installations and noted that, in order to accommodate the installation of the tornado dampers, these dampers could not be installed within the wall assembly. The fire dampers were installed in an angle iron type steel frame which was welded to the tube steel wall frame. The fire damper steel frame was sized to allow for thermal fire expansion of the damper. Each fire damper is held in place by a sill angle which was welded to the angle iron frame. The team found this fire resistive stairwell enclosure to be typical for Unit 2. In addition, the team found the design of these enclosures to meet the basis of the 2-hour fire resistive rating required by Supplement 21 to the CPSES, Units 1 and 2, SER.

5.5 Safeguards Building - Elevation 831'-6" and 832'-6"

Fire Area 2SB:

- corridor area
- pipe penetration area

Fire Area 2SE:

- electrical equipment area

The team noted that construction activities were still ongoing in these plant areas and the fire protection features were not fully completed. As an example, the doors in the fire barrier separating Fire Area 2SB and 2SE were not UL labeled. In addition, sprinkler valves were observed to have their water supplies isolated and the hose stations did not appear to be complete. Due to the amount of scaffolding in the area, the team's visual verification of smoke detection coverage for these areas could not be completed. In the electrical equipment area (Fire Area 2SE16) near Column Lines B-S and 14-S, the team noted a case were a cable tray nozzle was obstructed by a tray support. Also, near Column Lines E-S and 14-S, the intermediate level sprinklers placed under the overhead obstructions were located approximately 3 feet below these obstructions. These are additional examples of Inspection Followup Item 446/9249-10 where obstructions and the placement of sprinklers excessively below heat collection areas can affect their ability to control a fire.

5.6 Auxiliary/Electrical Control Building - Elevation 778'-0"

Fire Area AA:

- Essential Chiller Room

The Unit 2 essential chiller area deviates from the requirements of Appendix R and this deviation is currently being reviewed by the Office of Nuclear Reactor Regulation. The chillers and pumps are separated by partial height, 1-hour, equipment fire barrier walls. The fire resistive characteristics of this wall were not verified during this inspection. During the plant walkdown, the wall was verified to extend above and along the entire length of the chiller units. The licensee, as a part of their fire protection enhancement program, has installed curbs from where the chiller pump partial wall terminates to the wall of the room. These curbs are installed to preclude a combustible liquid spill fire from impacting both chiller pumps. In addition, the licensee has installed additional smoke detectors in this area to enhance their ability to rapidly detect a fire condition in this area. In the overhead of this room, cable trays transverse the area. These trays are an intervening combustible hazard to redundant chillers and their associated pumps. In order to preclude fire propagation caused by an electrical originated fire, the licensee has installed fire stops in the trays at the vertical extension plane of the walls. The intent of these stops is to preclude fire extension along the tray so that a tray fire presents an exposure to only one chiller or pump. The adequacy of these stops to perform their function will be further evaluated during a subsequent NRC inspection. The chiller area is protected by area wide sprinklers installed at the ceiling level. In addition, the licensee has installed at the vertical extension plane of these partial height walls a water curtain. This water curtain consists of closely spaced fast response sprinklers (165°F) designed to apply a discharge rate of 3 GPM/lineal foot of curtain length. The team reviewed

portions of Design Change Notice 4338, Revision 3, and could not confirm the use of draft stops. In addition, the team noted that the water curtain heads were not all at ceiling level and the level of placement varied as a result of obstructions. The team could not conclude that the water curtain will perform its intended function if a fire were to occur. For example, if a fire were to involve a chiller pump, the fire plume would develop and heat would spread across the ceiling. Under these conditions, without the water curtain sprinklers installed at the ceiling and no draft stops installed, sufficient heat energy to activate the water curtain sprinklers may not be collected in order to assure the timely development of the curtain. The team did conclude that, under these conditions, the ceiling level sprinklers would react to the fire condition. However, the team could not conclude that the sprinklers over the redundant chiller pump, which is not on fire, would not actuate or, if actuated, would not impact the operability of this pump. The licensee's analysis of inadvertent or advertent effects of sprinkler actuation and its impact on safety-related and safe shutdown equipment was not reviewed during this inspection and will be reviewed during a subsequent NRC inspection. This condition in the Unit 2 chiller room and the current design of the water curtain is considered to be unresolved and is identified as Unresolved Item 446/9249-11.

5.7 Auxiliary/Electrical Control Building - Elevation 830'-0"

Fire Area EO:

- Control Room

The team noted, in the control room back panel area, that the ceiling tiles around the smoke detectors had been removed. The licensee indicated that the ceiling tiles had to be removed in order to assure the seismic qualification of the control room suspended ceiling. The team could not conclude that the smoke detectors in their current configuration would provide rapid detection of a fire condition in the back panel area. Smoke from a potential fire condition would flow through these openings in the ceiling and bypass the detectors. The licensee, as a result of this concern, initiated a technical evaluation request (TE 92-2420) to evaluate the adverse affects the removed ceiling tiles may have on the fire detection system in the control room. This Technical Evaluation and the licensee's subsequent corrective actions will be reviewed during a subsequent NRC inspection. This condition is identified as Inspection Followup Item 446/9249-12.

