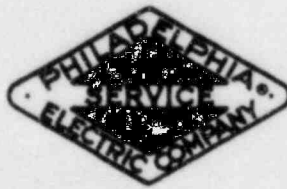


PROGRAM PLAN

INDEPENDENT DESIGN REVIEW OF LIMERICK GENERATING STATION UNIT NO. 1 CORE SPRAY SYSTEM

PREPARED FOR



PHILADELPHIA ELECTRIC COMPANY

MAY 7, 1984

Revision A



TORREY
PINES
TECHNOLOGY

A Division of GA Technologies Inc.

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1. SUMMARY

This program plan has been developed for an independent design review of the core spray system for the Limerick Generating Station Unit No. 1. This program will be performed by Torrey Pines Technology, a division of GA Technologies Inc., for Philadelphia Electric Company. The program is divided into six tasks as follows:

- Task A Design Procedure Review
- Task B Design Procedure Implementation Review
- Task C Technical Review
- Task D Physical Verification Walkdown
- Task E Processing of Potential Findings
- Task F Administrative and Reporting

GA Technologies, through its Torrey Pines Technology Division, is eminently qualified to perform this evaluation for Philadelphia Electric Company (PECO). We operate under the first NRC-approved quality assurance program. We have available the significant expertise in both quality assurance and design required to review in detail the Limerick Unit 1 core spray system, starting with a review of the design procedures and their implementation, through a review of the technical design aspects of this system, and a physical verification.

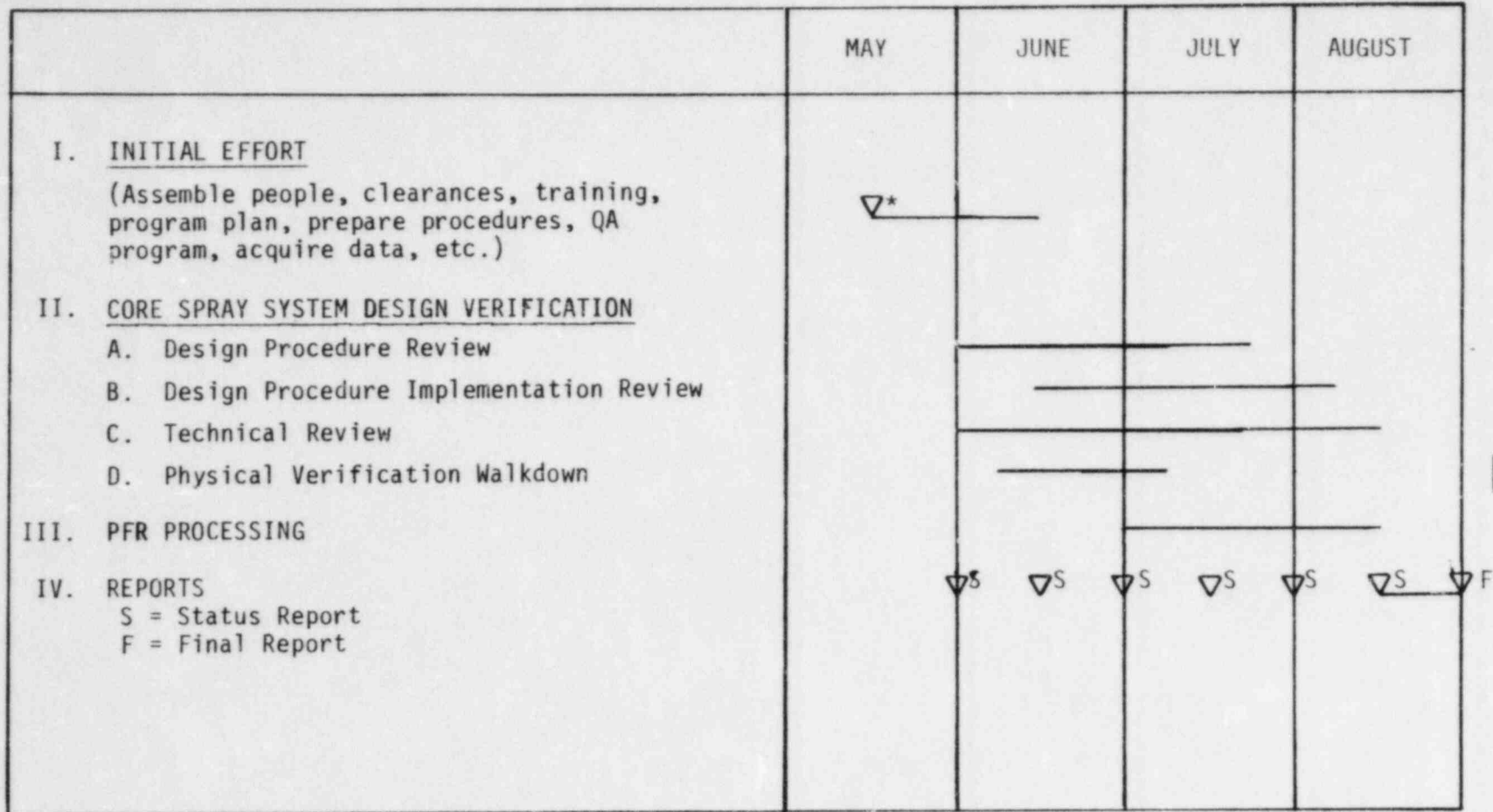
GA Technologies Inc. has obtained less than 2% of its revenue for the last two years from PECO and from its contractors for Limerick Unit 1. The individuals assigned to this program are free from conflict of interest. Key project personnel cannot have worked on Limerick design or construction currently or within the past three years. Project personnel must not have a family member employed by PECO, a cumulative ownership and creditor interest in PECO which exceeds 5% of their gross family annual income or be active on any other current PECO plant or PECO work.

