UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

NRC INSPECTION MANUAL RSIB

TEMPORARY INSTRUCTION 2515/107

ELECTRICAL DISTRIBUTION SYSTEM FUNCTIONAL INSPECTION (EDSFI)

2515/107-01 PURPOSE

This temporary instruction (TI) provides guidance for performing a comprehensive team inspection focused primarily on the electrical distribution system (EDS) at operating nuclear power plants.

2515/107-02 OBJECTIVES

The primary objective of the inspection is to assess the capacity of the EDS to perform its intended functions during all plant operating and accident conditions. A secondary objective is to assess the capability and performance of the licensee's engineering organization in providing engineering and technical support (E&TS). This inspection also examines the interfaces between the technical disciplines internal to the engineering organization and the interfaces between the engineering organization and the technical support groups responsible for the operability of the EDS.

2515/107-03 BACKGROUND

Previous NRC inspection teams have observed that the required functional capability of certain safety-related systems was compromised due to a lack of proper E&TS, which resulted in the introduction of various design deficiencies during the initial design or during subsequent design modifications of the station electrical distribution system. Examples of such deficiencies are as follows:

a. Load growth on Class 1E emergency diesel generator (EDG) supplied buses, Class 1E batteries and Class 1E inverters was not monitored and controlled. This resulted in the overloading of electrical equipment which compromised the safe shutdown and accident mitigation functions of certain safety-related systems.

b. Engineering modifications to the EDS were performed without detailed knowledge of the design basis or thorough consideration of system interactions or safety system functionality. (Functionality, as used in this TI, is the ability of the EDS to perform the intended design functions.)

c. Temporary modifications have been installed in the EDS for extended periods of time without the required 10 CFR 50.59 analysis to establish that they did not create an unreviewed safety question.

d. Electrical calculations were not technically adequate and did not reflect the current facility configuration. This resulted in various equipment being undersized, and a lack of coordination of protective devices between individual electrical loads, various station buses and electrical load centers.

e. Calculations to establish protective relay setpoints were not initially performed or were not updated to reflect setpoint changes and plant modifications.

f. Surveillance testing and post-modification and post-maintenance testing were not adequate to verify design assumptions and system functionality.

g. Commercial grade or non-like-for-like components and piece parts were used without being subjected to a proper dedication process.

h. Fuse control has been lacking. There have been numerous instances, because of a lack of such controls, where improperly sized fuses have been installed in safety equipment.

i. Electrical connections have not been properly installed resulting in either a failure or an inadvertent operation of connected equipment.

Mr. W. V. Johnston, Deputy Director, Division of Reactor Safety, Region I, performed a study entitled "Prioritization of an Electrical Inspection," dated September 1989 (Reference Section 04.03.d). The study provides additional insights into the areas within the EDS that are more significant, from a risk perspective, as either initiators of or contributors to design basis accidents, station blackout or core damage events. These insights have been factored into the requirements and guidance of this instruction.

2515/107-04 INSPECTION REQUIREMENTS

Perform a review of general activities outlined in Sections 04.01 and 04.02 for selected sample load path(s) at each voltage level of the ac and dc electrical distribution system for conformance with the design requirements. A load path is defined as the electrical power flow path between the selected load circuit and all available power source(s).

Inspection guidance is provided in Section 05.02 which includes a broad list of many possible technical and administrative inspection attributes for design, installation, test, and operation of the EDS. It is not the intent of this TI to verify all elements or programs relating to these attributes. Only those elements or portions of programs will be reviewed which directly affect the functionality of the equipment (considering all modes of operation) in the selected load path(s).

04.01 Engineering Office Inspection

a. Verify that the installed EDS is capable of providing quality power to engineered safety features (ESF) loads on demand to support the safe shutdown of the plant and accident mitigation functions. This includes a verification of the onsite and offsite power sources capacity.

(Quality power is power which has specified acceptable voltage, frequency and current such that connected loads will perform their design safety functions.)

b. Verify that the design of the EDS is in agreement with regulatory requirements, licensing commitments and applicable industry standards (See Section 04.03).

c. Verify that the ratings and setpoints have been correctly chosen and controlled for protective and control relays and circuit breakers to assure proper coordination, protection, required automatic action, and annunciation.

d. Verify that the EDS mechanical support systems such as the HVAC, EDG fuel oil transfer system, EDG cooling water system and air-start system are adequate to support operation under design basis conditions.

e. Verify that design modifications to the EDS, including electrical load growth, have been properly controlled.