5.8 Conclusions and Summary of Findings

A concern was identified with the positioning of smoke detectors. Fire barriers and seals were not completed to permit inspection. The selection and application of various suppression heads is considered nonconservative and remains unresolved. Physical obstructions did not permit the inspection of suppression equipment to be completed. the adequacy of the design of a water curtain intended to satisfy separation criteria remains unresolved and the significance of the impact of missing ceiling tiles on smoke detection will be reviewed further.

6 REACTOR COOLANT PUMP LUBE OIL COLLECTION SYSTEM

6.1 Overview

The team evaluated the RCPLOCS to determine if it was seismically designed, capable of collection from all potential leak sights, appropriately sloped, and hydraulically designed to handle maximum expected flow; if the collection tank was appropriately sized; and if controls were in place to periodically assess leakage collected and dispose of it. The team found that the RCPLOCS was adequately designed seismically and hydraulically, and physical walkdown of the system found the as-installed configuration to conform to the design drawings (BRP-RC-2-RB-080 through 083).

6.2 Design Calculation Error

In review of Stone & Webster Calculation 2-FP-0041, "Reactor Coolant Pump Lube Oil Collection System Design Evaluation," the team noted that the sizing of the collection tanks did not conform to Appendix R, Section III.O, in that the vented closed container (tank) could not hold the entire lube oil system inventory. The calculation indicated the tank inventory was deficient by approximately 5 gallons and there was no docketed exception to the Appendix R requirement in place. The licensee investigated and, with input from Westinghouse, satisfactorily demonstrated that the calculation was in error and the tanks actually had excess capacity even when thermal expansion of the lube oil was considered. The calculation was corrected and a TU Evaluation Form was initiated to address the erroneous input into the calculation. The corresponding calculation supporting Unit 1 did not contain the same error.

6.3 Level Indication and Administrative Controls

The team found that the collection tanks were not equipped with any instrumentation that would provide for either remote or local level indication. Further, there were no administrative controls in place to periodically sound the tanks and pump out the collected leakage as necessary. The licensee acknowledged the deficiency upon identification by the team and committed to sound and pump down, as necessary, the Unit 1 tanks prior to restart and have administrative controls in place for both units prior to Unit 2 fuel load.

6.4 Conclusions and Summary of Findings

The RCPLOCS was found to be adequately designed. A calculational error and a lack of administrative controls were identified by the team. The error was corrected and the corrective action process was initiated to determine its cause. The licensee committed to develop and implement the necessary administrative control for the RCPLOCS.

7 FIRE PREVENTION/PROTECTION PROGRAM (64704)

7.1 Overview

The team reviewed the fire protection program and the implementing procedures. A list of the procedures reviewed is included in Attachment 4. The licensee had adequate procedures, either issued or in draft form, that comprehensively covered all aspects of the fire prevention/protection program.

7.2 Administrative Controls

The team reviewed the licensee's programs and procedures related to fire hazard reductions and maintaining operability and readiness of fire suppression, detection, and support equipment. The results are summarized below.

7.2.1 Control of Combustibles, Maintenance, and Housekeeping

Procedural guidance was provided to control combustible material and to reduce fire hazards. Maintenance evolutions, which significantly increase fire risk, were properly controlled.

7.2.2 Maintenance and Surveillance Procedures

Administrative procedures were provided for maintenance and surveillance of suppression, detection, fire pumps, and support equipment. The licensee's fire protection surveillance program was established for Unit 1. The administrative procedures are common for both units. The unit specific test and inspection procedures for Unit 2 are in the process of development, review, and issue. The team reviewed a sampling of the issued and draft procedures. The licensee appears to be satisfactorily establishing the fire protection program surveillance requirements, identifying applicable limiting conditions for operation, and specifying the required compensatory measures for Unit 2.

7.3 Fire Protection Quality Assurance

Quality assurance audits for the past year were reviewed by the team. These audits were identified as: QAA-92-100, dated January 21, 1992, "Operations Fire Protection Program," and QAA-92-223, dated July 22, 1992, "Fire Protection, Penetration Seals and Thermo-Lag." The audits addressed fire brigade and fire watches, organization and procedures, procurement documentation, and verification of the personnel training. Discrepancies identified were formally presented to the responsible organizations. Responses were tracked to closeout, and the actions taken were reviewed for adequacy by the appropriate organizations.

7.4 Physical Observations from Fire Area Walkdowns

A tour of accessible areas of the plant was conducted by the team to assess general area conditions, work activities in progress, and condition of fire protection systems and equipment. Combustible materials, flammable and

combustible liquids, and gas usage were properly controlled in areas containing safety-related equipment and components. Items inspected included the position of selected valves, fire lockers, fire barrier conditions, hose stations, and fire extinguishers for type, location, accessibility, and conditions. All of the installations and fire brigade equipment were found to be functional and tested in accordance with the requirements established in the fire protection program. There were construction activities in progress in the toured areas and the general housekeeping was good.

7.5 Plant Fire Brigade

The licensee has organized to provide one five-man fire brigade per shift in support of both units. The basic qualifications requirements and training were established for Unit 1 and there has been no significant change in the program to date. To support the completion and licensing of Unit 2 the licensee has increased the number of qualified personnel, incorporated unit specific information in the lesson plans, and initiated unit specific fire brigade drills.