The independent review is scheduled to be completed in August 1984, assuming this program plan is approved by May 15. The summary schedule for this work is shown in Figure 1.

The core spray system work performed prior to February 1, 1984, is the basis for the review.

Proposed Schedule for PECO Independent Design Review

1-3



* Program Plan Approved

Figure 1

2. TASK DESCRIPTIONS

The purpose of this program is to conduct an independent review of the Limerick Unit 1 core spray system from NRC approved design basis to final design documents and system installation. The program will review the design process of the major suppliers, Bechtel and GE.

The program is structured to verify that the design process converted the design basis specified in the FSAR into design documents, and selected system components were installed in accordance with these documents. The detailed description of the tasks included in this program are in the following subsections.

TASK A - DESIGN PROCEDURE REVIEW

Objective

To verify compliance of design procedures and controls with the NRC-approved QA section of the PSAR or to 10CFR-Part 50, Appendix B. The procedures and controls used by PECO, GE, Bechtel will be reviewed.

Subtasks

- A1 Prepare a procedure and checklist to accomplish the evaluation described herein.
- A2 Provide a detailed description of the complete structure of the design control procedures applicable to the core spray system design work performed by PECO, GE and Bechtel. This description will include a comprehensive list of all relevant procedures including the procedures for handling site originated change requests.

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In carrying out this work item, it will be assumed that the major core spray system effort was performed by PECO, GE and Bechtel.

- A3 Obtain (or use on-site) copies of PECO, GE and Bechtel procedures identified in A2.

The initial collection of procedures will include only currently applicable revisions.

- A4 Determine if Bechtel procedures used for Limerick Unit 1 are essentially the same as the procedures used for either the San Onofre or Palo Verde plants.

1. If it is determined that the same procedures were used, then no further review of the Bechtel procedures will be performed.
2. If the titles and revisions of any of the Bechtel procedures are different from those used either on San Onofre or Palo Verde, then the principal aspects, in terms of the "who," "what," "when," and "how," and the controls described in each will be compared to identify differences, if any, in the approaches taken on the Limerick Unit 1 project versus the San Onofre or Palo Verde projects.
 - a) If the principal aspects of the controls are basically the same, then no further review of the Bechtel procedures will be performed and the results of the previous TPT reviews will be used as the basis for this review.
 - b) If the principal aspects of the controls described in the Bechtel procedures for PECO appear to contain basic differences from that described in either the comparable San Onofre or Palo Verde procedures, then the affected

Bechtel procedures will be reviewed in detail for compliance with PSAR commitments and NRC requirements (per A5).

