GRAND GULF NUCLEAR STATION - UNIT 1
DETAILED CONTROL ROOM DESIGN REVIEW
PROGRAM PLAN

Prepared for

U.S. Nuclear Regulatory Commission

December 1984

MISSISSIPPI POWER & LIGHT COMPANY

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	E-1
1. INTRODUCTION	1
1.1 General Comments	1
1.1.1 Program Plan Purpose	1
1.1.2 The Need for a DCRDR	1
1.1.3 Other MP&L Improvement Efforts in the Control Room	1
1.2 DCRDR Purpose and Requirements	1
1.2.1 Program Purpose	1
1.2.2 Regulatory Requirements and Guidance	1
1.3 Plant Description	2
1.3.1 Utility Information	2
1.3.2 Plant Site and Description	2
1.4 Plant Features Covered by the DCRDR	3
1.4.1 Main Control Room	3
1.4.2 Remote Shutdown Panels	3
1.5 Previous Human Factors Work in the Control Room	3
1.5.1 GGNS-1 Preliminary Design Assessment	3
1.5.2 Control Room CRT Console Human Factors Review	3
1.5.3 Transition from Previous Work to the DCRDR	5
1.6 Glossary of Terms and Acronyms	5
1.6.1 General Remarks	5
1.6.2 Terms	5
1.6.3 Acronyms	7
2. PLANNING PHASE	9
2.1 Planning Phase Objectives	9
2.2 Management and Staffing	9
2.2.1 DCRDR Team Structure	9
2.2.2 DCRDR Team Member Qualifications and Duties	9
2.2.3 DCRDR Team Support	12
2.2.4 DCRDR Team Orientation	12

	Page
2.3 Data Management	13
2.3.1 Documentation Requirements	13
2.3.2 Input Data	13
2.3.3 Output Data	14
2.3.4 Database Management System	14
2.4 Equipment and Workspace	15
2.5 Scheduling	15
2.6 Planning Phase Documentation	15
2.6.1 NRC Program Plan	15
2.6.2 MP&L Project Plan	15
2.6.3 Task Plans	17
2.6.4 Human Factors Criteria	17
3. REVIEW PHASE	18
3.1 Review Phase Processes	18
3.2 Operating Experience Review	18
3.2.1 Purpose	18
3.2.2 Methodology	18
3.3 Control Room Inventory	20
3.3.1 Purpose	20
3.3.2 Methodology	20
3.4 Control Room Survey	20
3.4.1 Purpose	20
3.4.2 Methodology	20
3.5 System Functions Review and Task Analysis	21
3.5.1 Purpose	21
3.5.2 Methodology for System Functions Review	21
3.5.3 Methodology for Operating Scenario Selection	21
3.5.4 Identification of Residual Tasks	23
3.5.5 Methodology for Task Analysis	23
3.5.6 DBMS Use for Managing Task Analysis Data	28
3.6 Verification of Task Performance Capabilities	29
3.6.1 Purpose	29
3.6.2 Methodology	29

Page

3.7 Validation of Control Room Functions........................ 30

3.7.1 Purpose.. 30
3.7.2 Methodology.. 30

3.8 Review Phase Documentation.................................. 32

4. ASSESSMENT AND IMPLEMENTATION PHASE.......................... 33

4.1 Assessment and Implementation Activities.................... 33
4.2 Analyze and Categorize HEDs................................. 33
4.3 Recommend and Evaluate HED Resolutions...................... 35
4.4 Document and Schedule Resolution Implementation............. 36

5. REPORTING PHASE.. 37

5.1 NRC Final Summary Report.................................... 37
5.2 MP&L Executive Summary Report............................... 37
5.3 Documentation Storage....................................... 37

6. PROGRAM INTEGRATION.. 38

6.1 General Comments.. 38
6.2 DCRDR Integration with Other ERC Programs................... 38

6.2.1 Safety Parameter Display System...................... 38
6.2.2 EOP Upgrade Program................................... 40
6.2.3 Program for Implementation of Regulatory Guide 1.97, Revision 2.. 40
6.2.4 ERC Training.. 41
6.2.5 Emergency Response Facilities......................... 41
6.2.6 HED Assessment Integration............................ 41

6.3 DCRDR Integration with Future Design Changes................ 41

APPENDIX A BIBLIOGRAPHY... A-1

APPENDIX B DCRDR TEAM MEMBER RESUMES............................ B-1

APPENDIX C SAMPLE DCRDR FORMS................................... C-1

GRAND GULF NUCLEAR STATION - UNIT 1
DETAILED CONTROL ROOM DESIGN REVIEW

EXECUTIVE SUMMARY

E.1 DETAILED CONTROL ROOM DESIGN REVIEW (DCRDR) METHODOLOGY

E.1.1 General Comments

The background, purpose, requirements, and scope of the DCRDR are discussed in the Program Plan. This Executive Summary outlines the methodology that Mississippi Power & Light Company (MP&L) will use to perform the DCRDR. An overview of DCRDR phases and activities is shown in Figure E-1, page E-5.

E.1.2 DCRDR Phases

MP&L will use a methodology that divides the DCRDR into component phases similar to those recommended in NUREG-0700 (Sections 2 through 4) and NUREG-0801. Each phase is described briefly below and is detailed in Program Plan Sections 2 through 6.

E.2 PLANNING PHASE

E.2.1 Regulatory Requirements and Guidance

This phase of the DCRDR will meet the planning requirements of NUREG-0737 Supplement 1 (Sections 5.1.b.i and 5.2.a) and will follow the guidance of NUREG-0700 (Sections 2 and 5.1) and NUREG-0801.

E.2.2 Planning Phase Objectives

The Planning Phase will define the organization and direction of the Grand Gulf Nuclear Station - Unit 1 (GGNS-1) DCRDR. The Program Plan is the principal record of this phase and will be used as the guiding document for all GGNS-1 DCRDR activities. Program Plan deviations will be documented by MP&L management in periodic Program Plan revisions if needed, and/or recorded in the Final Summary Report.

E.2.3 Summary of Planning Phase Components

The principal components of the Planning Phase are listed below and detailed in Program Plan Section 2:

- DCRDR Management and Staffing
- Data Management
- Equipment and Workspace
- Scheduling
- Planning Phase Documentation

E.3 REVIEW PHASE

E.3.1 Regulatory Requirements and Guidance

This phase of the DCRDR will meet the review requirements of NUREG-0737 Supplement 1 (Sections 5.1.b.ii-iv), and will follow the guidance of NUREG-0700 (Section 3) and NUREG-0801.

E.3.2 Review Phase Objectives

The Review Phase is the investigative portion of the DCRDR. There are two objectives for this phase:

a. Determine whether the Control Room provides the system status information, control capabilities, feedback, and performance aids necessary for Control Room operators to accomplish their functions and tasks effectively.

b. Identify characteristics of the existing Control Room instrumentation and controls (I&C), other equipment, and physical arrangements that may detract from operator performance.

E.3.3 Summary of Review Phase Processes

The six processes of the Review Phase are listed below and are detailed in Program Plan Section 3:

- Operating Experience Review
- Control Room Inventory
- Control Room Survey
- System Functions Review and Task Analysis
- Verification of Task Performance Capabilities
- Validation of Control Room Functions

E.4 ASSESSMENT AND IMPLEMENTATION PHASE

E.4.1 Regulatory Requirements and Guidance

This phase of the DCRDR will meet the assessment and implementation requirements of NUREG-0737 Supplement 1 (Sections 5.1.c and 5.1.d), and will follow the guidance of NUREG-0700 (Section 4) and NUREG-0801.

E.4.2 Assessment and Implementation Phase Objectives

The objectives for this DCRDR phase are listed below:

a. Analyze and evaluate the problems that could arise from identified human engineering discrepancies (HEDs).

b. Analyze means of correcting those discrepancies that could lead to substantial problems.

c. Interface the assessment process with those other Control Room related projects that are concerned with or may affect human factors.

d. Integrate the implementation process with the goals and implementation processes of these related human factors projects and other GGNS-1 activities.

Although the emphasis is on improvements affecting operator performance under emergency conditions, all improvements affecting operator performance will be considered.

E.4.3 Summary of Assessment Activities

During Assessment, all HEDs will be analyzed and the importance of each to plant safety and operation will be determined. The HEDs will be prioritized according to importance; significant discrepancies will be selected for resolution through modifications, additional training, etc. The proposed resolutions will be analyzed for impact and effect on plant safety and operation, cost/benefit relationship, and possible alternatives. As a final assessment step, an evaluation of the extent of correction for each HED selected for resolution will be made in order to document and justify all HEDs not fully corrected. The assessment process is detailed in Program Plan Section 4.

E.4.4 Summary of Implementation Activities

During Implementation, approved modifications will be integrated with other enhancement programs. These changes will be scheduled consistent with MP&L's existing work scheduling program, with consideration given the possible HED safety consequence, plant operating status, procurement time, etc. The implementation process is detailed in Program Plan Section 4.

E.5 REPORTING PHASE

E.5.1 Regulatory Requirements and Guidance

This phase of the DCRDR will meet the reporting requirements of NUREG-0737 Supplement 1 (Section 5.2.b), and will follow the guidance of NUREG-0700 (Section 5.2) and NUREG-0801.

E.5.2 Reporting Phase Objectives

The Final Summary Report will be submitted to the Nuclear Regulatory Commission (NRC) to document the GGNS-1 DCRDR. The report will accomplish the following objectives:

- Summarize the overall review process.
- Document all identified HEDs.
- Identify Control Room design improvements implemented before and during the DCRDR.

- Identify proposed and finalized design improvements and their proposed implementation schedule.

Although the DCRDR is to be reported in summary form, the details of the entire review will be documented and maintained in readily retrievable format for future MP&L use and possible NRC audit. The DCRDR Team will also prepare an Executive Summary Report for use by MP&L management.

E.5.3 Summary of Reporting Phase Activities

The Reporting Phase will consist of Final Summary Report and Executive Summary Report preparation, and the filing and storage of DCRDR documentation as the program concludes. The Reporting Phase is detailed in Program Plan Section 5.

E.6 PROGRAM INTEGRATION

E.6.1 General Comments

The importance of integrating DCRDR information and activities into GGNS-1 design procedures and other NUREG-0737 Supplement 1 programs, and vice versa, is such that MP&L considers Program Integration to be one of the five main components of the GGNS-1 DCRDR (see Program Plan Sections 2 through 6). However, due to the nature of this component, there will be few activities accomplished specifically under Program Integration. Each of the DCRDR phases, processes, and activities will incorporate the applicable requirements and objectives of Program Integration, as discussed below and detailed in Program Plan Section 6.