04.02 On Site Inspection

a. Verify that the installed configuration of the EDS corresponds to the design requirements and is in agreement with the facility documents.

b. Verify that the surveillance and test procedures are adequate to demonstrate the functionality of the equipment or system being tested or the design assumptions being verified.

c. Verify that the scope, depth and frequency of maintenance, surveillance and testing (including post-modification testing) of electrical components in the load path is adequate to verify functional performance.

d. Verify that design assumptions, operational restrictions and other pertinent design or vendor information are accurately and appropriately reflected in operating, maintenance, test, training, and surveillance procedures.

e. Verify that the licensee's engineering organization provides adequate engineering and technical support to the station operating staff and to the station maintenance and surveillance staff when required.

f. Verify that definitive root cause analyses are accomplished for operational problems, and corrective actions are appropriate. Where necessary, verify that the engineering support staff participates with

the plant operating staff to accomplish definitive root cause analyses of operational events or to review nonconforming conditions or conditions adverse to quality.

g. Verify, on a sample basis, engineers and craftsmen who are responsible for installation and testing of system and components have appropriate knowledge and skills.

04.03 References

a. 10 CFR 50, Appendix A, GDC 17.

b. 10 CFR 50, Appendix A, GDC 18.

c. 10 CFR 50, Appendix B, Criterion III and XI.

d. "Prioritization of an Electrical Inspection," dated September 1989 (NUDOCS Accession No. 8910120077), Mr. W. V. Johnston, Deputy Director, Division of Reactor Safety, Region I.

e. NRC Branch Technical Position PSB-1, "Adequacy of Station Electrical Distribution Voltages." [Based on NRC Multiple Plant Action (MPA) B-48.]

f. Plant Technical Specifications and FSAR.

g. NUREG-0800, Standard Review Plan.

2515/107-05 INSPECTION GUIDANCE

For this inspection, a vertical slice sample from the existing EDS design will be evaluated, as well as corrective actions associated with operational events of an electrical nature and modifications to the electrical system since receipt of the operating license. The size and scope of the inspection sample may be adjusted for each facility as determined necessary. This inspection is intended to focus on elements of the EDS which plant experience and PRA indicate are of higher risk to safety, and which will generate information sufficient to reach specific conclusions which are indicative of the functionality of the electrical distribution and the E&TS capability of the licensee.

05.01 Inspection Scope

The inspection should sample representative electrical attributes at each voltage level of the ac and dc safety-related and nonsafety-related electrical distribution system in load paths that power the ESF loads from all available power sources. Such power sources would include the unit generator, the offsite power supply, the onsite ac emergency power supply, and the station direct current (dc) system including the Class 1E batteries, inverters and chargers. The inspection team should evaluate on a sample basis the design, design changes, operation, maintenance and surveillance of the as-configured electrical distribution system including modifications made since receipt of the operating license.

The team should also review the validity of the root cause analyses of selected operational problems and the effectiveness of the associated corrective actions implemented, the disposition of nonconformances and conditions adverse to quality and the effectiveness of the interface between the engineering, plant operating and support staffs. Verify that the plant staff has been trained regarding the interface control procedures.

The team leader should establish the scope of the inspection by selecting one or more load paths from the various sources of electrical power (i.e., the switchyard, the unit generator and the EDGs for the ac system and the batteries, inverter and charger for the dc system) to the driven loads at each voltage level. In selecting a sample load path or sample electrical loads, the team leader should review the inspection and performance history in the electrical area for the facility including past failures and known weaknesses and the potential contribution of the load or load path to the probability for core melt. Consideration should be given to selecting load paths containing EDS support equipment (such as HVAC systems involved with EDS and service water cooling components for EDS).

