

CALVERT CLIFFS NUCLEAR POWER PLANT
UNITS 1 & 2

PLAN
FOR IMPLEMENTATION
OF
SUPPLEMENT 1 TO NUREG-0737,
REQUIREMENTS FOR
EMERGENCY RESPONSE CAPABILITY

April 15, 1983
Revision A
(Initial Issue; Preliminary)

THE BALTIMORE GAS AND ELECTRIC COMPANY

FOREWORD

The NRC issued operating licenses for Calvert Cliffs Unit 1 and Unit 2 in July 1974 and August 1977, respectively. Consequently, BG&E had acquired several years of nuclear power plant operating experience by the time the accident occurred at Three Mile Island Unit 2 on March 28, 1979. During the period immediately following this event BG&E closely followed and, whenever possible, participated in the joint efforts of the NRC and the nuclear utility industry to identify areas in plant design and operation where changes could be made to improve the overall safety and reliability of power plant operations. As a result of these activities, BG&E developed a better appreciation for human factors considerations as they relate to the conduct of operations at a nuclear power plant. To ensure that similar deficiencies did not exist at Calvert Cliffs, BG&E initiated several unilateral programs to improve the design of the Calvert Cliffs control room and the performance of the control room operators. These programs included a human factors-oriented review of the control room, a comparison of accident monitoring instrumentation provided in the control room against the latest regulatory criteria, improved operator and technical support staff training, and negotiations for the procurement of a plant-specific control room simulator. In addition to these early initiatives (which are now in various stages of completion), BG&E implementation of the many plant safety improvements required by the NRC in NUREG-0578 (Recommendations of the Lessons Learned Task Force) and NUREG-0737 is finally nearing completion.

With the recent issuance of Supplement 1 to NUREG-0737, the NRC is requiring all reactor licensees to develop plans for implementing the specific emergency response capability requirements of NUREG-0737; i.e., installation of a safety parameter display system, performance of a detailed control room design review, upgrade of accident monitoring instrumentation, development of symptom-oriented emergency operating facilities, and upgrade of emergency response facilities. The NRC had previously deferred these five NUREG-0737 items for implementation at a later date.

BG&E feels that its previous efforts to improve emergency response capabilities at Calvert Cliffs places the Company in an excellent position to respond to these requirements. Where these early initiatives may deviate slightly in substance from the specific nature of the latest requirements, it is felt that they should be acceptable to the NRC in light of the Generic Letter 82-33 policy statement that allowances will be made for "good faith" work already completed by licensees.

BG&E has established a multi-disciplinary group to oversee the development of an integrated plan and schedule for the implementation of the remaining emergency response capability work items. This report represents a preliminary effort by this group to document the additional work that must be completed to satisfy the requirements of Supplement 1 to NUREG-0737 and to develop an integrated implementation schedule. BG&E submits this document to the NRC for their information and use in evaluating the overall status of our efforts. It is expected that the information contained in this report will be expanded into further in detail as BG&E continues to make refinements to its implementation plans. This additional information will be provided to the NRC as it becomes available for release -- probably in the form of updates or revisions to this report.

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1. <u>INTRODUCTION</u>	1
1.1 Purpose of the Report	1
1.2 Summary of NRC Requirements	1
1.3 Summary of Submittal Requirements	2
1.4 Description of Industry Guidance	4
2. <u>SAFETY PARAMETER DISPAY SYSTEM</u>	6
2.1 NRC Acceptance Criteria	6
2.2 NRC Documentation and Review Requirements	7
2.3 Summary of SPDS Work Elements	7
2.4 Current Status	8
2.5 Implementation Plan	9
3. <u>DETAILED CONROL ROOM DESIGN REVIEW</u>	11
3.1 NRC Acceptance Criteria	11
3.2 NRC Documentation and Review Requirements	12
3.3 Current Status	13
3.4 Implementation Plan for Remaining Tasks	14
4. <u>REGULATORY GUIDE 1.97</u>	16
4.1 NRC Acceptance Criteria	16
4.2 NRC Documentation and Review Requirements	17
4.3 Current Status and Implementation Plan	17
5. <u>EMERGENCY OPERATING PROCEDURES</u>	19
5.1 NRC Acceptance Criteria	19
5.2 NRC Documentation and Review Requirements	19
5.3 Current Status and Implementation Plan	20
6. <u>EMERGENCY RESPONSE FACILITIES</u>	21
6.1 NRC Acceptance Criteria	21
6.2 NRC Documentation and Review Requirements	21
6.3 Current Status and Implementation Plan	22

<u>Section</u>	<u>Page</u>
7. <u>SUMMARY SCHEDULE FOR NRC SUBMITTALS</u>	23
8. <u>LIST OF REFERENCES</u>	24
APPENDIX A: INTEGRATED IMPLEMENTATION PLAN AND SCHEDULE	
APPENDIX B: OTHER PROGRAMS AFFECTING IMPLEMENTATION OF SUPPLEMENT 1 REQUIREMENTS	

SECTION 1. INTRODUCTION

1.1 Purpose of the Report

This document comprises the position of Baltimore Gas and Electric Company with regard to upgrading emergency response capabilities (ERC) at Calvert Cliffs Units 1 & 2. Sections 2 through 6 address each of the five major ERC topics; i.e.:

- o Safety Parameter Display System,
- o Detailed Control Room Design Review,
- o Regulatory Guide 1.97,
- o Emergency Operating Procedures, and
- o Emergency Response Facilities.

Each of these sections contain, as appropriate: (1) an interpretation of the acceptance criteria applicable to the requirement, (2) a summary of the documentation requirements and the review procedure that will be followed by the NRC, (3) a description of the basic work elements involved, (4) a description of the current status of implementation at Calvert Cliffs, and (5) a description of the plan to implement remaining work elements.

Section 7 provides a preliminary schedule for submitting the various documents that are required by Supplement 1 to NUREG-0737.

Appendix A presents a description of the integration scheme that will be used to ensure that important interfaces are properly accounted for during the phased implementation of the requirements. Appendix A will form the basis for a detailed implementation schedule which will be developed as our plans are finalized.