E.6.2 Regulatory Requirements and Guidance

This component of the DCRDR will meet the coordination and integration requirements of NUREG-0737 Supplement 1 (Section 3), and will follow the guidance of NUREG-0700 (Section 1.3) and NUREG-0801.

E.6.3 Program Integration Objective

The objective of Program Integration is the coordination of the DCRDR with the various NUREG-0737 Supplement 1 programs, the Safety Parameter Display System (SPDS), post-accident monitoring (PAM) instrumentation, upgrade of Emergency Operating Procedures (EOPs), and Emergency Response Capability (ERC) training, so that all programs are properly accomplished and an integrated, operable Control Room is the result.

E.6.4 Human Factors Considerations after the DCRDR

MP&L will conduct a human factors review of all future design changes in the Control Room. This review will use the computerized database and the Human Factors Criteria developed during the DCRDR. This process will be documented in MP&L GGNS-1 design procedures and is detailed in Program Plan Section 6.3.

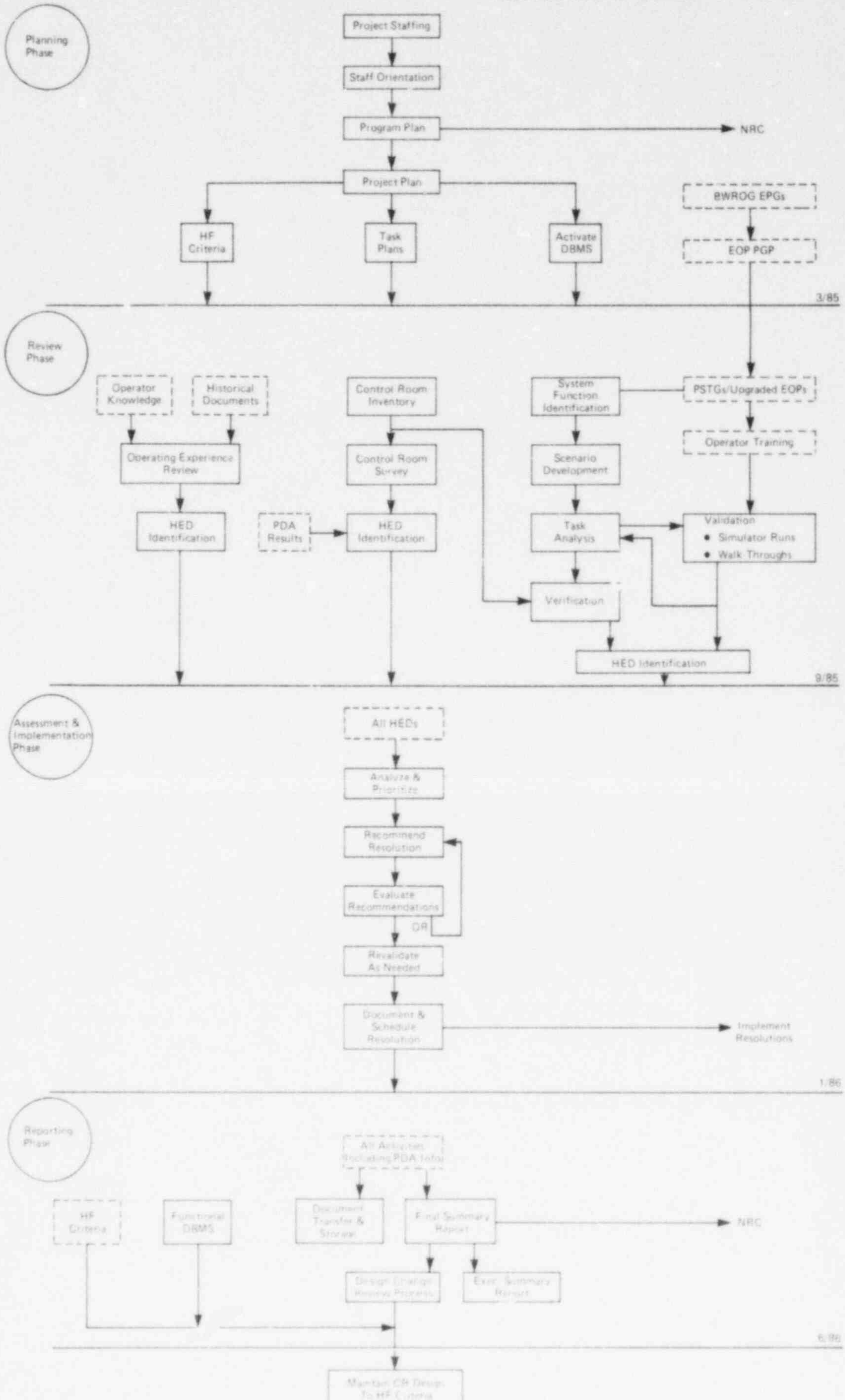


Figure E-1. DCRDR Phases and Activities

GRAND GULF NUCLEAR STATION - UNIT 1
DETAILED CONTROL ROOM DESIGN REVIEW PROGRAM PLAN

1. INTRODUCTION

1.1 General Comments

1.1.1 Program Plan Purpose

This Program Plan describes the program which Mississippi Power & Light Company (MP&L) will use to perform a Detailed Control Room Design Review (DCRDR) of the Grand Gulf Nuclear Station - Unit 1 (GGNS-1) in accordance with the requirements of NUREG-0737 Supplement 1 (Section 5).

1.1.2 The Need for a DCRDR

The need for DCRDRs has been well documented by the Nuclear Regulatory Commission (NRC) as a result of the investigations of the Three Mile Island accident (see Appendix A, Bibliography). The significant areas of concern identified included noncompliance of Control Room facilities with human factors principles, deficiencies in information presented to the operator, and inadequate operating procedures.

1.1.3 Other MP&L Improvement Efforts in the Control Room

The DCRDR is part of a larger effort within MP&L to improve the overall Emergency Response Capability (ERC). The scope of this Program Plan is directed toward a human factors review of the design adequacy and operability of the existing Control Room. However, MP&L recognizes and intends that other areas of concern related to the Control Room and ERC will be coordinated with the DCRDR to ensure that an integrated, operable Control Room will result. These other areas include upgrading the Emergency Operating Procedures (EOPs), installing a Safety Parameter Display System (SPDS), installing the appropriate post-accident monitoring (PAM) instrumentation per Regulatory Guide 1.97, and completing the ERC training program.

1.2 DCRDR Purpose and Requirements

1.2.1 Program Purpose

The DCRDR will identify and initiate improvements in the Control Room that offer high probability for improving plant safety by strengthening the man-machine interface. Although primary emphasis will be placed on improving ERC, problem areas in other operations will also be examined.

1.2.2 Regulatory Requirements and Guidance

To accomplish the above purpose, MP&L has designed the DCRDR to fulfill the requirements of NUREG-0737 Supplement 1 (Section 5) in

accordance with the guidance of the applicable portions of NUREG-0700 and NUREG-0801. These requirements for the GGNS-1 DCRDR are listed below:

a. The establishment of a qualified multidisciplinary review team and a review program incorporating accepted human engineering principles.

b. The use of system functions review and task analysis to identify Control Room operator tasks and information and control requirements during emergency operations.

c. A comparison of the display and control requirements with a Control Room inventory to identify missing displays and controls.

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.

e. An assessment of human engineering discrepancies (HEDs) that are significant and should be corrected; the selection of design improvements that will correct these discrepancies.

f. A verification that each selected design improvement will provide the necessary correction, and can be introduced in the Control Room without creating unacceptable HEDs because of significant contribution to increased risk, unreviewed safety questions, or situations in which a temporary reduction in safety could occur. Improvements that are introduced will be coordinated with changes resulting from other improvement programs such as SPDS, ERC training, new PAM instrumentation, and upgraded EOPs.

1.3 Plant Description

1.3.1 Utility Information

MP&L is a part of Middle South Utilities, Incorporated, and serves more than 310,000 customers in western Mississippi. The company was founded in 1923, and now employs more than 2,000 personnel in all areas of power generation and distribution. MP&L headquarters is located in Jackson, Mississippi.

1.3.2 Plant Site and Description

GGNS-1 is located in Claiborne County, Mississippi, approximately 25 miles south of Vicksburg near the town of Port Gibson, Mississippi. The GGNS-1 nuclear steam supply system (NSSS) is a General Electric Boiling Water Reactor/6 (BWR/6) with a Mark III Containment, capable of a peak electric generating capacity of

1250 megawatts. The GGNS-1 Architect-Engineer and Constructor was Bechtel Power Corporation. Significant dates for GGNS-1 are listed below:

Milestone	Date
Application for Construction Permit	September 1972
Construction Permit issued	September 1974
Operating License granted (Low Power)	June 1982
Operating License granted (Full Power)	August 1984

1.4 Plant Features Covered by the DCRDR

1.4.1 Main Control Room

The central focus of the DCRDR will be the main control room (see Section 1.6.2a), shown in Figure 1.

