



UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
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INSPECTION AND ENFORCEMENT MANUAL

DIP

TEMPORARY INSTRUCTION 2515/62, REVISION 2

POST FIRE SAFE SHUTDOWN, EMERGENCY LIGHTING AND OIL COLLECTION CAPABILITY AT ALL OPERATING PLANTS

2515/62-01 PURPOSE

To ascertain whether licensees are in conformance with Sections III.G, J, and O of 10 CFR 50, Appendix R, to the extent made applicable by licensing requirements and commitments, or the provisions of 10 CFR 50.48. This instruction provides inspection guidance for all operating commercial nuclear power plants. IP 64705 is the corresponding procedure for those reactor facilities that have not received their full-power operating licenses.

2515/62-02 BACKGROUND

Effective February 17, 1981, the Nuclear Regulatory Commission amended its regulations by adding Part 50.48 and Appendix R to 10 CFR 50 to require certain provisions for fire protection in nuclear power plants licensed to operate before January 1, 1979. This action was taken to resolve certain contested generic issues in fire protection safety evaluation reports (SERs) and to require all applicable licensees to upgrade their plants to a level of protection equivalent to the technical requirements of Sections III.G, J, and O of 10 CFR 50, Appendix R. Licensees were required to meet the separation requirements of Section III.G.2., the alternative or dedicated shutdown capability requirements of Sections III.G.3. and III.L., or request an exemption in accordance with 10 CFR 50.48.

Plants licensed after January 1, 1979, are subject to requirements similar to 10 CFR 50, Appendix R, as specified in the conditions of their Facility Operating License, commitments made to the NRC, or deviations granted by the NRC. These "post-79" reactor plants are subject to the requirements of 10 CFR 50.48 (a) and (e) only.

The Fire Hazards Analysis (FHA) (Fire Protection Review, Fire Protection Evaluation) document of these post-79 reactor plants may have been reviewed under Appendix A to Branch Technical Position APCS 9.5-1 "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976" of August 23, 1976 (in which case, the licensee conducted an Appendix R comparison and justified FSAR or FHA differences from specific provisions of Appendix R). It is also possible that these post-79 licensee submittals were reviewed under Standard Review Plan NUREG-0800 and Branch Technical Position CMEB 9.5-1 (formerly BTP ASB 9.5-1) "Guidelines for Fire Protec-

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tion for Nuclear Power Plants", Rev. 2 of July 1981 (in which case, licensee submittals were reviewed against requirements which closely paralleled the provisions of Appendix R).

The actual fire protection requirements applicable to a given reactor plant licensed after January 1, 1979 arise from the specific license conditions in the Facility Operating License. These license conditions refer to SERs and their supplements. Section 9.5 of the SER will delineate which licensee submittals were reviewed (e.g., a Fire Hazards Analysis would be such a submittal). The plant configurations and procedures described in these submittals are "requirements of the license." Answers to questions raised in the SER review process would be termed "licensing commitments." These "licensing commitments" are "requirements of the license" if referenced by or appended to SERs which are, in turn, referenced within the Facility Operating License.

2515/62-03 GENERAL INFORMATION

03.01 It is recommended that a team be assigned to perform this inspection. The following is a suggested minimum team.

- a. Team Leader - leads discussion with licensee at entrance and exit interview. Should be a region-based inspector. Also participates in inspection effort.
- *b. Mechanical Safe Shutdown Specialist - identifies and examines equipment and cabling necessary to achieve post fire safe shutdown.
- *c. Electrical Safe Shutdown Specialist - identifies and examines cabling and circuitry necessary to achieve post fire safe shutdown and identifies associated circuits of concern and the adequacy of their electrical separation, isolation, and protective features.
- *d. Fire Protection Specialist - inspects fire protection of the safe shutdown systems, equipment, and circuits.

03.02 Inspection experience to date has shown the usefulness of adding one team member to review the licensee's alternative safe shutdown systems and procedures.

03.03 This is a technically complex inspection. Because there are many variations in the technical details by which a facility can meet safe shutdown criteria, a site-specific inspection plan must be prepared. See Appendix A for detailed guidance on the preparation of inspection plans.

* Regions may use inspectors who have the necessary expertise, request assistance from NRR, or use available IE contractors who have the necessary expertise.