Appendix B provides a summary listing of other major or ongoing routine programs that are being conducted by BG&E to maintain and improve the safety and reliability of the Calvert Cliffs plant. Each of these programs will influence the implementation of ERC requirements at Calvert Cliffs either by virtue of the program products or because the program must share the same engineering, operations, training and maintenance resources. As the ERC implementation plan matures, BG&E intends to integrate these products and resource constraints into the ERC schedule, as appropriate.

1.2 Summary of NRC Requirements

Generic letter 82-33, which transmits "Supplement 1 to NUREG-0737: Requirements for Emergency Response Capability" (hereafter referred to as Supplement 1), requests licensees to submit the following items to the NRC by April 15, 1983:

- o A proposed schedule for completing the basic requirements of Supplement 1; and
- o A description of the licensee's plans for phased implementation and integration of emergency response capability (ERC) activities.

The following paragraphs provide a brief description of the basic requirements.

Safety Parameter Display System (SPDS)

Each operating reactor shall be provided with an SPDS that is located convenient to the control room operators. The SPDS should provide a concise display of critical plant variables or safety functions to aid the operators in rapidly and reliably determining the safety status of the plant and in assessing whether abnormal conditions warrant corrective actions by the operators to avoid a degraded core. Since the SPDS will only serve as a supplement to the safety-related control room instrumentation already required by the regulations, it need not meet single-failure criteria or be qualified to meet Class 1E or seismic design requirements. The SPDS must be suitably isolated from safety-related systems at the point of interface and must be designed in accordance with accepted human engineering principles.

Detailed Control Room Design Review

All licensees shall conduct a detailed control room design review (CRDR) at each facility. The objective of the review will be to improve the ability of the control room operators to prevent accidents or cope with accidents if they occur by improving the information provided to them. The review program should be conducted by a qualified multi-disciplinary review team and should incorporate accepted human engineering principles. The licensees shall identify the control room operator tasks and information and control requirements during emergency conditions and compare these requirements with instrumentation presently in the control room to identify missing displays or controls. The licensees shall also conduct a control room survey to identify deviations from accepted human factors principles and then determine which deviations are significant and should be corrected. Finally, the licensees shall implement those control room changes that are deemed to be necessary.

Regulatory Guide 1.97-Application to Emergency Response Facilities

Licensees shall review the accident monitoring instrumentation provided at each facility and identify deviations from the recommendations of R.G. 1.97, Rev. 2 with regard to monitored parameters, ranges of measurement, and level of qualification. The purpose of this review is similar to that of the CRDR in that it will provide added assurance that the control room operators are supplied with the data necessary to safely operate the plant and mitigate the consequences of accidents. This review will also serve to identify instrumentation that will be required by the emergency response team in performing their assigned functions in the Technical Support Center (TSC) and the Emergency Operations Facility (EOF). After deviations to the recommendations of R.G. 1.97 have been identified, the licensees shall determine which deviations are significant and should be corrected, and initiate a program for their implementation.

Emergency Operating Procedure

Each licensee shall develop a set of human-factored, symptom-oriented Emergency Operating Procedures (EOPs) for each facility. These upgraded EOPs shall be based upon a set of technical guidelines which identify operator tasks during transients and accidents. If generic technical guidelines are to be used, the licensees shall establish a planned method for adapting them to their plant-specific EOPs. In addition, the licensees shall develop an EOP writers' guide to provide for consistency in procedure writing practices, shall implement an EOP validation program, and shall provide for appropriate training of operating personnel prior to implementation of the upgraded EOPs.

Emergency Response Facilities (ERFs)

Each licensee shall proceed with the design and construction of emergency response facilities; i.e., the Technical Support Center (TSC), the Operations Support Center (OSC), and the Emergency Operations Facility (EOF) in accordance with the requirements of 10 CFR 50, Appendix E. The licensees shall review the applicable regulatory guidance and ensure that their ERFs satisfy the design requirements and will provide adequate capability to respond to emergencies.

1.3 Summary of Submittal Requirements

Supplement 1 requires submittal of the following six documents to the NRC during various stages of the ERC implementation program:

- a. Safety Parameter Display System Safety Analysis - submittal time frame not specified
- b. CRDR Program Plan - submit within two months of starting the review
- c. Regulatory Guide 1.97 Report - submittal time frame not specified
- d. EOP Technical Guidelines - Submit prior to implementation of the guidelines
- e. Emergency Operating Procedures Generation Package - submit at least three months prior to the start of operator training on the upgraded EOPs
- f. CRDR Results Summary - submittal time frame not specified

These submittals are discussed in further detail in Sections 2 through 6. A summary of the proposed schedule for submitting these documents to the NRC is provided in Section 7.

1.4 Description of Industry Guidance

BG&E is a participating member of the Nuclear Utility Task Action Committee on Emergency Response Capabilities (ERC NUTAC) which includes over 40 utilities and is administratively supported by the Institute of Nuclear Power Operations (INPO). BG&E has also participated in the EOP Implementation Assistance (EOPIA) Review Group and the SPDS and CRDR NUTACs. This section lists the guidance documents that have been or are being produced by these industry efforts. Since the documents provide valuable guidance on the implementation of each ERC element, our implementation plans should not be finalized until this guidance has been considered.

1.4.1 EOPIA Review Group Documents

- a. EOP Implementation Guideline (June 1982)
- b. EOP Writing Guideline (July 1982)
- c. EOP Verification Guideline (published)
- d. EOP Validation Guideline (scheduled for publication in May 1983)
- e. EOP Generation Package Guideline (February 1983)

1.4.2 CRDR NUTAC Guidelines

- a. CRDR Implementation Guideline (scheduled for publication in April 1983)
- b. CRDR Survey Development Guideline (scheduled for publication in April 1983)
- c. Human Factors Principles for CRDR (scheduled for publication in April 1983)
- d. CRDR Task Analysis Guideline (scheduled for publication in August 1983)

1.4.3 SPDS NUTAC Documents

- a. Guidelines for an Effective SPDS Implementation Program (January 1983)

1.4.4 ERC NUTAC Documents

- a. Regulatory Guide 1.97 Implementation Guideline (scheduled for publication in May 1983)
- b. Guidance for an Integrated ERC Implementation Plan (scheduled for publication May 1983)
- c. Component Verification and System Validation Guideline (scheduled for publication in May 1983)
- d. Guideline for Implementation of Emergency Response Facilities (scheduled for publication in May 1983)

SECTION 2. SAFETY PARAMETER DISPLAY SYSTEM

2.1 NRC Acceptance Criteria

The NRC has provided only general acceptance criteria for the SPDS; however, this guidance is strongly prejudiced towards a computer - based system. Specific performance and qualification criteria are to be established by each licensee based upon an evaluation of operator information needs across a broad spectrum of normal plant transients and abnormal and emergency conditions. The NRC has provided a considerable amount of related guidance in such staff documents as NUREG-0696, NUREG-0700, NUREG-0835, and Regulatory Guide 1.97.