1.4.2 Remote Shutdown Panels

Also included in the DCRDR will be the displays and controls required to bring the plant to cold shutdown should the main control room become uninhabitable. These items are listed below:

- Panel 1H22-P150, Division 1 Remote Shutdown Panel
- Panel 1H22-P151, Division 2 Remote Shutdown Panel

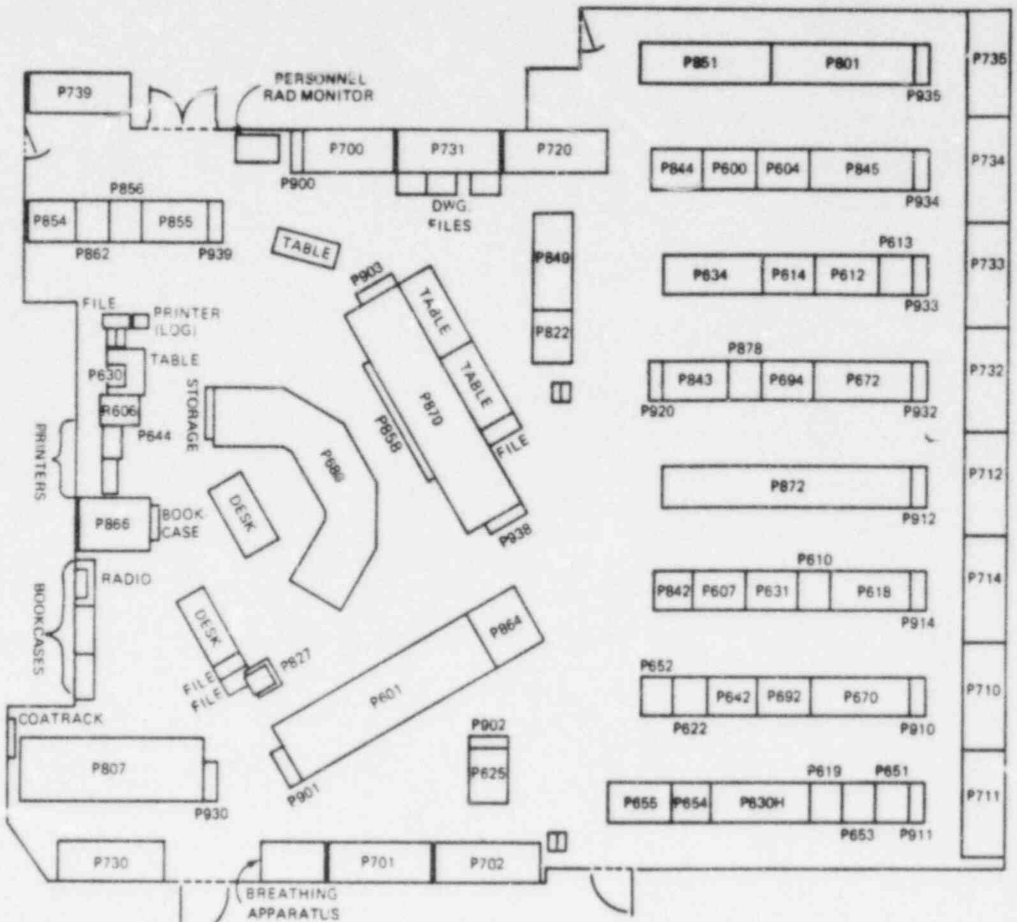
1.5 Previous Human Factors Work in the Control Room

1.5.1 GGNS-1 Preliminary Design Assessment

During a period extending from 1980 through 1982, MP&L performed a Preliminary Design Assessment (PDA) on GGNS-1 as allowed by NUREG-0737 Supplement 1 (Section 5.2.f). The initial results of the PDA were summarized in a document entitled "Human Factors Engineering Evaluation of the Grand Gulf Unit 1 Control Room," which was based on the checklist established in the NUREG-1580 guidelines. Subsequent environmental surveys were performed using the checklist guidance of NUREG-0700 (Section 6). Numerous HEDs were documented and resolutions agreed upon with the NRC prior to GGNS-1 full power licensing. The results of this effort, including HED resolution, are summarized in the GGNS-1 Safety Evaluation Report (NUREG-0831) and its Supplements 1 through 6.

1.5.2 Control Room CRT Console Human Factors Review

In 1982 MP&L commissioned the Quadrex Corporation to provide a human factors review of several GGNS-1 main control room information display systems, including Powerplex, Balance-of-Plant, and the process computer, with the operator guides. This review was summarized in a document entitled "Human Factors Review of the Control Room CRT Displays" (Report No. QUAD-1-82-242).



H13-P801	GENERATOR & TRANSFORMER PROTECTION VB
H13-P807	AUXILIARY ELECTRICAL CONTROL BB
H13-P822	TURBINE SUPERVISORY RECORDER VB
H13-P842	HVAC CONTROL VB
H13-P843	BOP PROCESS INSTRUMENT CABINET
H13-P844	AREA RADIATION MONITOR CABINET
H13-P845	OFF GAS SYSTEM (LOW TEMP) CONTROL VB
H13-P851	ANNUNCIATOR LOGIC CABINET
H13-P854	PLANT CONTROL VERTICAL BOARD
H13-P855	CONTROL ROOM VENT. VERTICAL BOARD
H13-P856	SEISMIC INSTRUMENT CABINET
H13-P862	FIRE PROTECTION VB
H13-P864	DIESEL GENERATOR BB
H13-P866	MONITORING CONSOLE
H13-P870	AUXILIARY CONTROL BENCHBOARD
H13-P87[illegible]	DIV. II ESF LOGIC VB
H13-P8[illegible]	BOP LOGIC VB
H13-P878	DIV. 4 ESF LOGIC VB
H13-P7XX	TERMINATION CABINETS
H13-P600	PROCESS RADIATION RECORDERS VB
H13-P601	REACTOR CORE COOLING BB
H13-P604	PROCESS RADIATION MONITORING INSTRUMENT PANEL
H13-P607	TIP CONTROL & MONITORING INSTRUMENT PANEL
H13-P610	CONTROL ROD TEST INSTRUMENT PANEL
H13-P612	FEEDWATER & RECIRCULATION VB
H13-P613	NSSS PROCESS INSTRUMENT CABINET
H13-P614	NSSS TEMPERATURE RECORDER VB
H13-P618	DIV 2 RESIDUAL HEAT REMOVAL (RHR) B & C RELAY VB
H13-P619	JET PUMP INSTRUMENTATION PANEL
H13-P622	INBOARD VALVE RELAY VB
H13-P625	HIGH PRESSURE CORE SPRAY RELAY VB
H13-P630	REMOTE ANN ELECTRONIC VB P630H
H13-P631	AUTO. DEPRESS. CHANNEL "B" RELAY VB
H13-P634	RECIRC. FLOW CONTROL
H13-P642	DIV. 2 LEAK DETECTION VB
H13-P654	MSIV DIV. 2 VB
H13-P655	MSIV DIV. 1 VB
H13-P670	NEUTRON & RADIATION MONITOR DIV. 2
H13-P672	NEUTRON & RADIATION MONITOR DIV. 4
H13-P680	OPERATOR CONTROL CONSOLE
H13-P692	DIV. 2 RPS LOGIC VB
H13-P694	DIV. 4 RPS LOGIC VB
H13-P651	ROD ACTION CONTROL CAB DIV. I
H13-P652	ROD ACTION CONTROL CAB DIV. II
H13-P653	ROD DRIVE CONTROL CAB
H13-P900	FIRE PROTECTION CABINET
H13-P901	FIRE PROTECTION CABINET
H13-P902	FIRE PROTECTION CABINET
H13-P903	FIRE PROTECTION CABINET
H13-P910	FIRE PROTECTION CABINET
H13-P911	FIRE PROTECTION CABINET
H13-P912	FIRE PROTECTION CABINET
H13-P914	FIRE PROTECTION CABINET
H13-P920	FIRE PROTECTION CABINET
H13-P930	FIRE PROTECTION CABINET
H13-P932	FIRE PROTECTION CABINET
H13-P933	FIRE PROTECTION CABINET
H13-P934	FIRE PROTECTION CABINET
H13-P935	FIRE PROTECTION CABINET
H13-P938	FIRE PROTECTION CABINET
H13-P939	FIRE PROTECTION CABINET
C91-R606	NSSS CRT
C91-P644	NSSS PERIPHERAL TABLE
C93-P827	SPDS CONSOLE
H13-P858	ISOLATION VALVE STATUS PANEL

Figure 1. Main Control Room Layout

1.5.3 Transition from Previous Work to the DCRDR

a. MP&L will perform a complete Control Room Survey during the DCRDR using NUREG-0700 (Section 6) guidelines as applicable to the GGNS-1 Control Room. MP&L will refer to the PDA results only to enhance and verify overall DCRDR results.

b. The Control Room Survey to be performed during the DCRDR (see Section 3.4) will confirm the adequacy of the resolution of the high-priority HEDs from the PDA and will verify that all low-priority HEDs from the PDA not previously resolved were identified as new HEDs.

c. The information in the Quadrex Corporation report (see Section 1.5.2) will be used in the DCRDR Review Phase.

d. MP&L will take credit for all work done to improve Control Room operability before the DCRDR. Such credit will be detailed and supported in the Final Summary Report.

1.6 Glossary of Terms and Acronyms

1.6.1 General Remarks

Within this Program Plan, a number of terms and acronyms are used that apply to the DCRDR. Since there are differences in the usage of these terms (even among practitioners in the nuclear industry), the definitions shown below will apply to all GGNS-1 DCRDR activities. Applicable acronyms are also listed.

1.6.2 Terms

a. Control Room - The term "Control Room" refers to all plant features covered by the DCRDR as outlined in Section 1.4. The term "main control room" is used to denote the control room as shown in Figure 1 and does not include the Remote Shutdown Panels.

b. Control Room Enhancements - Surface modifications that do not involve major physical changes, for example, demarcation, labeling changes, and painting.

c. Detailed Control Room Design Review (DCRDR) - The Control Room Design Review described in this Program Plan, as required by NUREG-0737 (Item I.D.1) and NUREG-0737 Supplement 1 (Section 5).

d. Emergency Operating Procedures (EOPs) - Plant procedures directing operator actions necessary to mitigate the consequences of accidents. The EOPs will be developed using the Plant Specific Technical Guidelines (PSTGs) and the EOP Writers Guide, per NUREG-0899.

e. Emergency Procedure Guidelines (EPGs) - The technical guidelines developed by the BWR Owners Group (BWROG), which provide sound engineering bases for use in developing BWR PSTGs and EOPs.

f. Final Summary Report - Report of the results of the DCRDR as described by NUREG-0737 Supplement 1 (Section 5.2.b). The GGNS-1 Final Summary Report is described in Section 5.1 of this Program Plan.

g. Function (Subfunction) - A kind of activity (or a static role) performed by one or more system constituents (people, mechanisms, structures) to contribute to a larger activity or goal state.

h. Function Allocation - The distribution of functions among the human and automated constituents of a system.

i. Function/Functional Analysis - The examination of system goals to determine the functions the system requires. Also, examination of the required functions with respect to available manpower, technology, and other resources, to determine how the functions may be allocated and executed. In the DCRDR, primarily the identification of established functions and examination of how they are allocated and executed.

j. Guidance - A given condition that is subject to modification or change when adequate, documented justification is provided.

k. Human Engineering - The science of optimizing the performance of human beings, especially in industry. Also, more narrowly, the science of the design of equipment for efficient use by human beings. In GGNS-1 DCRDR activities, the broader definition is used.

l. Human Engineering Discrepancy (HED) - A departure from some benchmark of system design suitability for the roles and capabilities of the human operator.

m. Operator - Any NRC-licensed individual in a nuclear power facility who manipulates a control or directs another to manipulate a control.

n. Plant Specific Technical Guidelines (PSTGs) - The plant specific technical requirements developed from the BWROG EPGs, along with any other plant specific requirements determined necessary for mitigating the consequences of an accident. The PSTGs provide the technical basis for the EOPs.

o. Requirement - A given condition that is not subject to modification or change.

p. System (Subsystem) - A whole that functions as a whole by virtue of the interdependence of its parts. Also, especially of human systems, an organization of interdependent constituents that work together in a patterned manner to accomplish some purpose.

q. System(s) Analysis - Examination of a complex organization and its constituents to define their relationships and the means by which their actions and interactions are regulated to achieve goal states.

r. Task (Subtask) - A specific action, performed by a single system constituent, person or equipment, that contributes to the accomplishment of a function. In the DCRDR, only tasks allocated to people, in particular to Control Room operators, are addressed in detail.

s. Validation - The process of determining whether the physical and organizational design for operations is adequate to support effective integrated performance of the functions of the Control Room operating crew.

t. Verification - The process of determining whether instrumentation, controls, and other equipment meet the specific requirements of the task performed by operators.