2515/62-04 SPECIFIC INSPECTION REQUIREMENTS

For reactor plants licensed after January 1, 1979, items to be inspected (and the necessary degree of compliance with Appendix R) at a reactor plant are dependent upon the specific requirements and commitments of the Facility Operating License and its supporting documentation (see Section 2515/-62-02). Section 2515/62-04 is written under the assumption that all provisions of Appendix R, Sections III.G, J, and O are applicable to the plant under consideration.

04.01 Section III.G.2, Redundant Train Safe Shutdown Capability

- a. Review the systems and equipment used to meet the safe shutdown requirements. Systems included should fulfill the following requirements:
 1. The reactivity control function shall be capable of achieving and maintaining cold shutdown reactivity conditions.
 2. The reactor coolant makeup function shall be capable of maintaining the level above the top of the core for BWRs and within the level indication of the pressurizer (or solid plant) for PWRs.
 3. The reactor heat removal function shall be capable of achieving and maintaining decay heat removal.
 4. The process monitoring function shall be capable of providing direct readings of the process variables necessary to perform and control the functions in Items a.1., a.2., and a.3., above. Note: Source range neutron indication is not required for BWRs.
 5. The supporting functions shall be capable of providing the process cooling, lubrication, etc. necessary to permit the operation of the equipment used for safe shutdown functions.
- b. Verify, on a sample basis, that plant fire areas (bounded by 3-hour-rated walls or equivalent approved by NRR) which contain components from both redundant trains of safe shutdown equipment meet one of the following:
 1. requirements of III.G.2

* See Section 04.02 (below) for inspection requirements if alternative or dedicated shutdown is required.

2. an alternative or dedicated shutdown capability meeting the requirements of III.G.3 and III.L as described in the safety evaluation report (SER) issued by NRR or licensee documents referenced therein*
 3. requirements of approved exemption requests
- c. Verify, on a sample basis, that modifications necessary to ensure safe shutdown are in conformance with the information described in the NRR SERs and their supplements, or applicable license documents.
 - d. Verify that redundant trains of cables (safety-related, nonsafety-related, and associated circuits) and equipment in selected fire areas have been identified and analyzed by the licensee to show that they would not prevent safe shutdown operation because of hot shorts, open circuits, or shorts to ground. Verify that they have separation or barriers as required by III.G.2 of Appendix R.
 - e. Verify, on a sample basis, that installation of necessary fire detectors and automatic fire suppression systems required by III.G.2 is as described in NRR SERs and their supplements, or other license documents. In addition, verify that the installation of automatic water suppression systems would adequately suppress fires associated with hazards of the area.
 - f. Verify, on a sample basis, that redundant trains of systems required for hot shutdown located in the same fire area are not subject to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems (reference IE Information Notice 83-41 of June 22, 1983). Determine the following:
 1. whether a fire in a single location (or inadvertent actuation of fire suppression system) could directly cause activation of potentially damaging automatic fire suppression systems for all redundant trains
 2. whether a fire in a single location could, indirectly, through the production of smoke, heat, or hot gases, cause activation of potentially damaging fire suppression for all redundant trains
 3. whether a fire in a single location (or inadvertent actuation or rupture of a fire suppression system) could, through local fire suppression activity, indirectly cause damage to all redundant trains (e.g., sprinkler caused flooding of other than the locally affected train)

4. whether, in response to a fire in a single location the utilization of manually controlled fire suppression systems could cause damage to all redundant trains

04.02 Sections III.G.3 and III.L, Alternative and Dedicated Shutdown Capability

- a. Review the systems and equipment used to meet the alternative or dedicated shutdown requirements. Verify they meet the following functional requirements:
 1. The reactivity control function shall be capable of achieving, monitoring, and maintaining cold shutdown reactivity conditions.
 2. The reactor coolant makeup function shall be capable of maintaining the reactor coolant level above the top of the core for BWRs or be within the level indication in the pressurizer (or solid plant) for PWRs.
 3. The reactor heat removal function shall be capable of achieving and maintaining decay heat removal.
 4. The process monitoring functions shall provide direct reading of the process variables necessary to perform and control the functions in Items a.1., a.2., and a.3., above. (See memo referred to in Appendix A, Section A.1.g of this temporary instruction.)
- b. Verify that alternative or dedicated shutdown capability is in conformance with information provided in the applicable SERs and their supplements or in supporting documents.
- c. Examine the alternative or dedicated shutdown equipment. Verify that it is independent of the fire area, room or zone under consideration and that electrical isolation capability is provided as described in the SER and supporting documents.
- d. Review the licensee's testing program for ensuring alternative or dedicated shutdown capability. Verify that it includes, at a minimum, provisions for ensuring that equipment operates from the local control station but cannot be operated from the control room when the transfer or isolation switch is placed in the "local" position. Also verify that equipment operates from the control room but cannot be operated from the local control station when the transfer or isolation switch is in the "remote" position.