05.02 Inspection Specifics

This inspection has two components, a design inspection typically conducted in the engineering offices of the licensee and a concurrently conducted site inspection. This TI is structured to have additional optional technical attributes that can be included in this inspection based on a knowledge of the performance and prior inspection history of the facility being inspected.

a. Engineering Office Inspection

For the selected load path(s) the inspection team should perform an in-depth evaluation of engineering and design aspects of the actual as-built configuration of the ac and dc electrical distribution system and associated components. This review should include the inspection of modifications made to the facility since receipt of the operating license. The review should also address the adequacy of the original design to the extent necessary to evaluate the adequacy of the existing as-built design. The engineering office inspection should selectively review the following design attributes and considerations as applicable for equipment in each load path or for the modifications selected:

1. Regulatory requirements and licensing commitments have been implemented and the EDS will perform its intended safety functions.

2. Adequacy of the size and the rating of electrical equipment in the selected sample load path which may include motors, breakers, fuses, contactors, motor control centers (MCCs), load break switches, cables, buses, transformers, penetrations, EDGs, batteries, inverters, chargers, capacitors, resistors and thermal overload heaters.

3. Adequacy of the load study, voltage profiles, voltage drop calculations, motor starting study, load shedding, ESF bus load sequencing and overload trip settings for ESF loads including

consideration of steady state and accident transient loads, acceleration of the loads during degraded voltage conditions that may occur during various modes of plant operation and accident mitigation scenarios.

4. Adequacy of the calculations for the EDG loading and load sequencing.

5. Adequacy of short circuit calculations, design of protective relay logic and relay setting calculations, grounding calculations and schemes, and protective device coordination studies.

6. Redundancy and conformance with the single failure criterion, including the potential for "sneak circuits" that could compromise single failure capability.

7. Electrical separation of redundant Class 1E electrical divisions and non-Class 1E and Class 1E loads, as applicable, including electrical isolation of associated circuits.

8. Proper control logic for system actuation and operation including interlocking and permissives for protection, indication, annunciation, and for correct manual and automatic operation of the safety systems during normal and abnormal conditions of the plant. Accurate translation of control and interlocking logic into electrical elementary diagrams using relays, solid state modules and programmable controllers.

9. Correctly chosen setpoints for overcurrent protective relays 1) to assure proper breaker coordination between different voltage levels; 2) to prevent exceeding the vendor specified thermal limits on motors, containment electrical penetrations and cable insulation systems; 3) to allow starting of electrical equipment under degraded voltage conditions; and 4) to provide adequate pre-trip alarms, when applicable.

10. Adequacy of setpoints and time delays for other protective relays for attributes such as under-voltage, under-frequency, reverse power, ground faults, differential current, thermal overload and phase synchronization to assure functionality of the EDS.

11. Mechanical loads, such as pump horsepower, correspond to actual system operating points during normal and accident conditions and have been correctly translated to electrical loads and incorporated in the electrical load list as appropriate.

12. EDS supporting systems, such as the EDG air start, cooling water, fuel oil storage and transfer, and HVAC for electrical equipment rooms, are adequately designed to perform both normal and accident functions.

13. Adequacy of switchyard design and availability and adequacy of independent preferred power sources, including bus transfers, and independence between onsite and offsite distribution systems.

14. The accuracy of the electrical load list by reviewing several large electrical loads and evaluating whether the actual steady state power requirements during various normal operating and accident mitigation modes are adequate.

15. The adequacy of root cause analyses, associated corrective actions and 10 CFR 50.59 evaluations by selecting several LERs, NCRs or corrective action requests and temporary modifications related to the EDS. Assess the adequacy of the involvement of the engineering organization with the operating staff in problem solving and in the interpretation of surveillance and test data.

16. The involvement of the engineering staff in the specification of post-modification testing and the development of test acceptance criteria for the modifications inspected.

17. Electrical load growth monitoring and control program.

18. Setpoint calculation and control programs.

19. Procurement specifications, environmental conditions, and other applicable design documents to assess FSAR compliance and other design commitments implementation.

In addition to the above design attributes, the following supplementary attributes may be reviewed as determined by the team leader and as time allows.

20. Dedication of commercial grade components for use in safety-related applications and non-like-for-like replacements to assure that the appropriate critical variable ranges have been preserved.