1.6.3 Acronyms

a. AMI - Accident Monitoring Instrumentation

b. ATWS - Anticipated Transient Without Scram

c. BWR - Boiling Water Reactor

d. BWROG - BWR Owners Group

e. CR - Control Room

f. CRT - Cathode Ray Tube (Display)

g. DBMS - Database Management System

h. DCRDR - Detailed Control Room Design Review

i. EOP - Emergency Operating Procedure

j. EPGs - Emergency Procedure Guidelines

k. ERC - Emergency Response Capability

l. ERF - Emergency Response Facility

m. ERFIS - Emergency Response Facility Information System

n. FSAR - Final Safety Analysis Report

o. GGNS-1 - Grand Gulf Nuclear Station - Unit 1

p. GDGs - Graphic Display Guidelines

q. HED - Human Engineering Discrepancy

r. HF - Human Factors

s. HFC - Human Factors Consultant

t. I&C - Instrumentation and Controls

u. LER - Licensee Event Report

v. MP&L - Mississippi Power & Light Company

w. NPE - MP&L Nuclear Plant Engineering

x. NRC - U.S. Nuclear Regulatory Commission

y. PAM - Post-Accident Monitoring

z. PDA - Preliminary Design Assessment

aa. PGP - Procedures Generation Package

bb. PSTGs - Plant Specific Technical Guidelines

cc. RG - Regulatory Guide

dd. SME - Subject Matter Expert

ee. SPDS - Safety Parameter Display System

ff. SRO - Senior Reactor Operator

gg. TAW - Task Analysis Worksheet

hh. V&V - Verification and Validation

2. PLANNING PHASE

2.1 Planning Phase Objectives

The main objectives of the Planning Phase are to completely identify activities and schedule sequences of events by the responsible organization and to develop a Program Plan for submittal to the NRC. In addition, the Planning Phase will be used to develop the DCRDR Task Plans, plan and schedule activities in a DCRDR Project Plan, orient DCRDR Team members, and document Human Factors Criteria for DCRDR use.

2.2 DCRDR Management and Staffing

2.2.1 DCRDR Team Structure

a. Team Leader

All levels of MP&L management recognize the importance of the DCRDR and the other NUREG-0737 Supplement 1 programs. MP&L is dedicated to providing all management involvement necessary to provide a complete, multidisciplined Control Room review. However, the day-to-day conduct of the review (including the use of additional support for the DCRDR Team as needed) will be the responsibility of the DCRDR Team Leader. The DCRDR Team Leader will provide the program management oversight to ensure the accomplishment of the project objectives and to meet the regulatory requirements of the review. The DCRDR Team Leader is responsible for planning, scheduling, coordinating, and integrating all DCRDR activities.

b. Team Members

The DCRDR Team consists of a core group of specialists in human factors engineering, plant operations, and nuclear and electrical/instrumentation & controls (I&C) engineering. This core group includes personnel who are also knowledgeable in licensing, training, program management, and other NUREG-0737 Supplement 1 programs such as SPDS and upgrade of EOPs. The relationships among team members are shown in Figure 2.

2.2.2 DCRDR Team Member Qualifications and Duties

The qualifications of the DCRDR Team members meet the NUREG-0801 criteria. The team members' resumes are provided in Appendix B. Briefly, the team members include:

a. Mr. H. E. Kook, Jr. - DCRDR Team Leader

Assigned to Nuclear Plant Engineering (NPE)-Electrical, Mr. Kook is an electrical engineer who is currently program manager for the GGNS-1 EOP Upgrade Program in addition to his

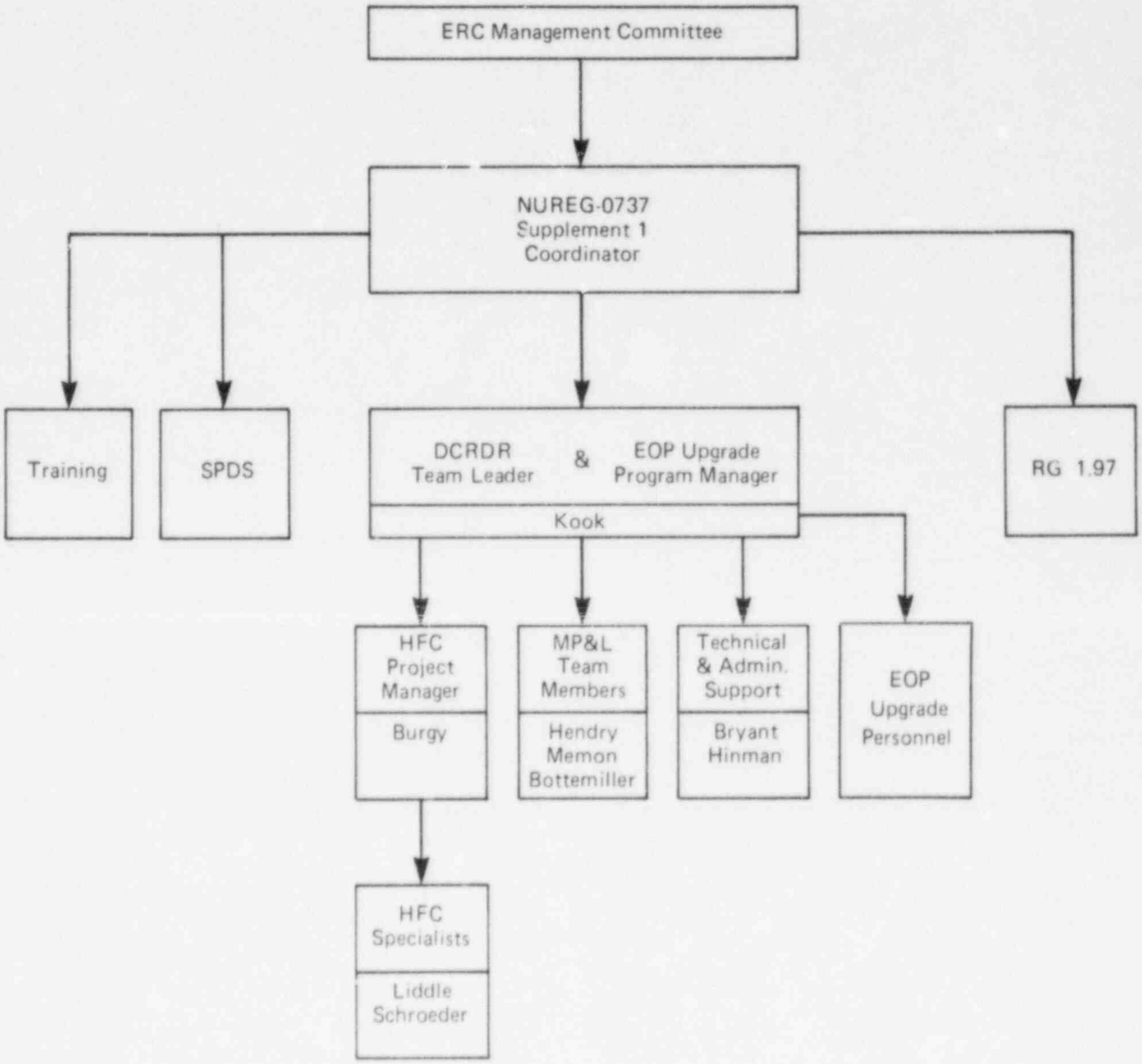


Figure 2. Functional DCRDR Team Organization

duties as DCRDR Team Leader. He is responsible for the scheduling, management, and integration of all DCRDR and EOP Upgrade Program activities.

b. Mr. C. A. Bottemiller - DCRDR Team Member for Operations and Training

Assigned to GGNS-1 Plant Staff-Training, Mr. Bottemiller is currently a licensed Senior Reactor Operator (SRO) with 3 years' experience at GGNS-1 and 3-1/2 years' experience at Brunswick Steam Electric Plant. He will provide operations and training input to the DCRDR Team, and is responsible for DCRDR liaison with MP&L's training department.

c. Mr. W. J. Hendry - DCRDR Team Member for Operations, Engineering, and Licensing

Assigned to MP&L Nuclear Safety and Licensing, Mr. Hendry is a nuclear engineer with previous experience as an SRO (cold license certification) and shift supervisor at GGNS-1, and as a shift supervisor at River Bend Nuclear Station. He will provide operations, engineering, and licensing input to the DCRDR Team, and is responsible for DCRDR liaison with MP&L's licensing organization.

d. Mr. M. A. Memon - DCRDR Team Member for Engineering

Assigned to NPE-Systems, Mr. Memon is an electrical engineer with 11 years' experience. He is currently head of the GGNS-1 Simulator Update Program. He will provide engineering input to the DCRDR Team, and is responsible for DCRDR liaison with NPE-Systems.

e. Mr. D. C. Burgy - DCRDR Team Member for Human Engineering

Assigned as Human Factors Consultant (HFC) Project Manager for the GGNS-1 DCRDR by General Physics Corporation, Mr. Burgy holds a master's degree in applied-experimental psychology and has more than 8 years' experience in the human factors field. He will provide human factors engineering input to the DCRDR Team, and is responsible for DCRDR liason with the HFC.

f. Other HFC Participation - DCRDR Team Member for Human Engineering

One of the following HFC personnel will also participate as a DCRDR Team member when appropriate:

1) Dr. L. R. Schroeder - Human Factors Engineer

Dr. Schroeder is a human factors engineer with over 11 years' experience in academics and industry. He will provide support to the DCRDR, under the direction of the HFC Project Manager.