- e. Verify that the licensee's training program for licensed and nonlicensed personnel has been expanded to include alternative safe shutdown capability training in the event of a fire for all required individuals.
- f. Verify that personnel required to achieve and maintain the plant in hot shutdown following a fire using the alternative shutdown systems, can be provided from normal onsite staff, exclusive of the five-person fire brigade.
- g. Verify that adequate procedures for use of the alternative shutdown system exist. Verify that the operators can perform the procedures within applicable shutdown time requirements. Ensure that adequate communications are available for the personnel performing alternative or dedicated safe shutdown. The licensee can be requested to demonstrate the adequacy of the alternative shutdown procedures by "walking through" the procedural steps.
- h. Verify, on a sample basis, that installation of necessary fire detectors and automatic fire suppression systems required by III.G.3 is as described in NRR SERs and their supplements or other license documents. In addition, verify that the installation of automatic water suppression systems would adequately suppress fires associated with hazards of the area.

04.03 Emergency Lighting

- a. Verify that the plant emergency lighting capabilities meet the following requirements of III.J.
 - 1. Required Areas for Emergency Lighting
 - a. control room,
 - b. other critical area(s) and access routes which require illumination to allow manual safe shutdown equipment operation or the monitoring of safe shutdown indications.
 - 2. If the emergency lights are powered from a central battery or batteries, then the distribution system must contain such protective devices that a fire in one area will not cause a loss of emergency lighting in any unaffected area needed for safe shutdown operations.

3. Review the manufacturer's information to verify that battery power supplies are rated with at least an 8-hour capacity.
- b. In addition to the regulatory requirements of III.J, the following areas should be reviewed:
 1. Tour the plant and inspect the emergency lights installed in a sample of the areas identified in 04.03.a. and the access routes to those areas. Verify the following:
 - a. lamps are properly aimed
 - b. installed indication that the batteries are being properly maintained such as:
 - charge rate indication (lamp or meter)
 - specific gravity indication
 - c. sufficient illumination provided to permit access for the monitoring of safe shutdown indications and/or the proper operation of safe shutdown equipment
 2. Review the manufacturer's information to determine the periodic maintenance recommendations.
 3. Review the preventive maintenance surveillance procedure used for periodic checks of the emergency lights through determining the following:
 - a. that the frequency is as specified by the manufacturer
 - b. that the units are being maintained as specified by the manufacturer
 4. Review the emergency lighting drawings to determine if emergency lighting had been designated for a sample of areas not toured and for areas found that did not have emergency lights installed.
 5. Request that the licensee perform an emergency lighting test for selected plant areas. Verify that the criteria provided in 04.03b1 are satisfied.

04.04 Oil Collection System for Reactor Coolant Pump

- a. Review the drawings for the system to verify that all potential leakage points have been contained and the drain line(s) have been sized to accommodate the maximum leak.
- b. Verify that the oil collection system components have been designed so that there is reasonable assurance that they would withstand the safe shutdown earthquake (see Section III.0 of Appendix R).
- c. Verify that either the oil has a sufficient high flash point to prevent ignition of the oil by any equipment in the area or the tank vent has a flame arrestor installed.
- d. Verify that the licensee has a surveillance procedure for the oil collection system and has implemented the procedure. The following should be included in the procedure:
 1. periodic testing of the remote level indication (if installed)
 2. periodic visual examination of the oil collection system piping and tank
- e. Verify that the collection tank is a closed, vented tank and has sufficient capacity to collect all the oil from all reactor coolant pumps (upper and lower lube oil system), simultaneously, or sufficient capacity to collect the oil from one reactor coolant pump and that overflow is directed to a location which does not present a fire hazard. Refer to applicable SERs for the specific configuration required.
- f. Inspect the reactor coolant pump oil collection system to verify that it was installed as indicated by the drawings. If the plant is operating, the spare reactor coolant pump may be inspected. If seismically designed, verify all piping is seismically supported.