7.5.1 Fire Brigade Training

The team reviewed selected lesson plans, training attendance records, and fire brigade drill and practice session records. This review confirmed that the licensee was covering the required topics, providing the required drills and practice sessions, and meeting the required frequency of training elements.

7.5.2 Fire Preplans

The team reviewed the licensee's fire preplan instruction manual for Unit 2. Seven of 20 preplans have been issued, some were in draft form and the remaining were being written. Those reviewed contained the essential elements of a fire preplan, such as: fire hazards, extinguishants, direction of attack, systems to be managed to reduce loss, heat sensitive systems, fire brigade specific duties, potential hazards, smoke control, ventilation systems, special operations, and general plant instructions.

7.5.3 Observed Fire Brigade Drill

The team observed a fire brigade drill. The drill scenario involved the Unit 2 lube oil reservoir room. The brigade assembled in a timely manner, properly utilized the turnout gear, and correctly donned and checked out their self-contained breathing apparatus. The fire brigade leader received a brief of conditions from the control room, consulted the fire preplans, and directed the brigade managers to bring special equipment, such as the foam nozzle, eductor, and foam concentrate. The brigade's approach to the fire area was satisfactory and indicated an appreciation of potential conditions and hazards. The licensee's provisions for area control and support personnel was considered excellent. The practice of an immediate debriefing of the brigade members following a fire drill was considered productive in providing feedback for future training. The training department representative acknowledged that a number of significant improvements have been made in the program as a result of post drill feedback.

7.5.4 Fire Brigade Equipment

The team checked the fire brigade equipment provided at each assembly point. The licensee provides two primary assembly points, one for each unit, with duplicate turnout gear and support equipment. A secondary assembly point is maintained in the building that houses the protected area fire truck. This point duplicates the primary point equipment and provides for significant additional support equipment if required. Each assembly point contained the required inventory.

7.6 Fire Watch Training

The licensee had established specific training requirements for individuals who had been classified as fire watch personnel. The trained fire watch personnel may be assigned as dedicated fire watches on each shift. Personnel assigned as a fire watch would have no other duties.

7.7 Outside Fire Protection

The licensee's site fire protection water supply consists of two 500,000 gallon storage tanks, with Squaw Creek Reservoir as the backup. Water supply distribution consists of one electric and two diesel fire pumps with a continuous pressure jockey pump feeding the main fire loop. The material condition of the pump house was very good and all pumps were operable. Postindicator valves were checked and found in the required position and locked. Hydrants and hose houses were maintained and tested as required. Hose houses checked were properly equipped. Access to hydrants and hose houses was clear.

7.8 Seismic Design of Hydrogen Lines

The team also reviewed the design adequacy of the hydrogen lines in the safety-related areas. The review verified that safety-related piping was seismically designed.

7.9 Conclusions

The licensee had maintained an overall effective fire protection program. The licensee's fire brigade training and composition were considered a strength in the fire protection program.

ATTACHMENT 1

PERSONNEL CONTACTED AND EXIT MEETING ATTENDEES

TU Electric

J. Conly, Unit 2 Licensing
S. Palmer, Stipulation Manager
H. Carmichael, Unit 2 EA Manager
J. Kulangara, Licensing
D. Kross, Unit 2 Shift Operations Manager
J. Wren, Construction QA Manager
D. Ranstrom, Construction QA Supervisor
J. Roberts, Senior Fire Protection Technician
S. Dwain, Senior Fire Protection Technician
I. Ahmad, Supervisor, Electrical Engineering
C. Beckett, Principal Engineering
D. Pendleton, Manager - Contracts
D. McAfee, Manager, QA
R. Walker, Manager of Regulatory Affairs
R. Braddy, APM -
C. Hooton, Unit 2 DPEM
W. Guldemond, Manager, ISEG
A. Saunders, Assessment Manager
D. Wilken, Unit 2 Maintenance
O. Bhatty, Site Licensing
B. Lancaster, Manager, Plant Support
C. Terry, Vice President, Nuclear Engineering and Support
J. Muffett, Manager of Design Engineering
D. DePierro, Assistant Project Engineer
E. Luengas, ISEG Senior Engineer, Nuclear Overview
S. Harrison, Unit 2 PEM

CASE

O. Thero, Consultant

SWEC/ABB Impell

R. Dible, Unit 2 Mechanical Engineer
F. Collins, Unit 2 Mechanical Engineer
M. Dempsey, Unit 2 Electrical Engineer
J. Jackson, Unit 2 Mechanical Engineer

Brookhaven National Laboratories

K. Parkinson, Systems Reviewer, NRC Contractor
K. Sullivan, Electrical System Reviewer, NRC Contractor

NRC

B. Holian, Project Manager, Project Directorate IV-2, NRR
T. Reis, Project Engineer, Project Section B, Region IV

T. Gwynn, Deputy Director, Division of Reactor Projects, Region IV
P. Madden, Senior Fire Protection Reviewer, NRR
M. Murphy, Reactor Inspector, Plant Support Section, RIV
A. Singh, Reactor Inspector, Plant Support Section, RIV
L. Yandell, Chief, Project Section B, RIV