2) Mr. R. J. Liddle - Human Factors Engineer

Mr. Liddle is a human factors engineer with over 5 years' experience in nuclear power plant human factors applications. He holds a masters degree in Industrial Engineering/Operations Research. He will provide support to the DCRDR, under the direction of the HFC Project Manager.

2.2.3 DCRDR Team Support

a. General Physics Corporation - Human Factors Support

General Physics Corporation will provide any additional human factors engineering support required for the DCRDR, as directed by the DCRDR Team Leader.

b. Mr. T. M. Bryant - Administrative and Technical Background Support

Mr. Bryant is an electrical engineer who will provide administrative and technical background support for the DCRDR, under the direction of the DCRDR Team Leader.

c. Mr. J. P. Hinman - Technical Support

Mr. Hinman is a mechanical engineer (with an associate degree in electronics technology) who will provide technical support and DCRDR liaison with NPE-Mechanical-I&C, under the direction of the DCRDR Team Leader. Additional technical support is available on site from the MP&L staff, the Architect-Engineer, and/or the NSSS supplier.

2.2.4 DCRDR Team Orientation

a. GGNS-1 Orientation for HFC

The HFC will undergo a brief orientation period at GGNS-1. During this orientation period, the HFC will establish a working knowledge of the GGNS-1 DCRDR by participating in an organizational meeting to establish project control guidelines and policy. In addition, this period will be a time for the HFC to become familiar with the general plant and Control Room layout and the MP&L ERC efforts.

b. Human Factors Orientation for MP&L

The HFC will present a short course at GGNS-1 detailing the applicable requirements of NUREG-0737 Supplement 1, the guidance of NUREG-0700 and NUREG-0801, and the basics of human engineering principles as applied to nuclear power stations.

2.3 Data Management

A large number of documents will be referenced and produced during the DCRDR. Therefore, an efficient and systematic method for controlling these documents is necessary. The DCRDR Team Leader is responsible for documentation control. All documents used as primary input to the DCRDR or generated during the DCRDR will be subject to document control procedures. All documentation received or generated during the DCRDR will be logged. The log will contain the document name, the revision level, and the date received. Written procedures will be prepared for the control of DCRDR documentation.

A comprehensive documentation file will be maintained for use by the DCRDR Team. At the end of the project, any GGNS-1 documentation retained by the HFC will be turned over to MP&L to maintain for future use and reference.

2.3.1 Documentation Requirements

The methodology described in this section will be used to meet the following documentation requirements:

a. Provide a record of all documents used by the DCRDR Team as references during the various phases of the DCRDR.

b. Provide a record of all documents produced by the DCRDR Team as project output.

c. Allow an audit path to be generated through the project documentation.

d. Develop project files in a manner that allows future access to help determine the effects of Control Room changes proposed in the future.

2.3.2 Input Data

The following documents have been identified as reference material to be used during the review process. As the review progresses, it is anticipated that additional material will be identified and referenced. Therefore the following list of documents is preliminary:

- Licensee Event Reports (LERs)
- Final Safety Analysis Report (FSAR), Chapter 15, "Accident Analysis"

- Training Department Systems Descriptions
- Piping and Instrumentation Drawings
- I&C Index
- Control Room Floor Plan
- Panel Layout Drawings
- Panel Photographs
- Emergency Procedure Guidelines (EPGs) prepared by the Boiling Water Reactor Owners Group (BWROG)
- GGNS-1 EOPs
- Off-Normal Event Procedures
- System Operating Instructions
- PDA information

2.3.3 Output Data

Throughout the DCRDR, documents will be processed to record data, document analyses, and record findings. Whenever possible and appropriate, standard forms will be developed and used. The following list represents a preliminary estimate of the types of documents that will result from the DCRDR:

- Program Plan
- Project Plan (including schedule)
- Task Plans
- Human Factors Criteria
- Operator Questionnaire
- LER Review Results forms
- Control Room Inventory Worksheets
- Panel Checklists (from the Control Room Survey)
- Task Analysis Worksheets
- Videotapes of Validation
- All HEDs
- Executive Summary Report
- Final Summary Report

2.3.4 Database Management System

The focus of the computerized database management system (DBMS) is an IBM XT computer. The DBMS software is based on the dBASE III system by Ashton-Tate, as modified by General Physics Corporation for DCRDR projects. The DBMS will allow for selective sorts and lists of data collected throughout the DCRDR. The following data will be input into the DBMS files:

- HEDs and other findings from the review of GGNS-1 operating experience

- A list of the tasks and subtasks from task analysis, including related systems, controls, or displays required to accomplish the task or subtask

- A list of controls, displays, and other equipment from the Control Room Inventory, including identification number, location, name, and description of features

- HEDs and other results of the Control Room Survey and the Verification and Validation activities

- The results of the Assessment and Implementation activities, documented on all HED forms (similiar to Figure C-1 in Appendix C)

- All forms and standard documents used in the DCRDR

- All other HEDs or findings not specified above

Each of the input data files will allow for rapid, convenient management and tracking of the review findings and results. The HED file will provide a look-alike output form (similar to Figure C-1 in Appendix C) that will be used in the Final Summary Report and other documentation. The DBMS will be used in the future MP&L review of Control Room design changes.

2.4 Equipment and Workspace

MP&L has made arrangements for workspace to be provided for the DCRDR Team in the GGNS-1 Energy Services Center, the site of the GGNS-1 plant specific simulator. The HFC will provide all the equipment required to conduct the Control Room Survey and videotaping of Validation walk-throughs.

2.5 Scheduling

MP&L has prepared a tentative schedule for all DCRDR activities. This schedule is shown in Figure 3.

2.6 Planning Phase Documentation

2.6.1 NRC Program Plan

In accordance with NUREG-0737 Supplement 1 (Section 5.2.a), this Program Plan was prepared for submittal to the NRC and is the controlling document for the GGNS-1 DCRDR.

2.6.2 MP&L Project Plan

The MP&L Project Plan will detail and schedule all DCRDR activities by MP&L and HFC organization. Reference to applicable DCRDR Task Plans will be used instead of detailing certain activities. The Project Plan will also specify all activities needed for the DCRDR to comply with the requirements of NUREG-0737 Supplement 1 (Section 3, "Coordination and Integration of Initiatives").

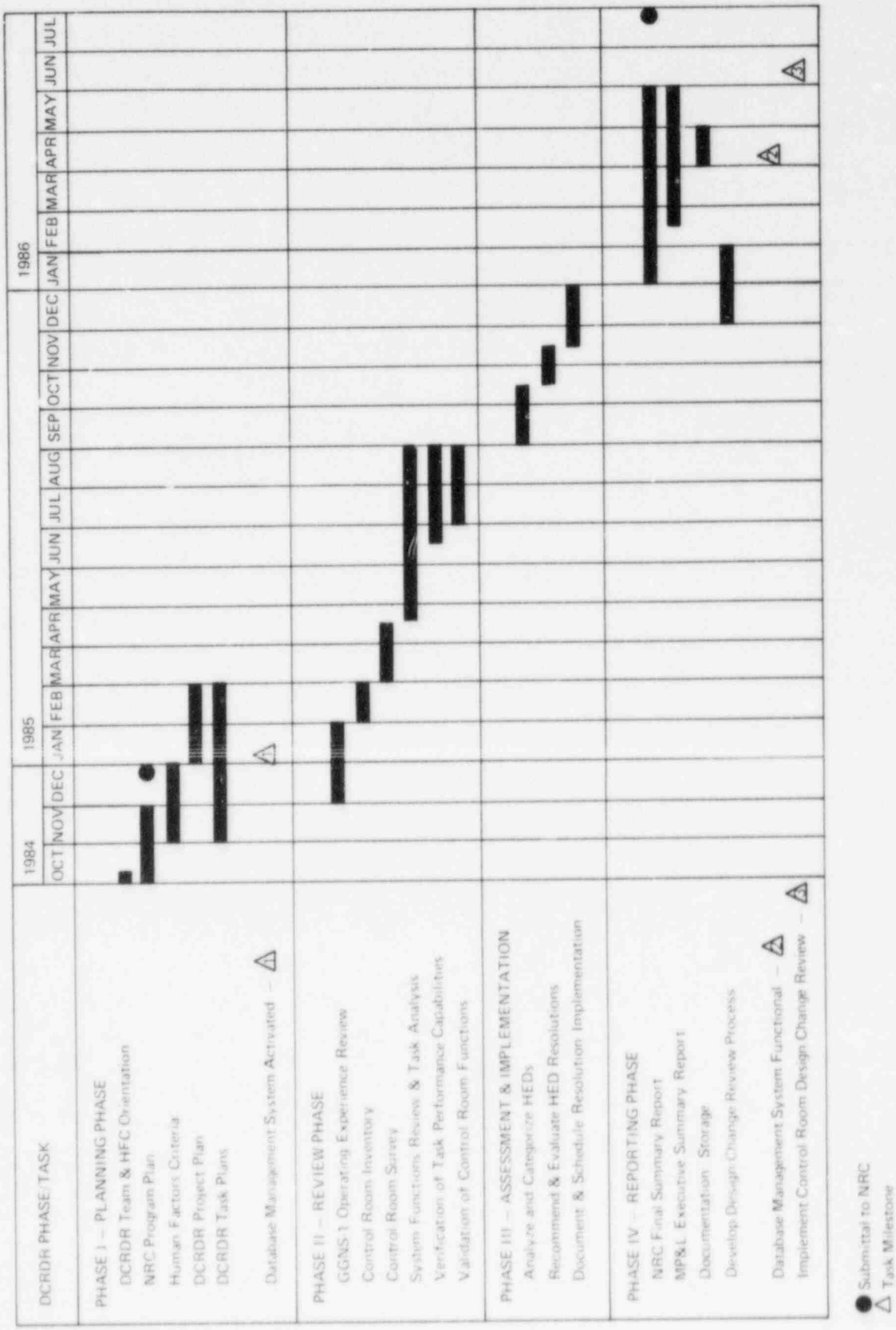


Figure 3. Tentative DCRDR Schedule

2.6.3 Task Plans

Over the duration of the DCRDR, approximately seven DCRDR Task Plans will be prepared. These Task Plans will supply detailed, working level instructions for the completion of certain DCRDR activities.