251562-05 REPORTING REQUIREMENTS

The results of this inspection will be documented in a standard inspection report. A copy of the final report shall be forwarded to the Office of Inspection and Enforcement, Division of Inspection Programs, and to the Office of Nuclear Reactor Regulation, Division of Licensing.

POST FIRE SAFE SHUTDOWN, EMERGENCY LIGHTING,
AND OIL COLLECTION

2515/62-06

2515/62-06 EXPIRATION

This temporary instruction will remain in effect for one year from the date of issue.

2515/62-07 IE CONTACT

Questions regarding this Temporary Instruction should be addressed to Mr. Leon Whitney (301-492-9668).

2515/62-08 STATISTICAL DATA REPORTING

Following is a list of inspection procedures for which credit may be taken.

Facilities Licensed before January 1, 1979:

<u>Procedure</u>	<u>Credit</u>	<u>Title</u>
37700	100%	Design Changes and Modifications
37701	100%	Facility Modifications Training
41700	30%*	Training
42700	50%	Plant Procedures
64704	100%	Fire Protection/Prevention Implementation
72701	100%	Startup Testing New/Modified

Facilities Licensed after January 1, 1979:

<u>Procedure</u>	<u>Credit</u>	<u>Title</u>
37301	50%	Comparison of As-built Plant to FSAR Description
41700	30%*	Training
42700	50%	Plant Procedures

2515/62-08

POST FIRE SAFE SHUTDOWN, EMERGENCY LIGHTING,
AND OIL COLLECTION

<u>Procedure</u>	<u>Credit</u>	<u>Title</u>
64704	100%	Fire Protection/Prevention Implementation
92718	50%	Safety Evaluation Report Review and Followup

* Nonlicensed individual training inspection credit up to 30%.

END

APPENDIX A

INSPECTION PLAN PREPARATION

A. Document Review

Because the inspection of the safe shutdown, emergency lighting, and oil collection requirements of Sections III.G., J., and O. of Appendix R to 10 CFR 50 is a complex undertaking, it is important that the personnel selected to perform the inspection be prepared before they arrive at the site.

1. Following is a list of documents that inspection personnel should obtain and review before the inspection:
 - a. Fire Hazard Analysis and related documents prepared by the licensee.
 - b. NRR Fire Protection Safety Evaluation Report and supplements, and licensee documents referenced therein that constitute the NRR review and approval of the Fire Hazards Analysis of Item A.1.a.,* and, if applicable, portions of the Facility Operating License applicable to post-fire safe shutdown.
 - c. NRR Fire Protection Safety Evaluation Report and licensee documents referenced therein that constitute the NRR review and approval of modifications required to satisfy the alternative or dedicated shutdown requirement of Section III.G.3 of Appendix R to 10 CFR 50.*
 - d. Licensee's assessment of the plant to III.G, III.J, and III. O (10 CFR 50, Appendix R) requirements that identifies redundant safe shutdown systems and components, defines the fire areas, and locates the safe shutdown equipment and cables by fire area (part of this may include Item A.1.a by reference).
 - e. Licensee and NRR correspondence constituting exemption requests and associated approvals.
 - f. NRR memorandum from R. J. Mattson to R. H. Vollmer July 2, 1982, "Position Statement on Allowable Repairs for Alternative Shutdown and on the Appendix R Requirement for Time Required to Achieve Cold Shutdown." (J. M. Taylor sent copies to the Regional Division Directors on August 17, 1982.)

* The dates of these items may be obtained from the NRR project manager.