Supplement 1 to NUREG-0737 clarifies some of the regulatory positions on SPDS design. The SPDS need not be designed to comply with single failure, Class 1E, or seismic Category 1 requirements. However, the SPDS must be suitably isolated from electrical or electronic interference with equipment and sensors that are in use in safety systems.

The information displayed on the SPDS must be concise and shall be designed to incorporate accepted human factors principles so that it can be readily perceived and comprehended by its user. The SPDS shall be located convenient to the control room operators and should be operable during normal as well as during abnormal conditions. SPDS displays need not be provided outside the control room.

Although the NRC has not imposed any requirements on SPDS availability, the NRC desires a "highly reliable" machine. In addition, the licensee must develop procedures and training programs which will ensure the timely and correct assessment of plant safety status with or without the SPDS. This requirement infers the need to establish firm criteria for determining SPDS availability.

The specific information to be displayed shall be based on the engineering judgement of the licensee, but the NRC requires the licensee to identify a set of plant-specific critical safety functions (CSFs) that will allow the operators to quickly assess the overall safety of the plant and take corrective, preventive, or mitigative actions. As a minimum, this information shall maintain operator cognizance of the following:

- a. Reactivity control
- b. Reactor core cooling and heat removal from the primary system
- c. Reactor coolant system integrity

- d. Radioactivity control
- e. Containment conditions

2.2 NRC Documentation and Review Requirements

Pre-implementation NRC review and acceptance of the Calvert Cliffs SPDS is not required. However, in the response to Generic Letter 82-33, the licensee must describe the SPDS implementation plan and provide a schedule for submitting a safety analysis which describes the basis for selection of the parameters to be monitored. The safety analysis must be submitted to the NRC prior to declaring the SPDS operational. If an unreviewed safety question is involved, then NRC approval is required prior installation. Otherwise, the NRC intends to review the submittal and will not challenge operation of the SPDS unless it considers the safety analysis to be inadequate. The above notwithstanding, a licensee may request a pre-implementation review/approval of the SPDS.

Finally, the licensee is required to propose an integrated schedule for implementation in which the SPDS design is an input to the other ERC initiatives (i.e. CRDR, R.G. 1.97, EOPs and training). This schedule shall indicate the date that the SPDS will be fully operational.

2.3 Summary of SPDS Work Elements

BG&E has reviewed the regulatory requirement for the SPDS and has determined that an acceptable SPDS implementation program must include the following work elements:

- a. Develop preliminary specification;
- b. Select Critical Safety Functions;
- c. Select parameters which will support the CSFs;
- d. Issue specifications for competitive bids;
- e. Evaluate bids and select prospective supplier;
- f. Finalize human factors criteria;
- g. Finalize other design criteria;
- h. Award contract;
- i. Design the SPDS;
- j. Verify the design;
- k. Construct the system;
- l. Perform factory testing and validation;
- m. Perform and document the SPDS safety analysis;

- n. Write installation procedures;
- o. Install SPDS;
- p. Write test procedures;
- q. Perform field testing (in situ verification);
- r. Write operating procedures;
- s. Validate SPDS elements with other ERC initiatives; and
- t. Perform operator training.

2.4 Current Status

BG&E has decided to install an SPDS at Calvert Cliffs Units 1 & 2 in parallel with the Data Acquisition System (DAS) and the new plant computers. Current plans call for an SPDS which is "driven" by the new plant computers. This approach is necessary because of the present configuration of data output capabilities in the Calvert Cliffs control room. The existing Westinghouse P-250 process computers currently serving each unit are now approaching the end of their useful life. Their output functions are now being tasked at full capacity, making it impossible to implement the additional parameter monitoring, data manipulation, and display support functions required to support the SPDS. In addition, the existing input/output modules do not have a sufficient number of data terminations to allow the extraction of additional Class 1E or non-Class 1E signals from the isolation points. The new DAS will greatly increase the number of both Class 1E and non-Class 1E signals available to the safety-related control panels, the replacement plant computers, and the SPDS.

Thus, it is logical to perform SPDS installation in parallel with these control room upgrades. The only other option for SPDS installation is to procure a stand-alone computer and provide the necessary signals by physically tapping into the safety-related signal loops and installing necessary isolators. BG&E is strongly opposed to this approach for the reason that the practice of tapping into Class 1E instrument loops inherently increases the probability of signal interference. Out of necessity, BG&E has employed this practice to implement the instrumentation additions that were required subsequent to TMI. Nevertheless, it was decided that this practice should not be continued further and that alternative measures should be evaluated. The DAS will alleviate the potential for unwanted electronic interference yet assure the availability of either Class 1E or non-Class 1E signals.

Procurement activities for the DAS are now nearing completion with a contract award pending in the immediate future. Procurement of the replacement computers is now underway. A specification was completed in late 1982 and was issued for bids in January 1983. This specification requires that prospective supplier bid on an SPDS which is to be supplied with the plant computers. In addition, the supplier is asked to respond to the various SPDS design and performance criteria contained in NUREG-0696, SECY 82-111, and the NUTAC "Guidelines for an Effective SPDS Implementation Program," dated January 1983.

2.5 Implementation Plan

An multi-disciplinary team consisting of appropriate engineering, operations-oriented, cost/scheduling, and management personnel has been established to oversee the plant computer replacement/SPDS project. This team is responsible for preliminary identification of SPDS design criteria including human factors considerations, preliminary identification of the critical safety functions, and supervision of design, installation, and verification efforts.