2.6.4 Human Factors Criteria

Human factors specialists will develop and document the human engineering criteria and conventions specifically applicable to the GGNS-1 Control Room. All applicable requirements, whether NRC (NUREG-0700) or other, and the source criteria will be identified in a manner that permits easy reference for convenient project use. Also, the human factors specialists will provide documentation indicating why specific NRC criteria are not applicable in a particular case. These criteria and documentation will be submitted to the DCRDR Team for review and approval. After the DCRDR, the Human Factors Criteria will be adapted for ongoing reviews and documentation of future changes to the GGNS-1 Control Room.

3. REVIEW PHASE

3.1 Review Phase Processes

Six major processes discussed in NUREG-0700 will be used to establish and apply benchmarks for identifying HEDs of both Control Room completeness and its human engineering suitability:

- Operating Experience Review
- Control Room Inventory
- Control Room Survey
- System Functions Review and Task Analysis
- Verification of Task Performance Capabilities
- Validation of Control Room Functions

The activities involved in each of the six processes are discussed below.

3.2 Operating Experience Review

3.2.1 Purpose

The Operating Experience Review will identify factors or conditions that could cause and/or have previously caused human performance problems and could be alleviated by improved human engineering. This review will provide information on potential problem areas by studying documented occurrences of human engineering related problems that have occurred at GGNS-1 and at similar plants.

3.2.2 Methodology

There are two major steps in the Operating Experience Review: a Historical Documentation Review and Operator Interviews. The methodologies for both tasks are described below.

a. Historical Documentation Review

LERs for GGNS-1 and two other similar plants (LaSalle and Susquehanna) will be reviewed to identify deficiencies known to have previously contributed to operator errors. This review will consist of the following steps:

1) Obtain documentation.

2) Examine LER documentation and summarize the circumstances and events that are associated with the Control Room problem noted in the documentation. An LER HED Review Summary form, similar to Figure C-2 in Appendix C, will be used to summarize and document Control Room human factors problems identified in historical reports. The form will provide information concerning the event itself, an indication of

what actions have been taken to resolve the problem, and additional human factors recommendations. A Control Room problem is defined as one in which:

a) The equipment referenced in the LER is located in the main control room or remote shutdown panels.

b) The procedure referenced is used within the main control room or remote shutdown panels.

c) The personnel error occurred using main control room or remote shutdown panel components.

3) The DCRDR Team will review the completed LER Review Results forms to determine applicability to GGNS-1. All applicable Control Room problems from the Historical Documentation Review will be documented as HEDs.

b. Operator Interviews

The purpose of the Operator Interviews is to obtain direct operator input to aid in identifying potential or actual deficiencies in the Control Room layout or design or in operating procedures that result in confusion (mental activities), difficulty (manual activities), or distraction (the environment).

The steps for conducting operator interviews are:

1) Distribute confidential questionnaires to as many operations personnel, including training instructors, as is possible. The HFC will distribute and evaluate the questionnaires to ensure uninhibited responses.

2) Assimilate questionnaire responses and develop interview format based on responses.

3) Conduct follow-up interviews with as many questionnaire respondents as possible. If possible, conduct interviews in the Control Room (or simulator) so that interviewees can refer to the control boards to explain in detail the types of concerns or problems they have encountered. Again, the HFC will take the lead in this activity to prevent peer and/or management pressure from influencing responses.

4) Review data to ascertain whether the concerns encountered are HEDs.

5) Document HEDs on an HED form.

3.3 Control Room Inventory

3.3.1 Purpose

The purpose of a Control Room Inventory is to provide a basis to determine whether the I&C needed to support GGNS-1 emergency operations are available in the Control Room.

3.3.2 Methodology

The DCRDR Team will review all GGNS-1 Control Room panel layout drawings to denote the current "as-built" configuration of the Control Room. An appropriate "freeze" date will be established by the DCRDR Team. Equipment characteristics associated with all Copntrol Room I&C will be noted using a form similar to Figure C-3 in Appendix C. Then, a data summary of the Control Room Inventory will be entered into the DBMS.

3.4 Control Room Survey

3.4.1 Purpose

The purpose of the Control Room Survey is to identify characteristics of I&C, equipment, physical layout, and environmental conditions that do not conform to precepts of good human engineering practice, regardless of the particular system or specific task requirements. This survey is accomplished by conducting a systematic comparison of existing Control Room design features with documented human engineering guidelines. The ultimate objective is to identify potential enhancements and modifications of the operator-Control Room interface that will reduce the potential for human error.

3.4.2 Methodology

The Control Room Survey will be performed using checklists based on NUREG-0700 (Section 6). Any difference from NUREG-0700 (Section 6) will be documented and justified in the Final Summary Report. The checklists will be completed for each panel in the main control room and the remote shutdown panels during the planned DCRDR activities. Any deviations from the checklist criteria will be documented as HEDs. The major steps in the checklist effort are:

a. Obtain one copy of the checklist per panel for the main control room and remote shutdown areas.

b. Conduct the survey using one checklist per panel and document pertinent readings and measurements, or compliance with the checklist criteria.

c. After all the checklist data have been collected, review the data to extract all HEDs.

d. Document HEDs on an HED form and input into the DBMS. These forms will be the input documentation for the DCRDR Assessment and Implementation Phase.

e. Verify that HEDs from the PDA not previously resolved were identified as new HEDs.

3.5 System Functions Review and Task Analysis

3.5.1 Purpose

The purpose of the System Functions Review and Task Analysis process of the DCRDR is to determine the input and output requirements of the Control Room crew for emergency operation and to ensure that required systems can be efficiently and reliably operated during emergency operations by available personnel. This will be accomplished by performing an analysis of tasks contained in the GGNS-1 draft EOPs or Plant Specific Technical Guidelines (PSTGs). This approach will address the concerns identified in the NRC Memorandum dated May 14, 1984, regarding the BWROG task analysis requirements.

The activities that make up the System Functions Review and Task Analysis are shown in Figure 4 and described below.

3.5.2 Methodology for System Functions Review

Plant systems and subsystems in the Control Room that the operator must access during emergency operations will be identified. Existing plant documentation (e.g., FSAR, systems descriptions, etc.) relating to safety-related systems will serve as a prime information source. Descriptions of the functions of each of these systems will be prepared. These functions descriptions will include:

- The function(s) of the system
- The condition(s) under which the system is used
- A brief explanation of how the system operates

The description of system functions in this manner will serve as a reference base for the subsequent task analysis. In addition, the systems list will be used to assist in the selection of operating scenarios for the Validation activities.

3.5.3 Methodology for Operating Scenario Selection

GGNS-1 PSTGs or draft EOPs and the list of GGNS-1 safety-related systems will be used to define a set of scenarios that adequately

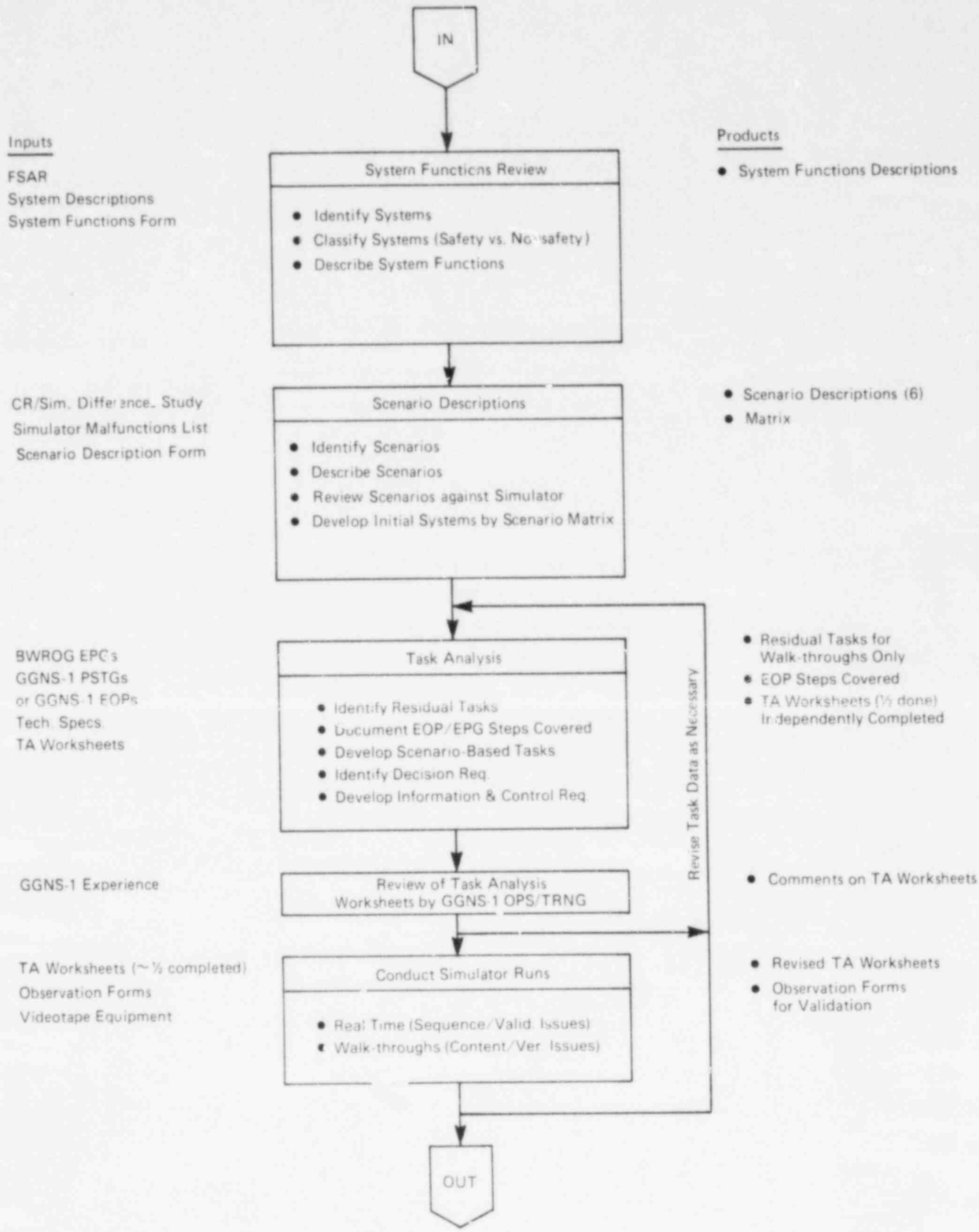


Figure 4. System Functions Review and Task Analysis Steps

sample various emergency conditions (including NUREG-1000 concerns), the plant systems, and system functions used under those conditions.