ATTACHMENT 2
SUPPORTING DOCUMENTATION OF APPENDIX R REVIEW

TABLE 1

COORDINATION OF ELECTRICAL PROTECTIVE DEVICES

Selected Component	Power Supply	Adequacy of Electrical Protection Provided
CCP 01: (TCX-CSAPCH-01) Location: Z:24/FA:AB	6.9Kv Safeguards Bus EPSWEA-01	Selective Tripping Acceptable Ref: Calc TWE-EE-CA0008-157, Rev. 2, 1/31/92
	125 VDC DIST PNL ECDPED-03	Selective Tripping Acceptable Ref: Calc EE-CA-0008-182, Rev 3 4/29/92
SW PUMP DISCH VLV 2-HV-4286	480VAC MCC EPMCEB07	Selective Tripping Acceptable Ref: Calc TNE-EE-CA-0008-169 Rev 3 9/3/91
	480V SWGR CP-2-EPSWB-03	Ref: Calc TNE-EE-CA-0008-163 Rev 3 8/5/91
	480V MCC EPMCEB-01	Ref: Calc TNE-EE-CA-0008-169 Rev 3 9/3/91
TRAIN A MDAFW	6.9Kv Safeguards Bus EPSWEA-01	Selective Tripping Acceptable Ref: Calc TWE-EE-CA0008-157, Rev. 2, 1/31/92
MDAFW PMP 1 RECIRC VALVE 2-FV-2456	125VDC DIST PNL ECDPED-01 125VDC SWITCHBOARD EPSWED-01	Selective Tripping Acceptable Ref: Calc EE-CA-0008-182 Rev 3 4/29/92

ATTACHMENT 2
TABLE 1 (continued)

COORDINATION OF ELECTRICAL PROTECTIVE DEVICES

Selected Component	Power Supply	Adequacy of Electrical Protection Provided
Station SW Train B	6.9Kv Safeguards Bus EPSWEA-02	Selective Tripping Acceptable Ref: Calc TWE-EE-CA-0008-157 Rev 2, 1/31/92
	125VDC Dist Pnl ECDPED-04	Selective Tripping Acceptable Ref: Calc EE CA-0008-182 Rev 3, 4/29/92
SG3 Level (S-7) LT-0503	118 VAC Dist Pnl Train A Channel III ECDPPC-03 - Fed From Inverter ESELIV-03	SELECTIVE TRIPPING UNACCEPTABLE - However, no credit is taken for this power supply in areas where its load cables are routed
CCP 02: (TCX-CSAPCH-02)	6.9Kv Safeguards Bus EPSWEA-02	Selective Tripping Acceptable Ref: Calc TWE-EE-CA0008-157, Rev. 2, 1/31/92
	125 VDC DIST PNL ECDPED-04	Selective Tripping Acceptable Ref: Calc EE CA-0008-182, Rev 3, 4/29/92
NON-SAFEGUARDS CCW	480VAC MCC EPMCEB-04	Selective Tripping Acceptable Ref: Calc TNE-EE-CA-0008-169, Rev 3, 9/3/91
SAFETY CHILLED WATER SYSTEM TRAIN B	480VAC MCC EPMCEB-07	Selective Tripping Acceptable Ref: Calc TNE-EE-CA-0008-169, Rev 3, 9/3/91
	480V SWGR CP-2-EPSWB-03	Selective Tripping Acceptable Ref: Calc TNE-EE-CA-0008-163, Rev 3, 8/5/91
	480V MCC EPMCEB-01	Selective Tripping Acceptable Ref: Calc TNE-EE-CA-0008-169, Rev 3, 9/3/91

ATTACHMENT 2

TABLE 2

CIRCUIT BREAKER AND RELAY TESTING PROCEDURES REVIEWED

NUMBER	TITLE	REV	DATE	COMMENT
MSE-S2-6302	U2 480 VOLT AIR CB SURVEILLANCE TEST	0	10/16/92	480V AIR CBs AND 480V RELAYS FOR CONTAINMENT PENE CONDUCTOR FEEDS
MSE-S2-0402A	U2 BUS 2EB1 AND 2EB3 OVERCURRENT SURVEILLANCE TEST	0	9/18/92	CHANNEL CAL AND SYST FUNCT TEST AT 18 MOS INTERVALS ON CONTAINMENT PENETRATION CONDUCTOR PROTECTIVE RELAYS ON BUS 2EB1 AND 2EB3
MSE-S0-6301	6.9KV AIR CB INSPECTION AND CLEANING	2	5/24/91	INSP. TEST, ADJUST AND CLEANING OF 6.9KV AIR CBS
MSE-P1-0661A	UNIT 1 TRAIN A 6.9KV SAFEGUARDS BUS PROTECTIVE RELAY FUNCTIONAL CHECK	0	6/5/92	
MSE-S0-6303	MOLDED CASE CB TEST AND INSPECTION	4	6/21/91	INSPECTION, TEST, ADJUSTMENT AND CLEANING OF MOLDED CASE CIRCUIT BREAKERS AND BREAKER AUXILIARIES
STA-694	STATION VERIFICATION ACTIVITIES	1	9/16/92	ADMIN CONTROLS FOR FUSE REPLACEMENT