The preliminary CSFs and the specific parameters that are selected to support these functions will be verified by comparison with the draft EOPs. Other SPDS design bases will be finalized after completion of a human factors review prior to design implementation. Requirements for verification and validation (V&V) of SPDS functions have been included in the procurement program to assure conformance with the design criteria. Verification activities will be performed before and after construction, and after installation. The specific objectives, methods, and criteria for performing SPDS verification will be based upon a review of NSAC-39 and the guidelines being developed by the ERC and SPDS NUTACs.

The schedule for completion of SPDS installation cannot be provided at this time. As previously discussed, the SPDS installation schedule is tied to that of the new plant computers. The plant computer replacement schedule, is highly dependent on the successful installation of the DAS. Presently, the DAS is scheduled to be installed during the Spring 1984 outage on Unit 2 and the Spring 1985 outage on Unit 1. If this schedule is realized, the plant computer replacement should be completed during the following refueling outages; i.e., Fall 1985 for Unit 2 and Fall 1986 for Unit 1. On this basis, we plan to install the SPDS during the 1985 and 1986 outages following installation of the plant computers. If problems develop in the plant computer installation then SPDS installation will be targeted for the 1987 and 1988 refueling outages.

BG&E plans to submit the SPDS safety analysis for NRC information and use approximately three months prior to installation. BG&E does not request a pre-implementation review of the SPDS.

In summary, the BG&E SPDS implementation plan and schedule will be influenced but not necessarily delayed by the following:

- a. Data Acquisition System installation;
- b. Plant computer replacement;
- c. Integration of the results of the CRDR, R.G. 1.97 and EOP initiatives into the SPDS design; and
- d. Integration into operator training schedule.

The relationship of the SPDS to the other ERC initiatives is illustrated further on Attachment 1 to Appendix A.

SECTION 3. DETAILED CONTROL ROOM DESIGN REVIEW

3.1 NRC Acceptance Criteria

Supplement 1 requires licensees to conduct a control room design review to identify Human Engineering Discrepancies (HEDs). This requirement stems from NUREG-0660, Item I.D. 1 which states that the purpose of the CRDR is to improve the ability of nuclear power plant control room operators to prevent accidents or cope with accidents if they occur by improving the information provided to them. From the list of HEDs that are generated as a result of the review, licensees are to identify any control room modifications that would "contribute to a significant reduction of risk and enhancement in the safety of operation." The NRC indicates that descisions to modify the control room should be carefully reviewed by "persons competent in human factors engineering and risk analysis," and should consider both the benefits of long term risk reduction and any potential temporary decline in safety resulting from the need to relearn maintenance and operating procedures.

The review shall consist of:

- a. The establishment of a qualified multi-disciplinary review team and a review program incorporating accepted human engineering principles;
- b. The use of function and task analysis (that had been used as the basis for developing emergency operating procedures Technical Guidelines and plant specific Emergency Operating Procedures) to identify control room operator tasks and information and control requirements during emergency operations. This analysis has multiple purposes and should also serve as the basis for developing training and staffing needs and verifying SPDS parameters;
- c. A comparison of the display and control requirements with the control room instrumentation to identify missing displays and controls; and
- d. A control room survey to identify deviations from accepted human factors principles. This survey will include, among other things, an assessment of the control room layout, the usefulness of audible and visual alarm systems, the information recording and recall capability, and the control room environment.

Those discrepancies that can be eliminated by simple enhancements such as paint-tape-lable changes should be done promptly.

Before implementation of any control room modification, the licensee shall verify that the change will accomplish the desired improvement, and can be introduced in the control room without creating unacceptable HEDs, unreviewed safety questions, or situations in which a temporary reduction in safety could occur. Improvements that are introduced as a result of the CRDR should be coordinated with the SPDS, operator training, EOP upgrade, and R.G. 1.97 review program.

The NRC contracted with the ESSEX Corporation for the development of guidance for performing control room design reviews at nuclear power plants. Draft guidance was issued for public comment in NUREG/CR-1580 (July 1980).

The NRC's final guidance on the performance of CRDRs was issued in NUREG-0700 (September 1981) which incorporated industry comments and experience gained by the NRC in the performance of control room reviews for near-term operating license applicants. The primary difference between NUREG/CR-1580 and NUREG-0700 is the statement in the latter that systems review and task analysis should be performed to support the identification of operator tasks and information requirements during abnormal and emergency operating conditions.

Finally, the NRC issued NUREG-0801 (October 1981) which describes their plans for evaluating the licensee's detailed CRDRs to determine whether the reviews meet the guidelines of NUREG-0700.

3.2 NRC Documentation and Review Requirements

Supplement 1 to requires two separate submittals to the NRC on the subject of the CRDR. First, each licensee must develop a CRDR program plan that describes how the CRDR tasks (see Section 3.1 items a through d above) will be accomplished. The NRC intends to review the CRDR program plan as the licensee implements it. Selected licensees will be subjected to an in-progress audit by the NRR human factors staff. The CRDR program plan would form the basis for this audit.

After completion of the CRDR all licensees must submit a detailed summary report outlining proposed control room changes, including proposed schedules for implementation.

In Sections 2 and 4 of NUREG-0801 the NRC has provided guidance on the content of both of the submittals identified above.

The NRC will review the CRDR summary report and will inform the licensee whether they intend to conduct a pre-implementation on-site audit. The decision to conduct a pre-implementation audit will be based upon the contents of the CRDR program plan and summary report. Upon completion of the NRC review of the summary report (whether or not an audit is conducted), an SER will be issued.

3.3 Current Status

In October of 1979 the Baltimore Gas and Electric Company determined that a control room design review should be performed at Calvert Cliffs. This determination was based upon a review of the Kemeny and Rogovin Commission reports which indicated that human factors design errors in the control room played a major role in the accident at Three Mile Island Unit 2. Furthermore, BG&E determined that a control room design review would be necessary to establish the baseline criteria and methodology for reviewing and implementing the multitude of instrumentation design changes that were being considered by the NRC in the wake of the TMI-2 accident. BG&E subsequently contracted with Essex Corporation for the performance of a human-factors oriented control room design review in accordance with the methodology and criteria that were being developed by Essex for NUREG/CR-1580. The review was conducted from May 1980 to March 1981.

The objectives of the Essex control room design review were to:

- o Identify facets of the control room design that were at variance with NUREG/CR-1580;
- o Recommend potential backfits for each of the design facets identified;
- o Assess the adequacy of information presentation to the control room;
- o Recommend human factors enhancements for control/display groupings; and
- o Recommend improvements for the control room communications systems.