- A5 Review all current procedures, as of February 1, 1984, affecting the core spray system design work for conformance to the commitments in the PSAR (except as modified for Bechtel per A4).
- A6 Review selected design control procedure revisions applicable in time periods other than those covered in A5 for compliance to the applicable PSAR, per A5.
- A7 Summarize the design procedure review, including any Potential Findings. This information will be included in the reports of Task F.

Milestones

	Dates
A1 Procedure and Checklist	5/30/84
A2 Complete Procedure Structure	6/15/84
A3 Access PECO, GE and Bechtel Procedures	6/15/84
A4 Review Bechtel Procedures	7/05/84
A5 Review PECO and GE Procedures	7/05/84
A6 Review Selected Procedures from Previous Time Periods	7/10/84
A7 Summarize Results	7/24/84

TASK B - DESIGN PROCEDURE IMPLEMENTATION REVIEW

Objective

To evaluate, through a sample of core spray system design documents, compliance with the design procedures and controls identified in Task A.

Subtasks

- B1 Prepare procedure and checklist to accomplish the evaluation described herein.
- B2 Select the design documents to be reviewed for compliance with the procedures. The selection of documents for review will be based on the following criteria:
 - 1. All documents reviewed in Task C will be included.
 - 2. Additional design documents for the core spray system shall be selected for other Quality Class I or II items from the Equipment Classification List in the FSAR.
 - 3. The selection shall include work by PECO, if any, GE and Bechtel.
 - 4. The selection shall include design documents such as calculations, drawings, specifications, memos, change notices, computer code verification reports. The selection will also include field initiated design change requests submitted to the home office. | A
 - 5. The selection shall include work which spans the calendar period of the design effort, and which covers all phases of the design process done prior to February 1, 1984.

- B3 Locate pertinent design documents.
- B4 Evaluate implementation of design procedures identified in Task A by reviewing design documents to determine if the design procedures have been properly implemented and the design documents properly controlled. | A
- B5 Summarize the review work for inclusion in the reports of Task F.

Milestones

	Dates
B1 Procedure and Checklist	5/30/84
B2 Selection of Design Documents	6/15/84
B3 Location of Design Documents	7/01/84
B4 Review Design Documents	7/27/84
B5 Summarize Results	8/10/84

TASK C - TECHNICAL REVIEW

The objective of this task is to review the structural, mechanical and electrical design of a selected portion of the core spray system to assure that the system design is adequate to perform its intended function. This will include review to assure that the design is in compliance with NRC approved design bases and methodologies as given in the FSAR.

- C1 Prepare specific procedures and evaluation criteria for the design review using ANSI N.45.2.11, Section 6.3.1 criteria for guidance.

The procedures will selectively address the following as they apply to each subtask:

- o Adequacy of design specification
- o Applied loads
- o Mathematical model used for analysis
- o Input to analysis
- o Validation of computer code used
- o Output of analysis
- o Calculations showing compliance with approved standards.

- C2 Prepare a design chain for major structures and components to identify major design organizations and interfaces.

- C3 Select the system features to be reviewed based on the following criteria:

- o The system features shall include safety-related mechanical components, controls, electrical, piping and process design.

- o Features which have design interfaces between the various major design organizations shall be included.
 - o Features selected shall be representative of safety-related portions of the system.
 - o A range of design methods shall be covered.
- C4 Obtain current design documentation from PECO, GE and Bechtel and perform review.

The review will be conducted in five major disciplines.

a. Structural Review

The structural review will address the structural adequacy of the piping, pipe supports and pump support. One pump support and one representative pipe hanger will be reviewed in detail to determine their adequacy to properly restrain the equipment for all appropriate FSAR criteria.

Confirm that high and/or moderate energy line breaks that originate in the core spray system have been identified and used as design inputs as appropriate. The consequences with respect to surrounding hardware from jet spray and/or pipe whip of a postulated core spray system pipe break will also be evaluated. In addition, confirm that high and moderate energy line breaks from other systems have been properly considered in the core spray system design.