ATTACHMENT 2

TABLE 3

HIGH/LOW PRESSURE INTERFACE CONTROLS

INTERFACE	METHOD OF CONTROL
1. Reactor Head Vent (2-HV1-3607 AND 2-HV-3608)	Manual operator action to de-energize - governed by written procedure
2. Pressurizer Vent (2-HV-3609 and 2-HV-3610)	Manual operator action to de-energize - governed by written procedure
3. Pressurizer PORVs (2-8000A&B, 2PCV-0455A and 2PCV-0456)	Combination of manual operator actions to de-energize and protection (Fire Wrap)
4. RCS Letdown (Normal) (5 valves: 2-LCV-0460, 2-LCV-0459, in series with the parallel combination of 2-8149C, 2-8149B, and 2-8149A)	Manual operator action to de-energize - governed by written procedure
5. RCS Letdown (Excess) (2-8154 and 2-8153)	Manual operator action to de-energize - governed by written procedure
6. RHR Suction (2-8701B/2-8702B and 2-8701A/2-8702A)	Administratively controlled: Power removed at MCC during plant operation

ATTACHMENT 2

TABLE 4

COMMON ENCLOSURE ASSOCIATED CIRCUITS REVIEWED

CABLE ENCLOSURE LOCATION/ID	SSD REQD CKTS IN ENCLOSURE?	NON-ESSENTIAL CIRCUIT ID	CABLE SIZE & TYPE	LOCATION/ ENCLOSURE NO. OF ELECTRICAL PROTECTIVE DEVICE	ELECTRICAL PROTECTION PROVIDED FOR NON-ESS CIRCUIT (FUSE/BKR SIZE AND TYPE)
FA 2SB / T-22000055	Y	E0200547 480V POWER FEED	3/C #10	MCC 2EB3-1 CP2-EPMCEB-03	15A THED BKR
FA 2SB / T-22000055	Y	E0205640A 118VAC POWER FEED	2/C #10	118 VAC PNL CP2-ECDPEC-01	20A TED BKR
FA 2SB /T-23G04880	Y	AG223454 ALARM	2/C #12	SSIC CP2-ECPRCR-16	Optical isolators with current limiting Power Supply
FA 2SB /T-23G04880	Y	AG245449 CONTROL	2/C #12	BOP AUX RR CP2-ECPRCR-14	6A BUSS ABC FUSE
FA2SB /T-23003514	Y	AO212210 MOV 2-HV-4758 CONTROL	2/C #12	118VAC PNL CP2-ECDPNC-05	3A FUSE
FA2SB /T-23003538	Y	AO212231 ALARM	2/C #12	SSIC CP2-ECPRCR-16	Optical isolators with current limiting Power Supply
		AO212241 ALARM	2/C #12	SSIC CP2-ECPRCR-07	Optical isolators with current limiting Power Supply
		AO213709 ALARM	2/C #12	SSIC CP2-ECPRCR-07	Optical isolators with current limiting Power Supply
		AO245500 CONTROL	2/C #12	2CR13	6A BUSS ABC FUSE

ATTACHMENT 2

TABLE 5

REMOTE SHUTDOWN PANEL INSTRUMENTATION

COMPONENT	DESCRIPTION
2-LI-2478B	Condensate Storage Tank Level,
2-LI-501A	Steam Generator 1 Wide Range Level,
2-LI-502A	Steam Generator 2 Wide Range Level,
2-PI-514B	Steam Generator 1 Pressure,
2-PI-524B	Steam Generator 2 Pressure,
2-LI-459B	Pressurizer Level,
2-NI-50A-3	Source Range Neutron Flux,
2-PI-455B	Pressurizer Pressure,
F-2EA1-L	Bus 2EA1 Frequency,
V-2EA1-L	Bus 2EA1 Voltage,
2-TR-410F	RCS Loop 1 Cold Leg Temperature,
2-TR-420F	RCS Loop 2 Cold Leg Temperature,
2-TR-413F	RCS Loop 1 Hot Leg Temperature,
2-TR-423F	RCS Loop 2 Hot Leg Temperature,

ATTACHMENT 2

TABLE 6

REMOTE SHUTDOWN PANEL CONTROLS

COMPONENT	DESCRIPTION
2-HS-4518C	Component Cooling Water Pump 1
CS-T2EB1-L	Transformer Breaker T2EB1
CS-T2EB3-L	Transformer Breaker T2EB3
CS-2EG1	iesel Generator Breaker 2EG1
CS-2EB1-	coming Breaker 2EB1-1
CS-2EB3-	oming Breaker 2EB3-1
1/2-APRH1F	Residual Heat Removal Pump 1
2-HC-618	RHR Heat Exchanger 1 Bypass Flow Control
2-HC-606A	RHR Heat Exchanger 1 Flow Control
2-HS-2333FL	Main Steam Isolation Valve 1
2-HS-2334FL	Main Steam Isolation Valve 2
2-HS-2335FL	Main Steam Isolation Valve 3
2-HS-2336FL	Main Steam Isolation Valve 4
2-HS-4286FL	Service Water Pump 1 Discharge Valve
2-HS-4393FL	Diesel Generator 1 Cooler Service Water Return Valve
1/2-8701AF	RHR Pump 1 Hot Leg Recirc Isolation Valve
1/2-8701BF	RHR Pump 2 Hot Leg Recirc Isolation Valve
1/2-APCH1L	Centrifugal Charging Pump 1
2-FK-121A	Charging Flow Control
1/2-8106FL	Charging Pump To RCS Isolation Valve
1/2-8110FL	Centrifugal Charging Pump 1 & 2 MiniFlow Valve
1/2-8149AL	45 GPM Letdown Orifice Isolation Valve
1/2-8149BL	75 GPM Letdown Orifice Isolation Valve
1/2-8149CL	75 GPM Letdown Orifice Isolation Valve
43/2-8153FT	Excess Letdown Isolation Control Transfer
1/2-8153FL	Excess Letdown Isolation Valve