21. Adequate incorporation of the design bases and operating limitations in normal and emergency operating procedures and adequate training of the staff.

22. Provisions for indication of bypass and inoperable status, and requirements for annunciation and the operator actions following annunciation.

23. The functional requirements of EDS support systems and verification that these have been correctly translated to logic and elementary wiring diagrams.

24. Engineering calculation performance and control program.

25. Licensee self assessment programs, including QA audits.

26. Design modifications and temporary modifications control programs.

b. On Site Inspection

To complement the engineering inspection efforts, a site inspection should be performed to evaluate the adequacy and effectiveness of the following attributes and their implementation for the load paths selected for review as part of the engineering review described in Section 05.02.a.

1. Field validation of the existing configuration of the EDS to ensure the EDS is in agreement with the facility drawings and documents such as the Q-list, setpoint list, and equipment location drawings. Verify that appropriate physical separation has been maintained between redundant Class 1E electrical divisions and that no obvious problems exist for internal plant hazards such as Seismic II over I, seismic interactions, high and medium energy line breaks, and compartment flooding.

2. Material condition of electrical equipment.

3. Surveillance and testing were properly performed by the licensee to validate key attributes and parameters such as, protective relay settings, setting of timers, breaker trip settings, EDG load sequencing and starting logic, fuse and thermal overload sizes, and Class 1E battery capacity, to assure the functionality of the EDS. Surveillance and test intervals used by the licensee are consistent with those assumed in setpoint calculations, and are performed at the appropriate intervals.

4. With respect to E&TS capability, the inspection team should review work orders, maintenance requests and temporary modifications. Evaluate whether inadvertent design changes have been made through maintenance activities, and whether definitive root cause analysis is being performed for failed components or components that have recurrent problems. Determine whether temporary modifications have received an appropriate 10 CFR 50.59 review.

5. Post-modification testing is adequate to verify functionality of the component or system and to verify the design objectives of the modification(s).

6. Engineering involvement (e.g., as indicated by documentation) is adequate for station generated activities such as surveillance, maintenance, temporary modifications, procurement efforts, field initiated design changes, setpoint control program, and generation and implementation of calibration and surveillance procedures.

7. The effectiveness of the licensee's self assessment programs, including QA audits of engineering and EDS areas.

In addition to the above attributes, the following supplementary attributes may be reviewed as determined by the team leader and as time allows.

8. To the extent appropriate, determine whether the station normal and emergency operating procedures include any design assumptions regarding operator action and conversely whether prescribed operator actions with respect to the EDS can put the plant outside its design basis.

9. The maintenance program is adequate to maintain the EDS equipment operable, and to maintain the EQ status of the EDS equipment.

10. Temporary modifications to the safety systems are tracked and controlled and receive the required technical evaluation in a timely manner. Review the temporary modification documentation and tracking system.

11. Controlled copies of the control room drawings and other operation and training related documents reflect the as-built configuration of plant systems including modifications.

12. Review the material history of selected load path equipment to determine if component reliability matches that assumed for design basis or for PRA.

13. Verify, on a sample basis, that engineers and craftsmen who are responsible for installation and testing have appropriate knowledge and skills.

05.03 Results and Conclusions

The results of the inspection should provide a reasonable basis for the team to draw overall conclusions regarding the ability of the EDS to perform its intended function, adequacy of E&TS, the ability of the licensee to manage and control the plant configuration, and the interface between the engineering and the plant operating staff. Specific conclusions also should be drawn regarding:

a. The ability of the existing configuration of the EDS to provide quality power to ensure that the safe shutdown and accident mitigation functions can be accomplished on demand.

b. The degree to which diagrams, specifications, calculations, "Q" lists, engineering and plant procedures, and drawings are complete, consistent, technically adequate, conservative with adequate margins, reflect as-built configuration, are controlled, and provide an adequate basis for future design modifications.

c. The degree to which the existing EDS configuration is in compliance with regulatory requirements and licensing commitments.

d. The adequacy of surveillance and test procedures and their implementation for electrical components.

e. The effectiveness of the licensee's self assessment programs in the areas inspected.

f. The effectiveness of the licensee's training programs in the areas inspected.