The structural adequacy of a selected core spray equipment cell water tight door to withstand external flooding will be evaluated.

b. Instrumentation and Controls Review

Instrumentation and controls, including control logic diagrams, will be reviewed to confirm that the core spray system can be configured to operate properly in both normal and accident modes of operation.

c. Mechanical Review

The design of the core spray system will be reviewed to confirm operational capability to function appropriately under both normal and accident conditions. The review will consider both the mechanical and hydraulic characteristics/capabilities to provide assurance of the system adequacy.

d. Electrical Review

The electrical design of the core spray system will be reviewed to confirm that the supply of electrical power, under both normal and accident conditions, will permit proper operation of the system.

e. Fluid System Review

The core spray system review will address the adequacy of the overall system to meet the basic functional requirements for the system. Capacities, temperatures and pressures will be reviewed.

- C5 Identify need for independent analysis with different analytical models and computer codes than those used by PECO, if any, and by GE or Bechtel. Independent analysis shall be done if one of the following situations arises:

- o The analytical output cannot be adequately judged based on ANSI N.45.2.11, Section 6.3.1.
 - o The method of analysis does not appear reasonable.
 - o The impact of a Potential Finding cannot be ascertained.
- C6 Summarize the technical review work for inclusion in the reports of Task F.
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Milestones

	Dates
C1 Review Procedures and Criteria	5/30/84
C2 Prepare Design Chain	6/08/84
C3 Feature Selections	On-going
C4 Design Review	8/10/84
C5 Identify Need for Independent Analysis	7/27/84
C6 Summarize Results	8/17/84

TASK D - PHYSICAL VERIFICATION WALKDOWN

Objective

To determine that the physical installation of selected portions of the core spray system conform to the requirements of design drawings and specifications.

Subtasks

- D1 Prepare procedures for each unique type of walkdown or inspection. Collectively these procedures will address the following as they apply to each feature:
 - o Installation of components in accordance with design documents.
 - o Installation of core spray system in accordance with P&I diagrams.
 - o Installation of piping in accordance with drawings and isometrics.
 - o Agreement between component functional rating, as given on nameplates, with design requirements, as given in corresponding specification.
 - o Inspection of selected features for compliance with design details.
 - o Equipment part numbers/tag numbers agree with drawings.

- D2 Choose items for physical verification from those features selected for design review under Task C. These will include major components, piping, and pipe supports. Item selection may consider design margin as determined from the design review.

D3 Perform walkdown to verify the adequacy of the installation. The walkdown will visually verify that the selected components, and piping have been installed in proper relative positions. The piping isometric walkdown will dimensionally verify routing and support locations as well as general support arrangement. Selected components and supports will also be inspected to dimensionally verify such details as material sizes, weld types, fasteners, and attachments to the structure.

D4 Summarize results of the work in Task D.

Milestones

	Dates	
D1 Prepare walkdown procedures	5/30/84	A
D2 Choose items for physical verification	6/04/84	
D3 Complete walkdowns	6/27/84	
D4 Summarize results	8/10/84	

TASK E - PROCESSING OF POTENTIAL FINDINGS

Objective

To review and document all Potential Findings identified during the review; to provide for evaluation and classification of the significance of Potential Findings; and to transmit Findings to PECO, GE and Bechtel.

Description

Tasks A, B, C, or D may identify differences between the core spray system design and the design requirements. These differences will be documented in Potential Finding Reports (PFRs). Following the filing of a PFR it is reviewed by the appropriate task leader. The purpose of this review is to determine if the PFR is valid, that is, if it is accurate, well defined and traceable to a specific requirement.

The original design organization constitutes the next level of review. The PFR is sent to the appropriate organization for the same type of accuracy and definition review as was conducted by the task leader. At the same time a copy of the PFR is sent to the PECO representative.

When the PFR is returned from the original design organization, it is sent back to the initiator and the task leader. Based on the information supplied by the design organization, the initiator may modify the PFR or just comment on the organization's response. The task leader can only add his comments. Following this review, the PFR is sent to the Findings Review Committee.

An impact assessment for the Potential Finding is prepared to define the potential for impact on the safety of the plant. The impact assessment and the PFR are then submitted to the Findings Review Committee for evaluation.

This committee is comprised of five senior technical people at GA who have extensive experience and broad knowledge of the design and construction of nuclear power plants. It is the purpose of this committee to evaluate each PFR and classify it according to established criteria.