ATTACHMENT 2
TABLE 6 (continued)

COMPONENT	DESCRIPTION
1/2-8153FL	Excess Letdown Isolation Valve
1/2-8801AF	Centrifugal Charging Pump SI Isolation Valve
1/2-455AFL	Pressurizer PORV
1/2-456FL	Pressurizer PORV
2-HS-2450C	Motor Driven AFWP 1
2-HS-2456FL	Motor Driven AFWP 1 Recirc Valve
43/2-456FT	Pressurizer PORV Control Transfer
2-HS-4514FL	Safeguard Loop Component Cooling Supply Valve
2-HS-6700FL	Safety Chill Water Recirc Pump 5
CS-BT2EA1-L	Bus Tie Breaker BT-2EA1
CS-BT2EB13-L	Bus Tie Breaker BT-2EB13
2-HC-2325	SG1 Atmospheric Relief Valve Control
2-HC-2326	SG2 Atmospheric Relief Valve Control
2-HC-2327	SG3 Atmospheric Relief Valve Control
2-HC-2328	SG4 Atmospheric Relief Valve Control

ATTACHMENT 3
"ABN-803B PROCEDURAL DEFICIENCIES"

The following procedure deficiencies and/or errors were identified in Procedure No. ABN-803B, Response To A Fire In The Control Room Or Cable Spreading Room:

1. Page 13 Item 11 should read "At the Control Rod Drive MG Set 2-01/2-02 Control Panel" rather than Remote Shutdown Panel.

2. Page 13 Item 11.a: Reactor Trip Breakers A and B have not been demarcated with a luminescent diagonal stripe.

3. Page 13 Item 11.b: Labels are not installed below the control switches for Generator NO. 1 Motor GM Set 1 Motor Circuit Breaker Control Switch and Generator NO. 2 Motor GM Set 1 Motor Circuit Breaker Control Switch.

4. Page 15 Item 16.a.7: An extension ladder dedicated for safe shutdown is required to be stowed in the immediate vicinity to allow access to 2-HV-4512.

5. Page 15 Item 17: 2-HS-4524FL and 2-HS-4526FL labels on the remote shutdown panel do not have red "FIRE" labels attached.

6. Page 18.1 Item 27 should be number 26.

7. Page 20 Item 27.c.4.B: 2EB4-2/5M/BKR-1 should read 2EB3-2/5M/BKR-1.

8. Page 22 Item 33.a. under the location column should read Train B rather than Train A.

9. Page 22 Items 33.f. and 33.g. should be reversed to minimize movement between plant levels.

10. Page 24 Item 33.r. the shell side outlet thermowell needs to be labeled on the RHR heat exchanger.

11. Page 26 Item 33.u.1. should read MOTOR FUSED SWITCH rather than MOTOR FUSE SWITCH.

12. Page 45 Step 6.b. should read "inside east side of panel" rather than inside west side of panel.

13. Page 46 Step 7.b.1 reads Place Auxiliary Lube Oil Pump in HAND AND allow turbo lube oil pressure to stabilize. Since no values are specified, what is an acceptable value for the pressure to stabilize at? [Is 0 acceptable?]

14. Page 48 Step 12 "FDR SUPPLY BKR FROM 138 KV SU XFMR XST 2, CUB 1, Control Power Fuses - REMOVED" should read "FDR SUPPLY BKR FROM 138 KV SU XFMR XST 1, CUB 4, Control Power Fuses - REMOVED."

15. Page 48 Step 12 "FDR SPLY BKR FROM 345 KV SU XFMR XST1 CUB 14 Control Power Fuses - REMOVED" should read "FDR SPLY BKR FROM 345 KV SU XFMR XST2 CUB 17 Control Power Fuses - REMOVED."

16. Page 49 Step 15 reads in part "AND remove the control power fuses for the PDP". The control power fuses are labeled "feed ..." rather than "control power".

17. Page 50 Step 20 reads "Proceed to SFGD 810' PENET RMs AND locally maintain seal injection flow". There are no controls for the operator to use in controlling seal injection flow from the SFGD 810' PENET RMs. The seal injection flow indicators are being used to determine seal flow from this location.

18. Page 51 Step 1 reads "At Operations Locker, TB 810' NORM SWGR, obtain a copy of this procedure AND perform Attachment 3." The procedure was not stored in Operations Locker, TB 810' NORM SWGR.

19. Page 52 Steps 3.b & d. require manipulation of circuit breakers on 118 VAC INVERTERs IV2EC1 and IV2EC2, but the circuit breakers have not been demarcated with a luminescent diagonal stripe.

20. Page 53 Step 6. reads "In AB 822 X-208 CLOSE 2-8483B-RO, CCP 2-01/2-02 CHRG FLO CTRL VLV OUT VLV RMT OPER." A T-handle wrench for operating the remote operator is not installed in the vicinity of the operator. A T-handle wrench found in the general area did not fit the remote operator.