The tasks that were performed during the control room design review included:

- o Evaluation of controls and displays via checklists and surveys;
- o Operator interviews;
- o Task analysis and procedures walk-throughs via simulator (using the Unit 1 plant-specific simulator at Combustion Engineering's facilities at Windsor, Connecticut) and control room reviews;
- o Evaluation of the alarm annunciator system;
- o Evaluation of the operator/computer interface;

- o Development of design specifications as needed to address proposed design changes;
- o Documentation of results and recommendations for correcting discrepancies identified;
- o Evaluation of the impact of environmental features, such as lighting and noise, on operator performance; and
- o Performance of other work projects as requested by the BG&E Human Factors Task Force.

Actual implementation is proceeding on correction of certain of the HEDs identified during this review. These changes include:

- o Modifications to correct violations of design conventions;
- o Paint, tape and label changes;
- o Major control board changes capable of incorporation with other facility upgrades; and
- o Annunciation system reorganization.

3.5 Implementation Plan for Remaining Tasks

Under BG&E direction, the ESSEX Corporation is preparing a CRDR program plan for submittal to the NRC to document the CRDR team composition, the plans for accomplishing each specific task, and the HED assessment methodologies that were employed. The content of this program plan will follow the guidelines provided in NUREG-0801. The program plan will provide discussions in support of BG&E's position that the Calvert Cliffs CRDR, although performed in accordance with NUREG/CR-1580, completely satisfies the intent of NUREG-0700.

The program plan will provide the framework for completing the following additional work elements:

- o Assessment of which of the remaining HEDs are significant and should be corrected;
- o Selecting design improvements that will correct these HEDs;
- o Providing justification for those HEDs that are to be left uncorrected or partially uncorrected;
- o Reviewing control room design changes that were made after completion of the ESSEX review; and
- o Integrating the CRDR with other Supplement 1 initiatives and future plant modifications via an ongoing human factors program.

The CRDR integration element is illustrated in Attachment 1 to Appendix A.

The baseline CRDR effort can be successfully completed for the purposes of NRC review prior to considering the results of the other Supplement 1 initiatives. However, the actual implementation of control room modifications, with the exception of those previously described changes that are deemed necessary for safety or that are easily implemented by paint, label or tape changes, should await completion of the initial SPDS, R.G. 1.97 and EOP efforts.

A detailed CRDR summary report is currently under preparation for eventual submittal to the NRC. The report is being written using the guidance contained in NUREG-0801 and will describe the following:

- o HEDs identified during the CRDR
- o Determination of HED significance
- o Proposed corrective actions
- o Schedule of corrective actions
- o Justification for deviations from NUREG-0700 and NUREG-0801

BG&E will institute appropriate technical and administrative provisions to ensure consideration of human factors engineering principles in the design, design verification and system validation phases for future changes to the control room. Such changes will be generated by the SPDS, R.G. 1.97, and EOP initiatives. In addition, changes that were implemented as a result of the TMI Action Plan, but after the Essex CRDR, must be reviewed retroactively.

BG&E plans to submit the Calvert Cliffs CRDR program plan for NRC review by August 1, 1983. Based on this schedule, we expect to submit the detailed CRDR summary report by November 1, 1983.

SECTION 4. REGULATORY GUIDE 1.97, ACCIDENT MONITORING INSTRUMENTATION

4.1 NRC Acceptance Criteria

Supplement 1 requires licensees to address the recommendations contained in R.G. 197 in identifying plant-specific criteria for accident monitoring instrumentation and to justify exceptions taken to the recommendations. The licensees must address all parameter categories (Type A, B, C, D and E) and all recommendations applicable to range, environmental qualification, seismic qualification, redundancy, power supply, quality assurance provisions, and display means.

The NRC has emphasized that exceptions may be taken to the provisions of the regulatory guide based on plant-specific design features and control room instrumentation needs. During the identification of Type A variables (i.e., those variables that provide primary information needed to permit the control room operating personnel to take the specified manually controlled actions for which no automatic control is provided and that are required for safety systems to accomplish their safety functions for design basis accident events) the licensees should ensure that the updated EOPs are used.

It is acceptable to rely on existing instrumentation if it will measure over the range indicated in R.G. 1.97, even if it is not presently environmentally qualified. The licensees should state that all R.G. 1.97 instrumentation will be qualified, as appropriate, per the new requirements of 10 CFR 50.49. With regard to seismic qualification, R.G. 1.97 instrumentation must comply with the seismic qualification criteria which was the basis for plant licensing.

The licensee must also provide reliable indication of the meteorological variables specified in R.G. 1.97 for site meteorology. However, the NRC has stated that no changes in existing meteorological monitoring systems are necessary if they have historically provided reliable indication of these variables and are representative of meteorological conditions in the vicinity (up to ten miles) of the plant site. Information on meteorological conditions for the region in which the site is located shall be available via communication with the National Weather Service.

The Technical Support Center (TSC) must be provided with those Type A, B, C, D and E variables that are essential for TSC functions. The TSC and the EOF must also be provided with the meteorological variables required to characterize transport and diffusion in the vicinity of the plant. The Emergency Operations Facility (EOF) must be provided with the instrumentation that will be necessary to monitor containment conditions and releases of radioactivity in the plant. Accident monitoring instrumentation provided in the TSC and the EOF shall be of reliable design but need not meet Class 1E, single failure or seismic qualification requirements.

4.2 NRC Documentation and Review Requirements

NRC review and approval of the licensees' R.G. 1.97 plan is not a prerequisite for implementation. However, the criteria for implementing R.G. 1.97 recommendations must be documented, and each licensee must submit a report to the NRC which tabulates how the recommendations will be met. This report should include justifications for any deviations from the guidance and must provide a schedule for implementing any plant changes that are required.

4.3 Current Status and Implementation Plan

An evaluation of the degree of compliance of the Calvert Cliffs accident monitoring instrumentation with R.G. 1.97 has been completed by Bechtel Power Corporation. The results of this initial evaluation are currently under review by another consultant to identify those areas of noncompliance which can be justified based on plant-specific design features and to identify those areas of noncompliance that will either require instrumentation changes or further analysis to determine their final disposition. This review effort also involves updating the initial R.G. 1.97 evaluation with all of the TMI-related changes that occurred since the evaluation was performed. Upon completion of this review effort, BG&E will develop a program plan for implementation of remaining R.G. 1.97 activities. Activities that will be covered under the program plan include.