A Potential Finding is classified as invalid if after the above-described review, the initiator, the task leader, and the original design organization agree that the Potential Finding is inaccurate. In addition, Potential Findings can be classified as invalid if two of the above-identified three reviewers conclude that the Potential Finding is invalid and the Findings Review Committee also decide it lacks validity.

The review procedure will contain criteria for classifying a valid Potential Finding as either a Finding or an Observation. Basically, if a Potential Finding is a deviation that could result in a significant safety hazard, or if there is an indication of a repetitive or generic deviation that could create a significant safety hazard, the Potential Finding is classified as a Finding. Potential Findings that are valid, but that do not satisfy the above criteria for a Finding, are classified as Observations.

The classification of the Potential Finding is reviewed by the Project Manager to determine if the correct procedures have been followed. Subsequently, the Observations and Findings are sent to the PECO representative for resolution. In the case of Findings, a Corrective Action Plan is prepared by PECO and returned for review. This review is to determine if the Corrective Action Plan satisfies the concern expressed in the Finding including identification of the root causes and the extent of the affects of the concern. Each Corrective Action Plan is reviewed by the initiator of the Finding, the task leader, the Findings Review Committee and the GA project manager.

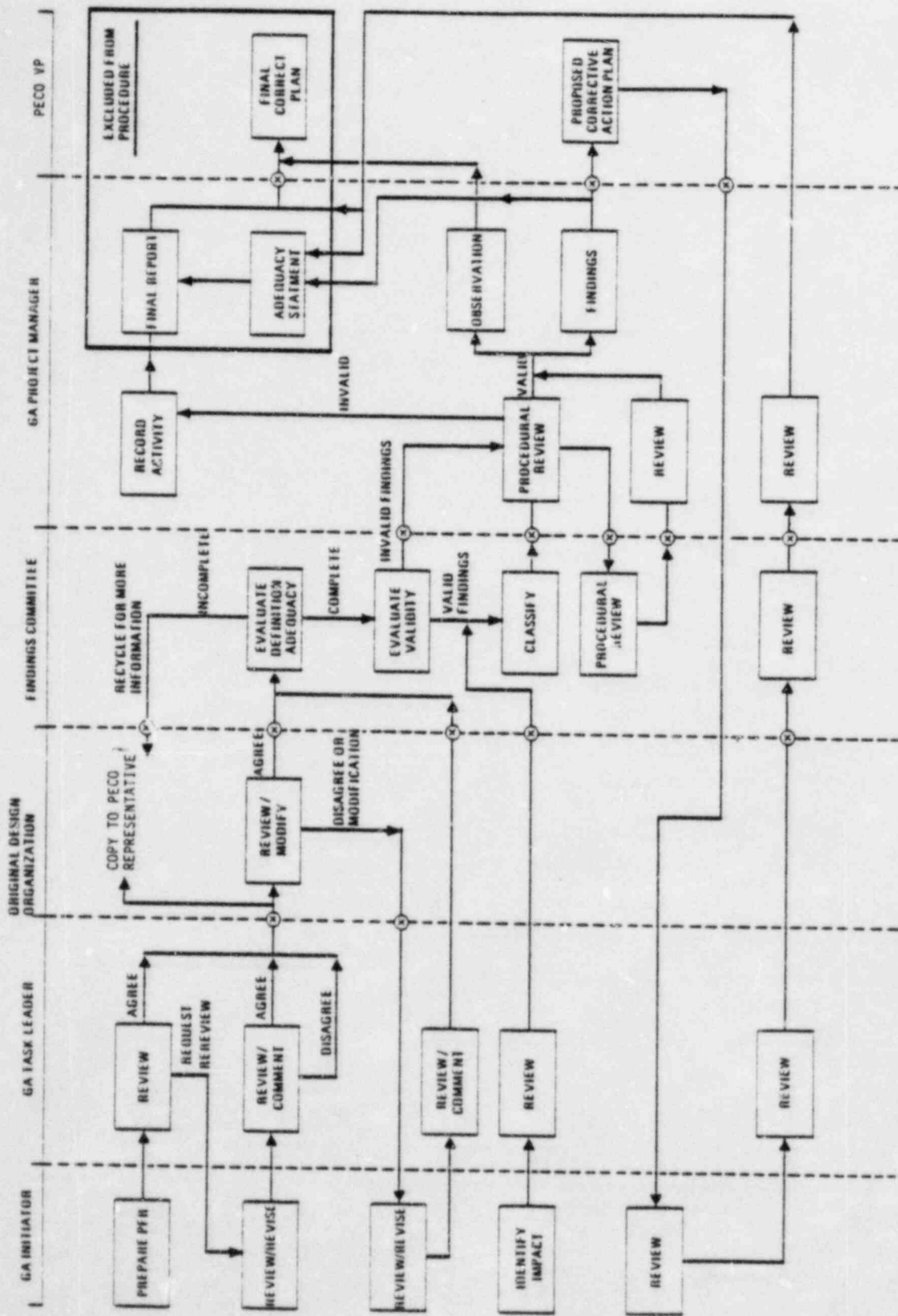
In each step of this review process the comments and information that are added become a permanent part of the PFR. All PFRs will be included in the final program report that is transmitted to PECO and to the NRC.