21. Page 54 Step 9.c. should have the following valves added to the list:

- 2-HV-8153, XS LTDN ISOL VLV
- 2-HV-8154, XS LTDN ISOL VLV

22. Page 56 Step 2.b. should read "START UP XFMR XST2 TO 6.9 KV SWGR 2EA2 ALTERNATE FEEDER BREAKER CUB 1" rather the "FDR SUPPLY BKR FROM 138 KV SU XFMR XST 1 CUB 1."

23. Page 56 Step 2.c. should read "START UP XFM XST1 TO 6.9 KV SWGR 2EA2 PREFERRED FEEDER BREAKER, CUB 16" rather than "FDR SUPPLY BKR FROM 345 KV SU XFM XST 2 CUB 16."

24. Page 56 Step 3 delete "to SFGD 832 electrical area" from the step.

25. Page 57 Step 6 should read "north of" rather than "across from."

26. Page 58 Step 7: Breaker 2EB3-1/7F/BKR label should read "CONTAINMENT" rather than "CONDENSATE."

27. Page 58 Step 10: An extension ladder dedicated for safe shutdown is required to be stowed in the immediate vicinity to allow access to 2-[illegible]-4572.

28. Page 60 Step 2.b: A T-Handle wrench is required for valve operations.

29. Page 60 Step 2.b should include instructions for failing air to 2-FCV-111B, i.e.:

    - Shut 2-FCV-011B, AS1 RCS MU TO VCT 2-01 ISOL VLV AS, and
    - Open drain on 2-FCV-0111B-PR1, RCS UM TO VCT 2-01 ISOL VLV PRESS REG.

30. Page 61 Step 2 should have boxes added to the left hand column for the operator to check off the step parts as they are performed.

31. Page 61 Step 2: 2CI-0385, U2 SFGG BLDG EL 790 INST AIR HDR ISOL VLV 0385, valve hand wheel is blue rather than yellow.

32. Page 61 Step 2: Change "SFGD 790 2-70 column 12S 6' W of DS" to read "SFGD 790 2-70 column 12S 6' W of DS behind 2CC-0107 CS HX 2-01 CCW SPLY ISOL VLV."

33. Page 61 Step 3: Lighting panel LTG PNL 2ESB1 and circuit breaker 20 have not been demarcated with a luminescent diagonal stripe.

34. Page 61 Step 5: CP2-EPPRNC-01 has not been demarcated with a luminescent diagonal stripe.

35. Page 63: 1/2-APRH1F, RHRP 1, was not designated by a red "FIRE" tag on the RSP.

36. Page 65: CS-BT2EB3-L should read "CS-BT2EB13-L"

37. Page 65: CS-BT2EB13-L, BUS TIE BKR BT-2EB13, was not designated by a red "FIRE" tag on the RSP.

38. Page 65: 2-HC-2325, SG 1 ATMOS RLF VLV CTRL, was not designated by a red "FIRE" tag on the RSP.

39. Page 65: 2-HC-2326, SG 2 ATMOS RLF VLV CTRL, was not designated by a red "FIRE" tag on the RSP.

38. Page 65: 2-HC-2327, SG 3 ATMOS RLF VLV CTRL, was not designated by a red "FIRE" tag on the RSP.

39. Page 65: 2-HC-2328, SG 4 ATMOS RLF VLV CTRL, was not designated by a red "FIRE" tag on the RSP.

40. Page 66: 2-NI-50A-3, NEUT FLUX SR, was not designated by a red "FIRE" tag on the RSP.

41. F-2EA1-L, BUS 2EA1 FREQ, was not designated by a red "FIRE" tag on the RSP.

41. V-2EA1-L, BUS 2EA1 VOLT, was not designated by a red "FIRE" tag on the RSP.

42. Page 67 Step 1: "MOTOR FUSED BREAKER" should read "MOTOR FUSED SWITCH."

43. Page 67 Step 8: "Rm N wall NE corner" should read "Rm N wall SE corner."

ATTACHMENT 4

DOCUMENTS REVIEWED SUPPORTING FIRE PROTECTION PROGRAM

PROCEDURES/DOCUMENTS REVIEWED

IS21.FBI.FG1, "Fire Brigade Initial"

IS21.FBI.FD1, "Fire Detection and Suppression"

IS21.FBI.VRI.LP, "Rescue"

IS21.FBI.FN1, "Fire Suppression Techniques"

IS21.FBI.PF1, "Portable Fire Extinguishers"

IS21.FBI.FD1.L2, "Hose and Appliances - Classroom"

IS21.FBI.BV1.LP, "Fire Behavior"

IS21.FBI.IB1.LP, "Fire Cause Determination"

IS21.FBI.FD1, "Fire Detection and Suppression"

IS21.FBI.BF1.LP, "Self Contained Breathing Apparatus"

MSE-P2-7701, Revision 0, "Fire Protection Control Panel CP2-EIPRLV-28 and 28A Test"

PPT-P2-3432, Revision 0, "Generator Hydrogen Seal Oil Unit Fire Protection Air Flow Test"

PPT-P2-3107, Revision 0, Draft, "Deluge Valve 2-TV-4102B (2FP-0095) For Main Feedwater Pump CP2-FWADrP-01 (East)"

PPT-P2-3112, Revision 0, Draft, "Flooding Valve 2-TV-4111B (2FP-0303) For Diesel Generator B Day Tank Room (West) Preaction"