2515/107-06 CONDUCTING THE TEAM INSPECTION

Prior to the inspection, the team will visit the licensee's design offices and plant site for approximately 3 days to review the availability of design documentation and gather information. The team inspection cycle will generally be of 5 weeks duration, with the team leader taking an additional 2 weeks to administratively coordinate the inspection with the regional office, the licensee and the consultants, gather technical information, and distribute it to the inspection team. The inspection report should be issued 6 weeks after the exit meeting. The 5 weeks of the team effort should typically consist of:

Week 1 - In office preparation for the site and engineering inspections.
Week 2 - Inspection at the site and at the licensee's corporate offices.
Week 3 - In office review.
Week 4 - Inspection at the site and at the licensee's corporate office and exit meeting.
Week 5 - Preparation of report inputs for the team leader.

The entire team should be onsite for the entrance meeting. Following the entrance meeting, a system walkdown should be performed by all team members.

Generally, the inspection team will be composed of the following six members:

a. One team leader
b. Two electrical power system design engineers
c. One mechanical systems design engineer
d. Two electrical field inspectors

However, the size of the team must be adjusted to accommodate the scope of the inspection and may vary from site-to-site based on the licensee's inspection and performance history in the electrical area for a given facility, and also based on input from NRR and regional management.

The team composition and the extent of effort for individual members may be adjusted by the team leader. The team composition will generally consist of consultants as well as regional and headquarters staff members. Except for several pilot inspections that will be led by headquarters, all inspections per this TI will be conducted by the regional staff with help in the design area from NRR/DRIS supplied consultants. It is anticipated that the surveillance testing, maintenance and operational portion of this inspection will be conducted by regional inspectors. This does not preclude the use of regional inspectors during the design phase if they have the appropriate technical background. Each of the three design engineers should have extensive nuclear power plant design experience, preferably comparable to the experience gained through previous employment with an architect/engineering firm in a supervisory capacity.

All team members should be familiar with the site organizations and types of documents used on site to be able to identify design information and assumptions that should be captured in documents related to plant operations, maintenance, surveillance and test activities. In addition, each team member should have a sound appreciation of integrated plant operations, maintenance, testing, surveillance activities and quality assurance, as well as a fundamental understanding of the plant's design bases and design considerations,

so that the inspectors will be able to relate their findings to the functionality of the plant safety systems during both normal operations and postulated accident scenarios.

In general, the NRR project manager for the plant will be involved with each inspection to the following extent:

- be available to facilitate interactions between the team leader and licensee contacts
- attend pre-exit and exit meetings

SES level managers from both the region and headquarters will normally attend the pre-exit and exit meetings.

2515/107-07 INSPECTION TASKS

07.01 Team Leader Preparation

At least 1 month before the inspection, the team leader should discuss the following items with the licensee staff. (The general schedules and scope of the inspection should be announced to the licensee 3 to 6 months in advance if possible.)

a. Detailed inspection scope and schedule.

b. Number of participants on the team and office space and communication equipment requirements.

c. Documents to be made available for the inspection.

d. Scope of licensee personnel involvement and licensee's organization charts to help identify the licensee's principal contacts and participating discipline contacts.

e. Advance arrangements for plant site access, including radiation protection training, security, and fitness for duty requirements, to avoid unnecessary delays.

f. The need for advance copies of identified review materials, such as the licensee's engineering office organization, station one-line and three-line wiring diagrams, selected P&IDs, logic diagrams, elementary wiring diagrams, significant modification packages related to the EDS or to the fluid systems that could impact the EDS, and engineering calculations, procedures and guidelines related to the design and design change control process.

g. The licensee should be requested to provide a presentation following the entrance meeting. The licensee should be advised that their presentation should as a minimum address the following:

    1. Licensee's organization charts, clearly showing responsibility, accountability and flow of authority.

    2. Station ac and dc distribution system arrangements.

    3. Interlocks and ties to various offsite and onsite power sources.

4. Transfer capability of the systems following the loss of normal sources.

5. Specific regulatory commitments, if they are unique in nature.

6. Licensee's in-house programs for load growth, modification control, setpoint control, etc.

7. Licensee's in-house monitoring and self assessment programs, if any.

8. Functional information on a fluid system(s) of interest identified by the team leader.

07.02 Inspection Preparation

In preparation for the inspection the inspection team should review and fully understand the goals and scope of the inspection. The team should be familiar with the design bases, design criteria and licensing commitments, the safety evaluation reports, and the electrical distribution scheme in general. During the preparation phase, the team members should prepare a draft list of items such as calculations, analyses, drawings, procurement specifications, test reports, modification packages, and maintenance, surveillance and test procedures which they would like to review. Their requests for such documents will be verbally provided to the licensee in advance of the inspection.