Subtasks

- E1 Establish a Findings Review Committee. This committee will be composed of senior technical people with broad experience in engineering management.
- E2 The Committee will identify specific criteria for determining the degree of impact that Potential Findings have on the design adequacy of the Limerick Unit 1 core spray system.
- E3 Establish a detailed procedure to process Potential Findings. This procedure will assure that PECO, GE or Bechtel have verified the definition and accuracy of the Potential Finding. The basic process is shown in Figure 2.
- E4 Process PFRs.

Milestones

	Dates
E1 Establish Committee	5/30/84
E2 Define Criteria	5/30/84
E3 Establish Specific Procedure	5/30/84
E4 Process PFRs	On-going



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Procedure for processing Potential Finding Reports

Figure 2 (A)

TASK F - ADMINISTRATIVE AND REPORTING

Objective

Provide administrative and management support for the project. Prepare biweekly status reports, and a final evaluation report on Findings and conclusions with respect to adequacy of the design of the Limerick Unit 1 core spray system. Assure all communication, including reports between TPT, PECO, BPC, and GE meet the NRC protocol for independent reviews.

Subtasks

- F1 Provide management of the design review program and accumulate cost and schedule data.
- F2 Prepare project procedures to assure that the following protocol is met:
 - a. Requests for information may be made directly to the appropriate organization without documentation other than that required for document control and follow-up.
 - b. PFRs, CAPs and clarification of information may go directly between TPT and PECO, BPC and GE. All such exchanges shall be documented for the permanent record and such documentation shall be maintained in a location accessible for NRC examination.
 - c. If TPT wishes to discuss with PECO, GE or BPC substantive matters related to information obtained to provide an interim report to PECO, or to discuss its findings or conclusions with PECO, GE or BPC in advance of completing its report, or if PECO, GE or BPC desires such communication, such discussions shall be accomplished in meetings open to public observation. Advance notice of such meetings

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shall be made to the appropriate participant by the NRC. Transcripts or written meeting minutes of such meetings shall be prepared by the organization requesting the meeting and provided to the NRC in a timely manner. Any portion of such meetings which deals with proprietary information may be closed to the public.

- J. All documents submitted to the NRC subject to this protocol, unless exempt from mandatory public disclosure, will be placed in the NRC Public Document Room near the Limerick site and Washington, D.C. and will be available there for public examination and copying.

- F3 Prepare biweekly status reports on progress of the review effort.

- F4 Compile all Potential Findings, results of the Findings Review Committee, Observations and Findings. Assess the adequacy of the core spray system design and installation.

- F5 Prepare a final report compiling all Potential Findings, Observations, and Findings, including their description, comments, assessments of impact, and results of the Findings Review Committee, the results of the review of PECO Corrective Action Plans, and the final assessment of the adequacy of the design of the Limerick Unit 1 core spray system.

- F6 Issue Final Report.

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Milestones

	Dates	
F1 Management/Cost	Continuous	
F2 Protocol Procedures	6/01/84	A
F3 Complete biweekly status reports	Biweekly	
F4 Complete compilation of information	8/15/84	
F5 Complete final report draft	8/24/84	
F6 Issue final report	8/31/84	

The project organization established for this independent design review is shown in Figure 3.