PPT-P2-3119, Revision 0, Draft, "Deluge Valves 2-HV-4104A (2FP-0410) and 2-HV-4104B (2FP-0412) For Unit 2 Cable Spreading Rm 134-Preaction"

PPT-P2-3120, Revision 0, Draft, "Deluge Valve 2-HV-4075D (2FP-0493) For the Containment Building Hose Stations - Unit 2"

MSE-P2-7702, Revision 0, "Fire Protection Control Panel CP2-EIPRLV-33 Test"

MSE-P2-7703, Revision 0, "Fire Protection Control Panel CP2-EIPRLV-33A Test"

MSE-P2-7704, Revision 1, "Halon Fire System Test CPX-EIPRLV-42A"

STA-722, Revision 3, "Fire Protection Program"

STA-723, Revision 1, "Fire Protection Systems/Equipment Requirements"

STA-724, Revision 1, "Fire Reporting and Response"

STA-728, Revision 1, "Storage and Handling of Flammable/Combustible Material and Compressed Gases"

STA-729, Revision 4, "Control of Transient Combustibles, Ignition Sources and Fire Watches"

STA-738, Revision 3, "Fire Protection Systems/Equipment Impairment"

TRA-104, Revision 9, "Fire Protection Training In Draft"

FIR-108, Revision 1, "Fire Protection Organization"

FIR-202, Revision 2, "Fire Protection Inspections"

FIR-301, Revision 3, "Portable Fire Extinguisher Inspection, Maintenance, Recharging and Hydrostatic Testing"

FIR-302, Revision 5, "Fire Door Tests and Inspections"

FIR-303, Revision 4, "Halon Fire Suppression System Inspection"

FIR-307, Revision 3, "Inspection of Sprinkler Systems"

ATTACHMENT 5

INSPECTION SUMMARY AND SUMMARY OF INSPECTION FINDINGS

Inspection Summary

Inspection Conducted November 16-20, 1992 (Report 50-446/92-49)

Areas Inspected: Planned prelicensing team inspection including an assessment of the licensee's implementation of the approved fire protection program for Unit 2, selective evaluation of the licensee's docketed commitments, and exceptions taken to the design requirements for: the fire protection of safe shutdown capability, alternative and dedicated shutdown capability, emergency lighting, the reactor coolant pump lube oil collection system, and ar assessment of the licensee's plant hardware, personnel, and procedures necessary to achieve a postfire safe shutdown.

Summary of Inspection Findings:

- Unresolved Item 446/9249-01, related to testing and maintenance of breakers and relays required for safe shutdown equipment, was opened in paragraph 2.3.1.2.
- Unresolved Item 446/9249-02, related to assumptions in the high impedance fault study, was opened in paragraph 2.3.1.3.
- Unresolved Item 446/9249-03, related to the potential for spurious operations and damage to motor-operated valves (MOVs) and the failure for an automatic turbine trip to occur, was opened in paragraphs 2.3.2.2 and 3.2.1.
- Inspection Followup Item 446/9249-04, related to procedural deficiencies and physical deficiencies identified during walkdown of Procedure ABN-803B, was opened in paragraph 3.2.2.
- Unresolved Item 446/9249-05, related to testing and maintenance of emergency lighting, was opened in paragraph 4.3.
- Inspection Followup Item 446/9249-06, related to the need to assess blackout testing of emergency lighting, was opened in paragraph 4.4.
- Inspection Followup Item 446/9249-07, related to the positioning of smoke detectors relative to air flows, was opened in paragraph 5.2.
- Inspection Followup Item 446/9249-08, related to the completion of fire barriers and seals, was opened in paragraphs 5.2 and 5.3.
- Unresolved Item 446/9249-09, related to fire suppression sprinkler head selection, was opened in paragraph 5.3.

- Inspection Followup Item 446/9249-10, related to physical obstructions to sprinklers, was opened in paragraphs 5.4 and 5.5.

- Unresolved Item 446/92-11, related to the design of the water curtain and associated suppression equipment installation for the essential chiller area, was opened in paragraph 5.6.

- Inspection Followup Item 446/92-12, related to missing ceiling tiles, was opened in paragraph 5.7.

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Areas Inspected: Unit 1 inspection was limited to a brief, partial walkdown of the safeguards building fire suppression system and housekeeping in various fire zones.

Summary of Inspection Findings

- Unresolved Item 446/9249-01 is applicable to Unit 1 and will be tracked as Unresolved Item 445/9249-01.

- Unresolved Item 446/9249-02 is applicable to Unit 1 and will be tracked as Unresolved Item 445/9249-02.

- Unresolved Item 446/9249-03 is applicable to Unit 1 and will be tracked as Unresolved Item 445/9249-03.

- Unresolved Item 446/9249-05 is applicable to Unit 1 and will be tracked as Unresolved Item 445/9249-05.

- Unresolved Item 446/9249-09 is applicable to Unit 1 and will be tracked as Unresolved Item 445/9249-09.

- Unresolved Item 446/9249-11 is applicable to Unit 1 and will be tracked as Unresolved Item 445/9249-11.

- Inspection Followup Item 416/9249-12 is applicable to Unit 1 and will be tracked as Inspection Followup Item 445/9249-12.