- a. Development of an R.G. 1.97 design criteria document that lists each parameter with its range, function, and qualification criteria;
- b. Identification of Type A variables;
- c. Development of a methodology for making final decisions on any instrumentation changes;

- d. Development of final qualification criteria for each instrument appropriate with its importance to safety in accordance with 10 CFR 50.49;
- e. Performance of qualification activities in accordance with the above criteria;
- f. Documentation of qualification results and any justifications for deviations from the established qualification criteria;
- g. Comparision of the R.G. 1.97 design criteria document with the results of the CRDR and the initial upgraded EOPs; and
- h. Identification of R.G. 1.97 requirements for the TSC and the EOF; and
- i. Development of a schedule for implementing any plant changes.

BG&E plans to submit the Calvert Cliffs R.G. 1.97 program plan to the NRC by September 1, 1983

SECTION 5. EMERGENCY OPERATING PROCEDURES

5.1 NRC Acceptance Criteria

Supplement 1 requires licensees to develop a set of human-factored, symptom-oriented Emergency Operating Procedures (EOPs). The purpose of these upgraded EOPs is to improve human reliability and the ability to mitigate the consequences of a broad range of initiating events and subsequent equipment failures or operator errors, without the need to diagnose specific events.

In accordance with Item I.C.1 of NUREG-0737, each licensee is required to reanalyze transients and accidents for the purpose of identifying operator tasks and information and control needs. This information, in turn, is to be incorporated into a set of EOP Technical Guidelines. The reanalysis of transients and accidents and the development of the Technical Guidelines may be performed generically.

Licensees must develop an appropriate procedure Writer's Guide for use with an approved set of Technical Guidelines in generating the upgraded EOPs. After the initial EOPs are written, they must be validated against control room modifications proposed as a result of the SPDS, R.G. 1.97, and CRDR work elements before operator training with the new procedures may begin.

Guidance on the preparation of EOPs is provided by the NRC in NUREG-0899.

5.2 NRC Documentation and Review Requirements

The Technical Guidelines must be submitted to the NRC for review and approval before implementation. Upon approval of the Technical Guidelines, and at least three months prior to the date that formal operator training is commenced on the upgraded EOPs, the licensee must submit a Procedures Generation Package (PGP) consisting of: (1) the Technical Guidelines, (2) the procedure Writers' Guide, (3) a description of the EOP validation program, and (4) a brief description of the training program for the upgraded EOPs.

Although NRC approval of the PGP is not required before the EOPs are implemented, it is expected that the NRC would exercise its prerogative in requiring a cessation of EOP implementation if it found serious deficiencies in the provisions of the PGP.

5.3 Current Status and Implementation Plan

5.3.1 Technical Guidelines

The Calvert Cliffs EOPs will be based on the Emergency Procedure Guidelines (EPGs) that were developed by the C-E Owners Group (CEOG). These EPGs have been approved by the NRC for implementation into plant-specific EOPs (refer to NRC letter from D.G. Eisenhower to R.G. Wells, CE, dated February 4, 1983). BG&E plans to submit a letter to the NRC by June 1, 1983 referencing the use of the CEOG EPGs.

5.3.2 Writers' Guide

A Calvert Cliffs EOP Writers' Guide is currently under development and should be available for use by our operations staff in writing the initial EOP drafts in June 1983.

5.3.3 Procedures Generation Package

We are currently reviewing available industry guidance concerning EOP validation to determine the most effective means of ensuring that the final EOPs are usable and reflect control room changes that may occur as the result of the SPDS, the CRDR, and the R.G. 1.97 work elements. The validation methods selected by BG&E will consider the existing manpower and mockup capabilities at Calvert Cliffs. Concurrent with this effort the existing operator training program will be evaluated to determine whether special administrative changes or supplemental training aids will be required to implement an appropriate integrated training program for the EOP upgrade effort. BG&E plans to document its preferred approach to EOP validation and integrated training in time to support a submittal of the Calvert Cliffs procedures generation package by December 1, 1983.

SECTION 6. EMERGENCY RESPONSE FACILITIES

6.1 NRC Acceptance Criteria

The minimum criteria that must be applied to the design of emergency response facilities (ERFs) are identified in 10CFR 50.47 and 10 CFR 50, Appendix E, Section IV. Supplement 1 to NUREG-0737 provides clarification and additional guidance on the basic requirements of 10 CFR Part 50 concerning ERF location, design features, data collection and display instrumentation, communication equipment, etc. Notable amongst these clarifications is the requirement that appropriate power plant and meteorological parameters from R.G. 1.97 be provided in both the Technical Support Center (TSC) and the Emergency Operations Facility (EOF).

6.2 NRC Documentation and Review Requirements

In Supplement 1 to NUREG-0737 the NRC has stated that even though the conceptual design for ERFs have been submitted to them for review, the submittals contained insufficient detail to support a decision on acceptability. Since the NRC does not consider it necessary to review and approve these facility designs prior to implementation, they decided to reprint their basic requirements in Supplement 1 and place the burden on each licensee to ensure that the design of the ERFs satisfies these requirements. If exemptions from the requirements are desired, the licensee should forward appropriate requests to the NRC.

In Supplement 1 the NRC requested schedules for completion of the ERFs. The NRC intends to conduct appraisals of the completed facilities to verify that these requirements have been satisfied and that the ERFs are capable of performing their intended functions. Licensees need not document their actions on each specific item contained in NUREG-0696.

6.3 Current Status and Implementation Plan

The Calvert Cliffs TSC was declared operational in June 1982 (refer to BG&E letter from Mr. A. E. Lundvall to Mr. D. G. Eisenhut, dated June 4, 1982). A detailed description of the TSC and a conceptual description of the new EOF was provided in a letter from Mr. A. E. Lundvall to Mr. D.G. Eisenhut, dated June 1, 1981. A new TSC Annex will perform the radiological assessment functions. To accomplish these functions, a dedicated telephone line and radio base station must be moved from the present Temporary Emergency Control Center to the TSC Annex. This work will be completed in time to allow integration of the TSC Annex into the Emergency Response plan by January 1, 1984.