- g. Memorandum from L. S. Rubenstein to P. J. Mattson January 7, 1983, "Statement of Staff Position Regarding Source Range Flux, Reactor Coolant Temperature and Steam Generator Pressure Indication to Meet Appendix R Alternative Shutdown Capability."
 - h. Licensee analysis generated in response to the IE Information Notice 83-41, "Actuation of Fire Suppression System Causing Inoperability of Safety Related Equipment" June 22, 1983.
 - i. Generic Letter 83-33, "NRC Positions on Certain Requirements of Appendix R to 10 CFR 50," October 19, 1983.
 - j. IE Information Notice 84-09, "Lessons Learned from NRC Inspections of Fire Protection Safe Shutdown Systems (10 CFR 50 Appendix R)," February 13, 1984 and Revision 1, March 7, 1984.
 - k. "Interpretations of Appendix R" or similarly titled NRR Generic Letter to be generated in Spring, 1985 (Commission review required).
 - l. Generic Letter 81-12: Fire Protection Rule (45 FR 76602, November 19, 1980) - February 20, 1981.
 - m. Memorandum from R. J. Mattson to D. G. Eisenhut, March 22, 1982, "Fire Protection Rule-Appendix R," containing clarifications of Generic Letter 81-12.
 - n. Memorandum from V. A. Moore to V. Benaroya, October 11, 1984, "Emergency Lighting Illumination Standards."
 - o. Memorandum from D. G. Eisenhut to J. A. Olshinski, February 16, 1984, "Oil Collection System Reactor Coolant Pumps, Florida Power and Light Company, St. Lucie Unit 2, Docket No. 50-389."
2. From the documentation develop the following information:
- a. equipment required for hot shutdown
 - b. additional equipment required for cold shutdown
 - c. areas of the plant where alternative shutdown capability has been provided
 - d. areas of the plant that contain components or cable runs (control, power or instrumentation) from both redundant trains of equipment required for hot and cold shutdown

- e. licensee's listings of associated circuits of concern
- 3. The licensee should be asked to provide the following information, if it is not available in the regional office:
 - a. emergency operating procedures, or equivalent, that are used to achieve and maintain the plant in hot shutdown following a fire
 - b. emergency operating procedures, or equivalent, that are used to cool down the plant following a fire
 - c. fire pre-plans for critical areas, if developed
 - d. results of tests run (if any) to verify the ability to maintain the plant in hot shutdown following a fire with an assumed loss of offsite power (e.g., natural circulation test while using the atmospheric steam dumps)
 - e. results of qualification and/or acceptance tests for special features (e.g., cable enclosures or penetration seals)
 - f. any documents identified in Item A.1 that were prepared by the licensee

B. Inspections of Hot Shutdown Capability

1. System/Equipment/Instrumentation

- a. From the list of systems, equipment, and instrumentation required to achieve and maintain hot shutdown, select a sample for indepth review. For example, in a PWR the following could be selected:
 - (1) reactivity control - boration capability
 - (2) reactor coolant makeup - charging pump
 - (3) reactor pressure control - pressurizer heaters
 - (4) decay heat removal - auxiliary feedwater pump
 - (5) process monitoring instrumentation - reactor temperature and steam generator level (see Item A.1.f for complete list)
 - (6) support - onsite AC power and its distribution system

The six systems identified above generally define the areas of concern following a fire. Selection of one or two components from each area should be an adequate sample size.

- b. For the systems, equipment, and instrumentation selected in Item B.1.a, perform the following:
 - (1) Using the licensee's cable routing drawings or analysis, identify the areas of the plant traversed by the cables of the redundant trains of hot shutdown equipment. The cables should include:
 - (a) power (normal and emergency)
 - (b) control
 - (c) instrumentation
 - (d) associated circuits of concern
 - (2) Identify the areas of the plant that contain the equipment of the redundant trains required for hot shutdown.
 - (3) Where modifications have been required to meet the requirements of III.G.2, review the modification packages for adequacy of licensee review and approval, including 10 CFR 50.59 aspects.
 - (4) Inspect the areas of the plant and verify that the selected equipment and cables of the redundant trains meet the separation requirements of Section III.G.2 of Appendix R (i.e., separation by a 3-hour fire barrier, or separation by a horizontal distance of 20 feet with no intervening combustibles with fire detection and automatic fire suppression in the area, or enclosure of the cables and equipment in a 1-hour fire barrier with fire detection and automatic fire suppression in the area) or verify that appropriate deviations or exemptions approved by NRR exist for the areas being reviewed.

2. Inspection of Alternative or Dedicated Hot Shutdown Capability*

- a. From the licensee's analysis, identify the fire areas for which alternative shutdown has been provided or a dedicated shutdown system has been provided.

* If the separation criteria of III.G.2 cannot be met for system, equipment, or instrumentation required for hot shutdown, then alternative or dedicated shutdown provisions must be provided.