INDEPENDENT DESIGN REVIEW
LIMERICK UNIT 1 CORE SPRAY SYSTEM
ORGANIZATION

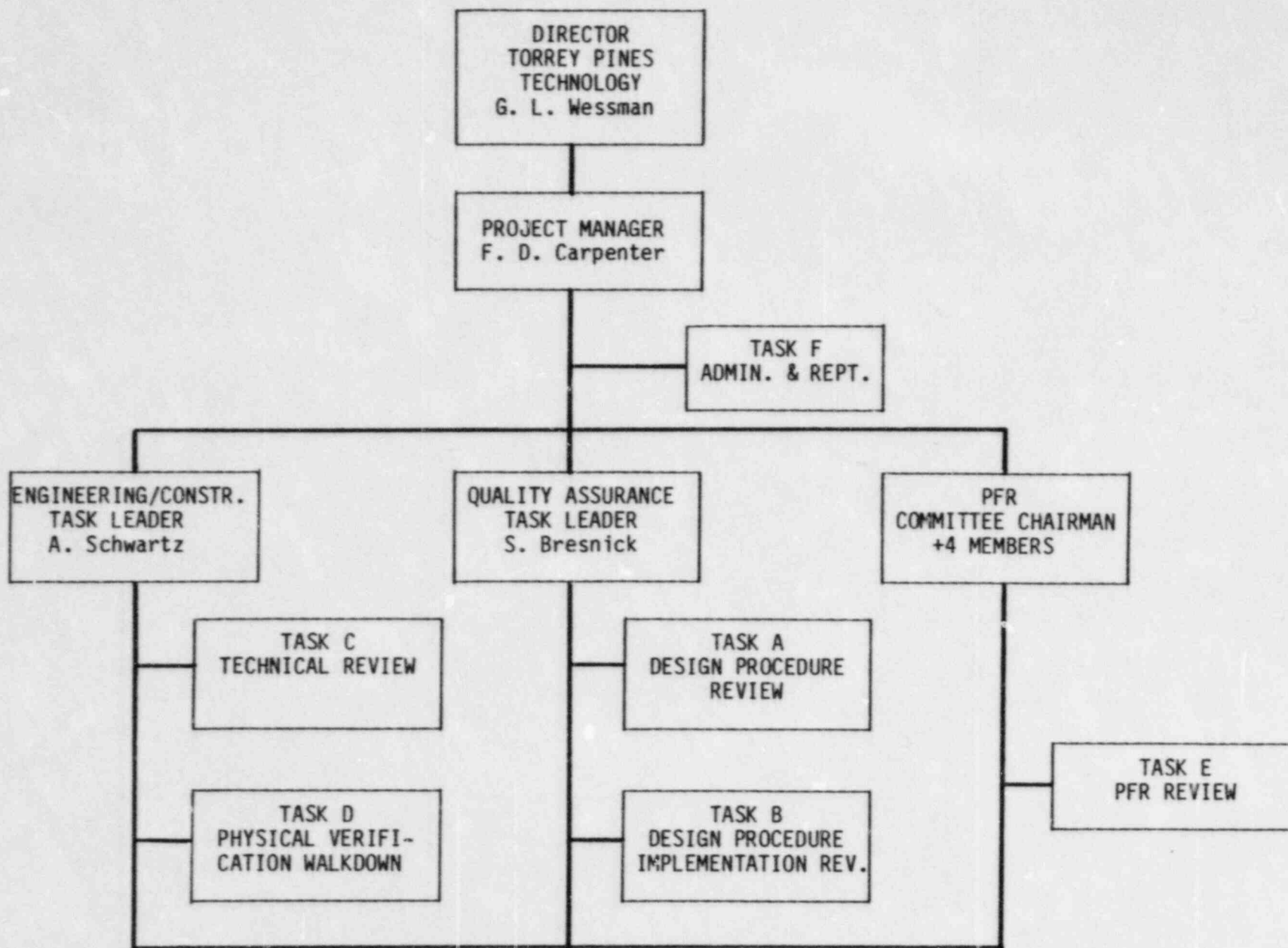


Figure 3



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