As discussed in our June 1, 1981 letter, the Calvert Cliffs EOF is being constructed in Hallowing Point, Maryland approximately 12 miles northwest of the plant. The EOF will be completed in time to allow integration into the Emergency Response Plan by January 1, 1984.

As discussed in Section 4, the plant requirements for the TSC and the EOF will be identified as part of the R.G. 1.97 review. If as a result of this review the need for additional instrumentation is identified over and above that which we are currently planning to provide in the TSC an EOF, it is not likely that installation could be accomplished before January 1, 1984. It is our position that any such instrumentation should be installed as backfit items and should not delay operability of either the TSC or EOF. In any event, BG&E will submit its plan to provide any additional accident monitoring instrumentation for the TSC and the EOF as part of the R.G. 1.97 program plan.

Redundant site meteorological towers currently provide reliable meteorological data as specified in R.G. 1.97, Rev. 2. This information can be supplemented via telephone with the Patuxent Naval Air Station. Regional meteorological information is available from:

- (1) Electric System Operation - Accuweather
- (2) National Weather Service via teletype from Baltimore Washington International Airport

The Calvert Cliffs Operations Support Facility (OSC) is currently fully operational and has been integrated into the Emergency Response Plan.

SECTION 7.

This section provides BG&E's preliminary schedule for submitting the documents required by Supplement 1 to NUREG-00737. The contents of each these reports is described in Sections 2 through 7.

<u>Submittal</u>	<u>Date</u>
a. SPDS Safety Analysis	(See Note)
b. CRDR Program Plan	August 1, 1983
c. Regulatory Guide 1.97 Report	September 1, 1983
d. EOP Technical Guidelines	June 1, 1983
e. Procedure Generation Package	December 1, 1983
f. CRDR Summary Report	November 1, 1983

Note: Not available at this time. A schedule for completion of SPDS design can only be provided after a contract has been awarded. A schedule for completing the safety analysis and parameter selection would be a component of the design schedule.

SECTION 8. LIST OF REFERENCES

This section lists the regulatory and industry documents which have been or are being used by BG&E in the implementation of ERC requirements.

8.1 General

- 8.1.1 NUREG-0737, "Clarification of TMI Action Plan Items", dated October 31, 1980
- 8.1.2 Supplement 1 to NUREG-0737 - "Requirements for Emergency response Capability (Generic Letter 82-33)," dated December 17, 1982.

8.2 SPDS

- 8.2.1 NUREG-0696, "Functional Criteria for Emergency Response Facilities"
- 8.2.2 NUREG-0835, "Human Factors Review Guidelines for the Safety Parameter Display System"
- 8.2.3 SPDS NUTAC, Guidelines for an Effective SPDS Implementation Program, dated January 1983

8.3 CRDR

- 8.3.1 NUREG-0585, "Final Report of the TMI-2 Lessons Learned Task Force," October 1979.
- 8.3.2 NUREG/CR-1580, "Human Engineering Guide to Control Room Evaluation," July 1980.
- 8.3.3 NUREG-0700, "Guidelines for Control Room Design Reviews," September 1981.
- 8.3.4 NUREG-0801, "Evaluation Criteria for Detailed CRDR," (draft).

8.4 Regulatory Guide 1.97

- 8.4.1 Regulatory Guide 1.97 (Rev. 2)
- 8.4.2 Regulatory Guide 1.23, February 12, 1972.

8.5 Emergency Operating Procedures

- 8.5.1 NUREG-0660, "TMI Action Plan"
- 8.5.2 NUREG-0899

8.6 Emergency Response Facilities

- 8.6.1 10 CFR 50.47 (b) -- Requirements for emergency facilities and equipment for OLs.
- 8.6.2 10 CFR 50.54 (q) and Appendix E, Paragraph IV.E -- Requirements for emergency facilities and equipment for ORs.
- 8.6.3 NUREG-0660 -- Description of and implementation schedule for TSC, OSC and EOF.
- 8.6.4 Eisenhower letter to power reactor licensees 9/13/79 -- Request for commitment to meet requirements.
- 8.6.5 Denton letter to power reactor licensees 10/30/79 -- Clarification of requirements.
- 8.6.6 NUREG-0654 -- Radiological Emergency Response Plans
- 8.6.7 NUREG-0696 -- Functional criteria for emergency response facilities.
- 8.6.8 NUREG-0737 -- Guidance on meteorological data requirements
- 8.6.9 Eisenhower letter to power reactor licensees 2/18/81 -- Commission approved guidance on location, habitability and staff for emergency facilities. Requested conceptual design of facilities.
- 8.6.10 Reg. Guide 1.97 (Rev. 2) -- Guidance for variables to be used in selected emergency response facilities.