- b. From that analysis, select a sample of the areas and/or equipment for in-depth review as follows:
 - (1) Select three or more areas of the plant (including the control room) where alternative shutdown has been provided, or
 - (2) If a dedicated shutdown system is installed, select a sample of systems (see Item B.1.a for an example of equipment and instrumentation).
- c. For the areas and/or equipment selected in Item B.2.b, perform the following:
 - (1) Using the licensee's cable routing drawings or cable analysis, identify the protective measures isolating the cables that could affect the alternative shutdown capability for that area. These cables should include:
 - (a) power (normal and emergency)
 - (b) control
 - (c) instrumentation
 - (d) associated circuits of concern
 - (2) Identify the location of the equipment necessary to provide alternative or dedicated shutdown capability.
 - (3) Verify that the areas for which alternative or dedicated shutdown has been provided are protected by fire detection and a fixed fire suppression system.
 - (4) Where modifications have been required, review the modification packages for adequate licensee review and approval, including 10 CFR 50.59 review.
 - (5) Inspect the areas of the plant to verify that the commitments of the SER have been met for the equipment and cables selected above.
- d. Where procedures have been developed, request that appropriate licensee personnel conduct a walkthrough of the alternative shutdown procedures.

3. Procedure for Hot Shutdown*

- a. Review the procedure that the licensee uses for bringing the plant to hot shutdown in the event of a fire in:
 - (1) cable spreading room
 - (2) control room**.
 - (3) other selected critical areas
- b. Determine the feasibility of performing the procedure in case of fire by a walkthrough of specific sections of the procedure.
- c. Pay particular attention to prescribed modifications (e.g., lifting leads, pulling fuses) (if any) that must be made to achieve or maintain the plant in hot shutdown.

4. Staffing

- a. Determine if there are enough qualified personnel available on shift to perform the operations necessary to maintain the plant in hot shutdown and staff the five-person brigade.
- b. Verify that communications capability between the various control stations is adequate for shutting down and maintaining the hot shutdown condition.

5. Training

- a. Verify that the licensee's training program includes instruction, on a periodic basis, in the use of the procedure for hot shutdown following a fire.
- b. Interview a sample of operators and assess the adequacy of training that has been conducted on the existing procedure.

* Procedures for bringing the plant to hot shutdown in the event of a fire should consider both the use of only onsite power and the use of offsite power. Credit taken for the failed position of some equipment on loss of offsite power must be reconsidered when offsite power is not lost. Additionally, some "associated circuits of concern" may require procedures to detect and correct spurious operations of these circuits. These procedures should also be included in the review.

** Credit is given for manual scram from the control room prior to evacuation.

C. Inspection of Cold Shutdown Capability

1. Systems/Equipment/Instrumentation

- a. From the list of additional systems, equipment, and instrumentation required to cool the plant from hot shutdown to cold shutdown, select a sample for in-depth review. For example, in a PWR, the following could be selected:

- (1) reactor coolant system pressure reduction - auxiliary spray line valve controls
- (2) decay heat removal - RHR pump
- (3) support - onsite power

The above three items represent equipment, in addition to the equipment required for hot shutdown, necessary for cold shutdown. Selection of at least one or two components from each area should provide an adequate sample size.

- b. For the systems, equipment, and instrumentation selected in Item C.1.a, perform the following:

- (1) For postulated fire damage, determine the feasibility of repair and cool down within 72 hours.
- (2) Determine that any material required to repair the damaged area is available on site, so that the 72-hour limitation can be met.
- (3) Review the licensee's procedure for repairing the damaged area.
- (4) Inspect the areas of the plant containing the equipment, systems, and instrumentation required to cool down the plant.

2. Procedure for Cooldown

- a. Review the procedure that the licensee uses for bringing the plant to cold shutdown conditions in the event of a fire in:

- (1) cable spreading room
- (2) control room

- b. Determine the feasibility of performing the procedure in case of fire by a walkthrough of specific sections of the procedure.
- c. Pay particular attention to repairs that must be made to cool the plant to cold shutdown conditions.

3. Training

- a. Verify that the licensee's training program includes instructions, on a periodic basis, for the use of the cooldown procedure following a fire.
- b. Interview a sample of operators and assess the adequacy of training that has been conducted on the existing procedure.