In addition, the team leader should discuss with the Electrical Systems Branch of NRR the status of any current electrical issues at the planned inspection site.

07.03 Entrance Meeting

During the entrance meeting, the team leader will describe the scope of the inspection and present the schedule for the inspection, the plant walk down, the exit meeting and the daily briefing meeting with the licensee. The team leader will also introduce the inspection team members to the licensee's staff. Other logistical considerations relating to working hours and admission of team members to the office facility before and after normal working hours will also be discussed. In addition, the licensee should be prepared to make a presentation on the electrical system as detailed in Section 07.01.g.

07.04 Exit Meeting

At the conclusion of the inspection, issues and findings should be formulated for presentation to the licensee during the exit meeting. The exit meeting should include a brief discussion of the inspection findings. However, as with all exit meetings, the licensee should be reminded that the findings are preliminary until reviewed by NRC management and the inspection report is issued.

07.05 Report Preparation

To facilitate prompt report issuance, team members should document observed strengths and weaknesses and specific technical deficiencies as they become apparent during the inspection. Copies of such documentation should be made available to the team leader at frequent intervals during the inspection.

The final report should document the elements reviewed, licensee strengths and weaknesses, and safety significance of any deficiencies and their regulatory basis. The report should also contain an overall summary, conclusions drawn, references, and a list of the persons contacted (see Exhibit 1 for a typical report outline). An appendix should be provided for each report that identifies each finding, the description of the finding, the technical requirements, safety significance and associated references. This appendix provides a summary for each finding so that the concerns are clearly identified for licensee resolution, regional followup to the findings is assisted, and DRIS can more readily collate the technical issues for further internal or external distribution (see Exhibit 2 for a typical finding description).

A copy of each EDSFI report should be sent to the Chief, Special Inspection Branch, NRR (OWFN 9-A-1).

07.06 Followup

Any unresolved findings identified during the inspection will be appropriately tracked and resolved by the NRC regional office. For complex issues, appropriate headquarters or contractor personnel can also be utilized to participate in the followup. To facilitate identification of items requiring followup, a conference call involving regional management and headquarters project and technical management should be held with the team leader within one week following the exit meeting. Any items requiring immediate regulatory followup should be identified at this time.

2515/107-08 COMPLETION SCHEDULE

This team inspection will commence following the completion of the maintenance team inspections. It is anticipated that most of the EDSFIs TI will be initiated by FY 91 and completed in early FY 93. Since these inspections are particularly resource intensive regarding electrical design specialists, their performance will require close coordination with headquarters staff. The Special Inspection Branch (RSIB) of the Division of Reactor Inspection and Safeguards (DRIS) is responsible for arranging for contractor resources and for monitoring and providing the technical oversight for this TI.

2515/107-09 EXPIRATION

This temporary instruction will remain in effect until November 1, 1992.

2515/107-10 NRR TECHNICAL CONTACT

Any questions regarding this temporary instruction should be addressed to E. V. Imbro, FTS (301) 492-0954 or S. V. Athavale FTS (301) 492-0974. Requests for contractor support should be made directly to DRIS via memorandum.

2515/107-11 STATISTICAL DATA REPORTING

For RITS input, the actual inspection effort should be recorded against 2515/107. At the discretion of the team leader and regional management, credit may be taken for completion of appropriate core modules on the basis of the efforts expended on this TI.

2515/107-12 ORIGINATING ORGANIZATION INFORMATION

12.01 Organization Responsibilities

The Special Inspection Branch (RSIB) of the Division of Reactor Inspections and Safeguards (DRIS), NRR will provide support and overall guidance for these inspections.