APPENDIX A: INTEGRATED IMPLEMENTATION PLAN AND SCHEDULE**A.1 Introduction**

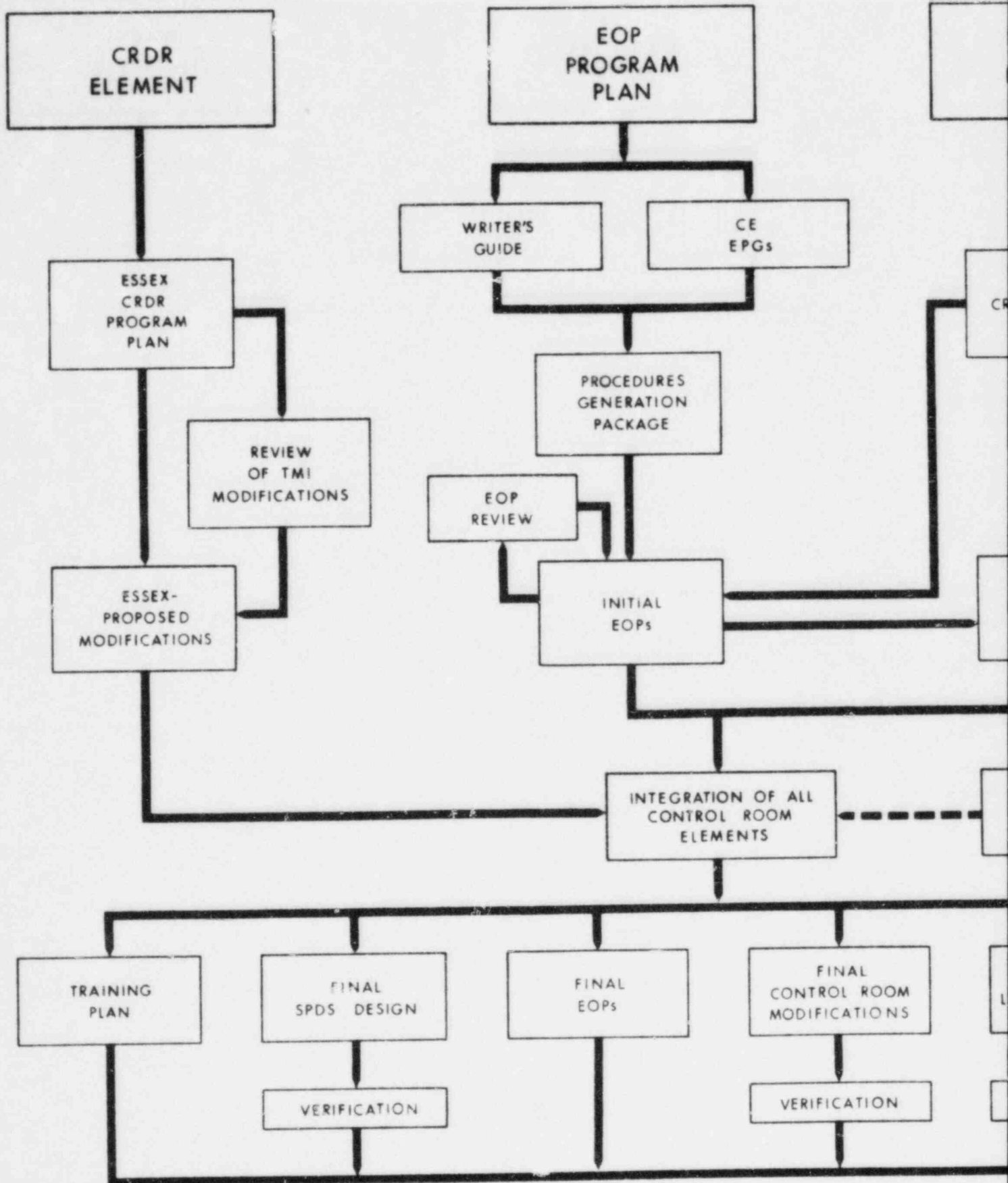
This appendix presents the integration plan and implementation schedule for completion of Supplement 1 requirements at Calvert Cliffs Units 1 & 2. Two major components are involved in the integration of these requirements. The first component involves careful consideration of the control room modifications resulting from the SPDS, CRDR and R.G. 1.97 initiatives to ensure that these modifications, as a whole, adequately support the upgraded EOPs. The second component involves consideration of non-Supplement 1 initiatives to the extent that they will result in additional modifications in the control room or the EOPs or will divert manpower from the implementation of Supplement 1 requirements.

In a future revision to this appendix, a detailed description of our integration plan will be provided in Section A.1. A preliminary integration scheme is provided as a flow chart in Attachment 1.

Similarly, a detailed description of our phased implementation schedule will be provided in Section A.2. The actual schedule will appear as Attachment 2.

**A.2 Integration Considerations
(Later)****A.3 Schedule Considerations
(Later)**

INTEGRATION SCHEME FOR N WORK ELE



Attachment 2

(Appendix A)

Implementation Schedule

(Later)

APPENDIX B: OTHER PROGRAMS AFFECTING IMPLEMENTATION OF
SUPPLEMENT 1 REQUIREMENTS

B.1 Introduction

This appendix provides a listing of programs and miscellaneous work activities that are either currently being performed or are being planned for Calvert Cliffs and are related to the enhancement of continued safe and reliable operations. A future revision to this section will provide a summary description of the scope and objectives for each program or activity. The discussions will indicate whether the program or activity will have a direct impact on the implementation of Supplement 1 requirements. Eventually, this appendix will indicate when and how the products of each these programs and activities are to be considered in the integrated plan and schedule provided in Appendix A. This may be accomplished by: (1) identifying the resources required to complete each of the remaining programs or activities in terms of type of manpower (engineering, technician, clerical, contractor) and total man-years, and (2) identifying the points in the integrated schedule where the aforementioned products will be used (and thus may act as schedule constraints) and where the total commitment of manpower exceeds our available resources. Where resources become a constraint in the integrated schedule, work will be prioritized based on safety significance or other factors, such as the level of completion of the competing work items.

B.2 NRC-Sponsored Programs

- a. Pressurized Thermal Shock Study (US1 A-49)
- b. Integrated Reliability Evaluation Program
- c. Safety Significance of Control Systems (US1 A-47)

B.3 Industry-Sponsored Programs

- a. DOE Study: An Integrated Approach to Reliable Safe and Economical Nuclear Power
- b. INPO Accreditation of CCNPP Training Program

B.4 CCNPP Engineering and Operations Support by BG&E

- a. Plant Computer Replacement
- b. Data Acquisition System (DAS) installation
- c. Upgrade of inadequate Core Cooling Instrumentation
- d. Fire Protection - Appendix R Modifications

- e. Environmental Qualification per 10 CFR 50.49
- f. Completion of remaining TMI Action Plan Items
(per recent Confirmatory Orders)
- g. Installation of Plant-Specific Training Simulator
- h. Auxiliary Feedwater System Modifications
- i. Unit 1 Condenser Modifications
- j. Steam Generator Nozzle Dams/Sludge Lancing
- k. Radwaste Facility Upgrades
- l. Resolution of Control of Heavy Loads
- m. Upgrade of miscellaneous electrical conductor seals
- n. Upgrade of Saltwater Valves and Piping
- o. Renovation/Expansion of Auxiliary Bldg. Facilities for
Containment Access Control
- p. Upgrade of Reactor Cavity Pool Seal
- q. Reanalysis of Masonry Walls (IEB 80-11)
- r. Revaluation of certain electrical penetration assemblies
- s. Resolution of IEB 80-04
- t. Resolution of ATWS
- u. Steam Generator Integrity