A brief narrative description of each scenario will be prepared that establishes the limits and conditions of the events to be analyzed. Each scenario description will include:

- Initial plant conditions
- Sequence initiator
- Progression of action
- Final plant conditions
- Major systems involved

3.5.4 Identification of Residual Tasks

Residual operator tasks (unique tasks) from the PSTGs or draft EOPs not covered in the scenarios will also be identified and analyzed for associated information and control requirements. The analysis of residual tasks will be done to ensure that all operator interfaces have been examined, even if those interfaces are not exercised in the emergency scenarios selected for task analysis and validation. Task Analysis Worksheets will also be completed for these tasks. Verification of equipment availability and suitability will be performed for these residual tasks as well as for tasks embedded in the emergency scenarios.

3.5.5 Methodology for Task Analysis

Task Analysis Worksheets (see Figure 5) will be completed to indicate the operational steps required in each scenario along with the appropriate information and control requirements, means of operation, and I&C present on the control boards. The selected scenarios will provide the driving force for the Task Analysis. The scenario number will be recorded for each Task Analysis Worksheet under "Scenario" (Column 1 in Figure 5). The Task Analysis Worksheet fields are detailed in Figure 6. The operator tasks will be analyzed using the GGNS-1 PSTGs or draft EOPs as a starting point. The Task Analysis Worksheets will be prepared according to the steps described below:

a. Part I - Identification of Procedure Steps, Tasks, Decision/Contingent Actions, and Information and Control Requirements (Independent of the Control Room).

   1) Discrete steps in the GGNS-1 PSTGs or draft EOPs and corresponding EPGs will be identified in order of performance within each scenario. These steps will be recorded under "Procedure Number" (Column 2), and branching points noted depending on the plant transient being analyzed under "Scenario Response" (Column 4). Note that there may be more tasks subsequently identified in

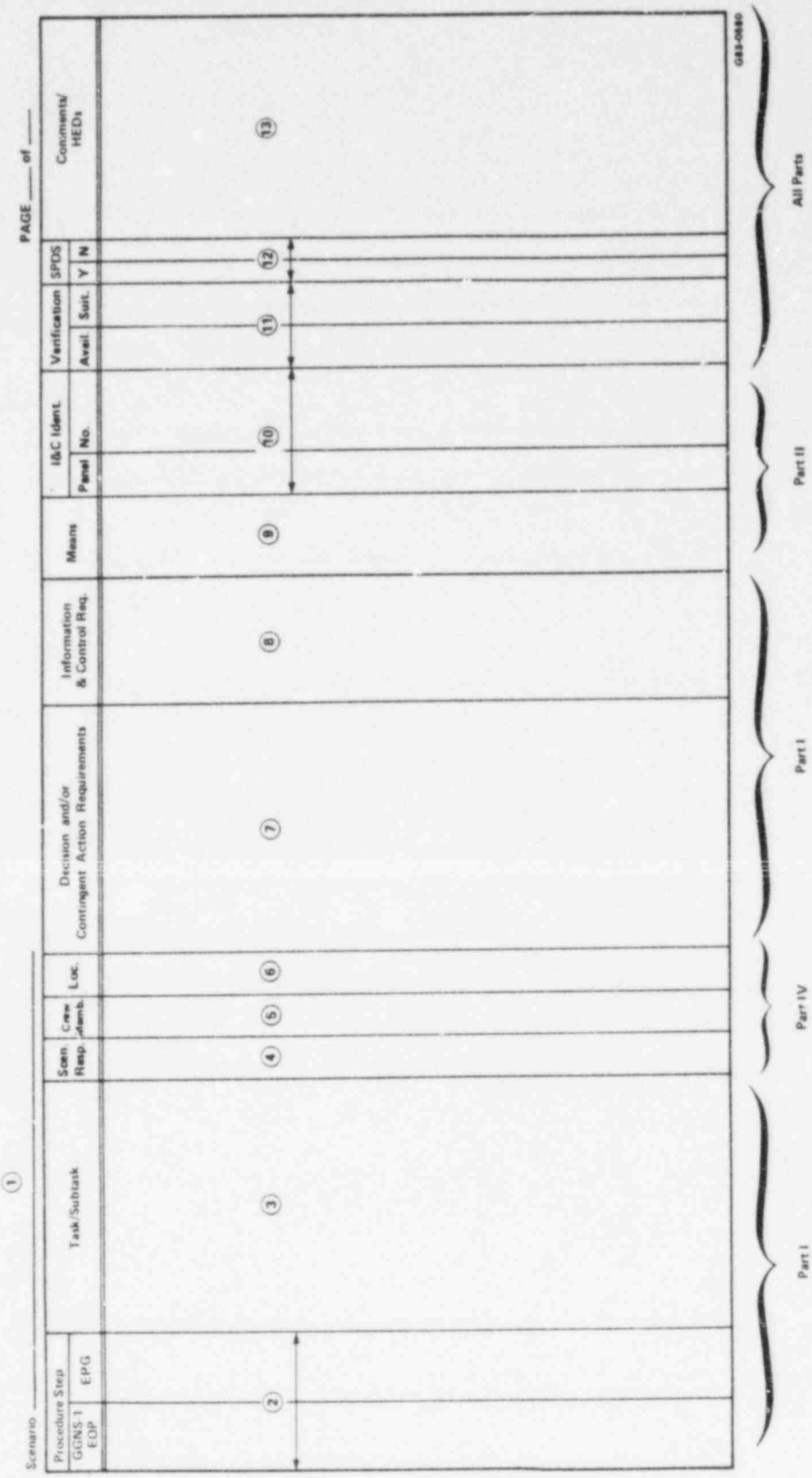


Figure 5. Task Analysis Worksheet (see Figure 6 for numbered column definitions; Part numerals represent groups of columns filled out together)

1. **SCENARIO** - operating scenario name and identifier (completed during Task Analysis).

2. **PROCEDU TEP** - procedure step number for GGNS-1 PSTGs or draft EOPs and for the ROG generic EPGs (completed during Task Analysis).

3. **TASK/SUBTASK** - a description of the crew member task/subtask in the operating sequence (completed during Task Analysis).

4. **SCEN. RESP.** - a notation designating decision points or branching information needed for correct task execution for the operating scenario as defined in the operating scenario description (completed during Task Analysis).

5. **CREW MEMBER** - the crew member who performs the task (completed during Validation).

6. **LOC** - the location where the task is performed (completed during Validation).

7. **DECISION AND/OR CONTINGENT ACTION REQUIREMENTS** - any contingent decision and/or action requirements that are linked to task performance (completed during Task Analysis).

8. **INFORMATION AND CONTROL REQ.** - the information and control requirements for successful task performance (derived independently of the actual I&C in the Control Room). Noted in this column are (1) the system involved, (2) the parameter, component in procedure needed, and (3) the relevant characteristics of the parameter or component referenced for the operator to execute the task (completed during Task Analysis).

9. **MEANS** - the actual means (e.g., switch or meter) used by operators to perform the task in the Control Room (completed during Verification and supplemented during Validation).

10. **I&C IDENT. (PANEL/NO.)** - the actual I&C identified from walk-throughs that the operators used to perform the task. The I&C is uniquely identified using a Panel number and Equipment number (completed during Verification and supplemented during Validation).

11. **VERIFICATION (AVAIL./SUIT.)** - columns that indicate the availability and suitability of the I&C needed for task performance. These columns would contain a "yes" or "no" answer that is arrived at through the Verification process. "No" entries are detailed further on an Equipment Suitability HED form (similar to Figure C-4 in Appendix C) (completed during Verification).

12. **SPDS** - the presence or absence of the I&C and associated characteristics on the SPDS is noted in the "Y" or "N" columns (completed during Verification).

13. **COMMENTS/HEDs** - any comments relating to the above files and/or reference to related HEDs.

Figure 6. Task Analysis Worksheet Field (Column) Definitions

Step 2 below than there are procedural steps. In this case, a unique identifier will be entered in the column when no explicit procedure step is present in the draft EOPs, PSTGs, or EPGs.

2) A brief description of the operator's tasks (in order of procedural steps) will be recorded under "Task/Subtask" (Column 3). Note that there may be many more tasks described than are explicitly called out in the procedural step. All tasks, both explicit and implicit, will be documented by operations-experienced subject matter experts (SMEs) and the HFC using the EPGs, GGNS-1 PSTGs or draft EOPs, and the FSAR.

3) The operator decisions and/or actions linked to task performance are then noted under "Decision and/or Contingent Action Requirements" (Column 7). System functional response is described when appropriate in this column. This set of data also includes branching points in the PSTGs or draft EOPs that determine the outcome of the scenario.

4) Information and control requirements for successful task performance are noted under "Information and Control Requirements" (Column 8). These would typically be parameters, components, or procedural information necessary for operators to adequately assess plant conditions or system status (e.g., reactor vessel water level or containment temperature).

   The relevant characteristics for parameter readings or control selection will also be noted by the SME and HFC under "Information and Control Requirements" (Column 8). The primary sources of information and control requirements for each task will be noted on an Information and Control Requirement Sources form (similar to Figure C-5 in Appendix C). The interrelationships between Figure 5, Task Analysis Worksheet, and the Information and Control Requirement Sources form is shown in Figure 7.