12.02 Estimated Resources

Prior to the inspection, the team will visit the licensee's design offices and plant site for approximately 3 days (4 staff weeks) to gather information for the inspection team. Each inspection is planned for about 5 weeks for 6 persons with 2 of the 5 weeks being direct inspection by the team at the licensee office and at plant site (12 staff weeks), 1 week office review (6 staff weeks), 1 week each for office preparation and report writing (12 staff weeks), and 1 week for team leader preparation, and 5 additional weeks for the team leader to issue the final report (6 staff weeks) and 1 week of inspection coordinator support for staff briefing, participation in the final exit meeting and for guiding the team leader when necessary during the entire inspection process (1 staff week). Thus the total resources required for activities directly related to the performance of inspection is approximately 41 staff weeks per site. For MIPS planning purposes, 360 hours of direct inspection hours are used for NRC personnel, exclusive of contractor assistance.

Normally not more than three team members will be contractors, accounting for 11 to 16 of the 41 staff weeks per inspection. For the planning purposes of team members, a 6 week cycle is assumed. To complete all sites in two years, five teams would be required to function simultaneously and would need to draw on a pool of between 15 to 20 contractor engineers, primarily with electrical power systems design background.

Team leaders, it is assumed, will function on a 12 week cycle. Therefore a minimum of 10 to 12 team leaders will be required nationwide to complete this TI in a two year period.

12.03 Inspection Implementation Latitude

The expectation is that this TI will be performed at essentially every site and that the inspection requirements identified in Sections 04.01 and 04.02 will be accomplished. A regional evaluation, that has been approved at the regional division director level and that has received concurrence by the Director, Program Management, Policy Development and Analysis Staff, may conclude that the inspection scope requirements can be reduced or that the inspection can be waived for unique situations. These options are envisioned if indepth inspections had recently been performed in the areas addressed by the TI.

12.04 Program Effectiveness Review

There will be a planned hiatus of inspection activity associated with this TI during the month of September 1991. That will allow for feedback of regional experience with the TI implementation and to revise the TI approach as needed. DRIS will coordinate this evolution with the regional offices.

END

Enclosure 1: Typical EDSFI report Outline
Enclosure 2: Sample Finding Summary for Appendix A

EXHIBIT 1

TYPICAL EDSFI REPORT OUTLINE

EXECUTIVE SUMMARY

1.0 INTRODUCTION

2.0 ELECTRICAL SYSTEMS

- 2.1 Class 1E 4160 Volt AC System
- 2.2 Class 1E 480 Volt System
- 2.3 Class 1E 125 Volt DC and 125 Volt AC System
- 2.x (others as needed)
- 2.4 Conclusions

3.0 MECHANICAL SYSTEMS

- 3.1 EDG Support Systems
- 3.2 HVAC System
- 3.x (others as needed)
- 3.4 Conclusions

4.0 EDS EQUIPMENT

- 4.1 Equipment Walkdowns
- 4.2 Equipment Modifications
- 4.3 Equipment Testing and Calibration
- 4.x (others as needed)
- 4.4 Conclusions

5.0 ENGINEERING AND TECHNICAL SUPPORT

- 5.1 Organization and Key Staff
- 5.2 Root Cause Analysis and Corrective Actions
- 5.3 Engineering Involvement in Operations
- 5.4 Self Assessment and Training
- 5.x (others as needed)
- 5.5 Conclusions

6.0 GENERAL CONCLUSIONS

Appendix A - Findings
Appendix B - Personnel Contacted

EXHIBIT 2

SAMPLE FINDING SUMMARY FOR APPENDIX A

FINDING: Emergency Diesel Generator Load Sequencer Timers
(Section 2.1 of report)

DESCRIPTION:

The engineering calculations presumed the load sequencer timers would operate at fixed times. In actuality the timers would operate within a band around the setpoint. The licensee initiated a review of the calculations with respect to the timer tolerances to assure the EDG will not be overloaded.

TECHNICAL REQUIREMENTS:

Calculations E-192 Revision 3 and 12210-1A-SWP-23

SAFETY SIGNIFICANCE:

A potential exists for overlapping starting sequence loads which was not analyzed. This could overload the EDG.