NOTE: It is important to note that Part I is completed on the Task Analysis Worksheet using <u>independent sources of data</u> other than the actual I&C present in the Control Room. Part II essentially completes the first step in the verification process to identify whether or not the necessary I&C for task performance is available in the Control Room.

b. Part II - Determination of I&C Available in the Control Room. After the Tasks, Decision Requirements, and Information and Control Requirements have been identified, the specific I&C that the operator has available for each procedural step

TASK ANALYSIS WORKSHEET

Scenario ____________________ PAGE ____ of ____

Procedure Step		Task/Subtask	Scen Resp.	Crew Memb.	Loc.	Decision and/or Contingent Action Requirements	Information & Control Req.	Means	I&C Ident.		Verification		SPDS		Comments/HEDs
GGNS-1 EOP	EPG								Panel	No.	Avail	Suit.	Y	N	

Sources of Relevant Characteristics

* I&C Identifi
includes 'Me

INFORMATION AND CONTROL REQUIREMENT SOURCES

Completed by: ____________________
Date: ____________________

TAW REF.		SOURCE OF INFORMATION & CONTROL REQUIREMENT									
Scenario	Task I.D.	SME	EPG	EOPs	EOP Basis	SPDS/AMI	FSAR/ Design Bases	Tech. Specs.	EPRI GDG	Other	Location of Source

Also Available On
Aperture Card

TAW REF		I&C Equipment Ident.	EQUIPMENT SUITABILITY HEDs**			Comments
Scen	Task I.D.		Info. not Appropriate	Direct Sys. Status Not Provided	Not Fully Useable	

** Discussion of this form is included in verification section of program plan.

ation
ns' column

EQUIPMENT CHARACTERISTICS

I & C (Equipment) Identification	Parameter	Display Characteristics		Scale Units/Type
		Range	Units	

Figure 7

850

and task will be determined from the Control Room Inventory discussed in Section 3.3. All I&C needed to (1) initiate, maintain, or remove a system from service, (2) confirm that an appropriate system response has or has not occurred, i.e., feedback, or (3) make a decision regarding plant or system status will be listed from the inventory.

The "Means" (Column 9) refers to how the information and control requirements are presented on the control boards (e.g., switch or meter). "I&C Identification" (Column 10) provides the specific panel number and identification number of the control or instrument.

For each I&C equipment item identified in this column, the equipment characteristics (parameter, range, units, scale, and/or control states) will already be noted on a separate I&C Equipment Characteristics form that was completed as part of the inventory process discussed in Section 3.3.

The remaining columns of the Task Analysis Worksheet (Parts III and IV) will be used during the Verification of Task Performance Capabilities, which is described in Section 3.6. The Task Analysis Worksheet thus serves as the complete record of operator tasks, decisions, information and control requirements, and I&C availability and suitability verification.

3.5.6 DBMS Use for Managing Task Analysis Data

All Task Analysis data will be entered into the GGNS-1 DCRDR DBMS. The forms used in collecting the data are:

- Task Analysis Worksheet (Figure 5)
- Information and Control Requirement Sources form (similar to Figure C-5)
- I&C Equipment Characteristics form (similar to Figure C-3)

These forms collectively make up the complete database fields that are defined for the Task Analysis, Verification, and Validation activities/phases of the DCRDR. The interrelationships among the discrete columns in the forms (database fields) are shown in Figure 7. The Task Analysis Worksheet is the master record of task data and the verification process decisions made about the task data and associated I&C equipment characteristics.

In the DBMS, each data field (column) is represented only once, with all data being keyed to one or more fields of the Task Analysis Worksheet. The other two forms are linked either by the Task Analysis Worksheet "Scenario" and "Task ID" (see Figure C-5) or by the "I&C Identification" columns (see Figure C-3). The DCRDR Team member can enter the database by referencing either the "Scenario" and "Task ID" or the "I&C Identification" keys. In this way, the database allows flexibility to search both operator task data and equipment data.

TASK ANALYSIS WORKSHEET

Scenario ______________________ PAGE ___ of ___

Procedure Step		Task Subtask	Scen. Resp.	Crew Memb.	Loc	Decision and/or Contingent Action Requirements	Information & Control Req.	Means	I&C Ident.		Verification		SPDS		Comments HEDs
GGNS 1 EOP	EPG								Panel	No.	Avail	Suit	Y	N	

Sources of Relevant Characteristics

* I&C Identific
includes 'Me

INFORMATION AND CONTROL REQUIREMENT SOURCES

Completed by: ______________
Date: ______________

TAW REF.		SOURCE OF INFORMATION & CONTROL REQUIREMENT									
Scenario	Task I.D.	SME	EPG	EOPs	EOP Basis	SPDS/AMI	FSAR/ Design Bases	Tech. Specs.	EPRI GDG	Other	Location of Source

Also Available On
Aperture Card

EQUIPMENT SUITABILITY HEDs**

TAW REF		I&C Equipment Ident	Info not Appropriate	Direct Sys. Status Not Provided	Not Fully Useable	Comments
Scen	Task I.D.					

** Discussion of this form is included in verification section of program plan.

ation
ns' column

EQUIPMENT CHARACTERISTICS

I & C (Equipment) Identification	Display Characteristics				Control
	Parameter	Range	Units	Scale Units/Type	State(s)

Figure 7. Interrelationships among Task Analysis Data Forms

3.6 Verification of Task Performance Capabilities

3.6.1 Purpose

The purpose of the Verification is to systematically verify that the I&C identified in the Task Analysis as being required by the operator are:

- Present in the Control Room
- Effectively designed to support correct task performance

3.6.2 Methodology

The Verification will use a two-step approach to achieve the purpose stated above. A summary of the verification process will be noted in Part III of the Task Analysis Worksheets and will be supplemented by additional data described below. In the first step, the presence or absence of the I&C postulated in the Task Analysis Worksheets will be confirmed by comparing the postulated requirements under "Information and Control Requirements" (Column 8 of the Task Analysis Worksheet) to the actual Control Room I&C listed under "Means" (Column 9) and "I&C Identification" (Column 10). In the second step, the suitability of the available I&C to meet task performance capabilities will be evaluated.

a. I&C Availability

The presence or absence of required I&C will be noted by a "yes" or "no" under "Availability" (Column 11). If it is discovered that required I&C is not available to the operator, any such occurrence will be identified as an HED and documented accordingly on an HED form. The I&C identified above will be reviewed again to ensure direct versus indirect indications of parameters.

In addition to a verification of the required I&C on the control boards, an additional step will be conducted to verify the parameters present on the SPDS. The presence or absence of these indications on the SPDS will be noted under "SPDS" (Column 12).

b. I&C Suitability

The second step of Verification will determine the human engineering suitability of the required I&C. For example, if a meter used in a particular procedure step exists in the Control Room, that particular meter will be examined to determine whether or not it has the appropriate range and scaling (i.e., the appropriate characteristics) to support task performance under the corresponding procedural step. If the range and scaling are appropriate, it will be noted by checking the "yes" area under "Suitability" (Column 11) on the Task Analysis Worksheet.

Conversely, if the meter range or scaling is not appropriate for the parameter of interest to the operator, the "no" area under "Suitability" on the Task Analysis Worksheet will be checked and the appropriate column checked on the Equipment Suitability HED form (similar to Figure C-4 in Apppendix C). This will be defined as an HED and documented accordingly on an HED form.

3.7 Validation of Control Room Functions

3.7.1 Purpose

The purpose of the Validation is to determine whether the functions allocated to the Control Room operating crew can be accomplished effectively within (1) the structure of the GGNS-1 EOPs and (2) the design of the Control Room as it exists. Additionally, this step provides an opportunity to identify HEDs that may not have become evident in the static processes of the DCRDR, for example, in the Control Room Survey.

3.7.2 Methodology

If possible, the Validation will be performed in conjunction with the validation of GGNS-1 EOPs required by NUREG-0737 Supplement 1. Using the Task Analysis Worksheets, walk-throughs and simulator exercises will be performed using the PSTGs or draft EOPs. A normal crew complement will be performing these exercises.

a. Real-Time Simulator Runs

The scenarios will be run in real time on the GGNS-1 plant specific simulator. These real-time simulator runs will be videotaped for later reference. For each task, the following types of information will be recorded in Part IV of the Task Analysis Worksheets:

1) An indication that the scenario response was accomplished will be noted under "Scenario Response" (Column 4 of the Task Analysis Worksheet).

2) Identification of which member of the operating crew performed the task will be noted under "Crew Member" (Column 5).

3) The location of the crew member when performing the task will be noted under "Location" (Column 6).

4) A verification of the specific decisions and contingent actions that are associated with each operator task will be noted under "Comments" (Column 13). This will include communications between and among crew members.

5) A verification of the I&C required in the associated procedural step or task, for example, an indicating light on a controller energizing to red, or a pointer on a meter deflecting upward, will be added under "I&C Identification" (Column 10).

6) Comments related to Verification or Validation and any HEDs will be noted under "Comments" (Column 13).

The operators who performed the scenario will review the Task Analysis Worksheets and videotapes along with the DCRDR Team. The operators will be asked to note any errors or problems that were encountered in the real-time simulator runs and to expound on the source of the errors or problems. These errors or problems will be documented for investigation as HEDs.

b. Walk-Throughs without Simulation

The purpose of the walk-throughs is to evaluate the operational aspects of Control Room design in terms of control/display relationships, display grouping, control feedback, visual and communication links, manning levels, and traffic patterns.

The operating crew will be given copies of the PSTGs or draft EOPs to follow as they are walking through the events. DCRDR Team members will use the partially completed Task Analysis Worksheets to record observations and HEDs.

One scenario at a time will be walked through. Operators will be requested to perform the walk-through in slower than real time to provide a relatively slow-paced rehearsal of the event. During these walk-throughs, the operators will be instructed to speak one at a time and describe their actions. Since this will force serial action, the tasks will not be performed simultaneously. Specifically, the operators will identify the:

- Component or parameter being controlled or monitored
- Purpose of the action
- Expected result of the action in terms of system response

As the operators walk through the event, they will point to each control or display they utilize and indicate which annunciators are involved. As the walk-throughs proceed, the operators will also note any errors, such as improper step sequencing or branching, that may occur on the Task Analysis Worksheets. These errors will be traced back to the PSTGs or draft EOPs for investigation to ascertain whether the error occurred because of a procedural problem.

If a procedural problem is discovered, it will be documented. This documentation will be useful in responding to Item 7 of NUREG-0737 Supplement 1, which involves the upgrade of EOPs. Procedure validation problems will be addressed as part of the task analysis and walk-throughs of the upgraded EOPs. This documentation will also be useful in any type of long-term training program that involves procedures upgrades.

c. Link Analysis

Once the events have been analyzed to extract the information noted above, link analyses, which trace the movement patterns of the operating crew in the Control Room, will be prepared to assess whether the Control Room layout hinders operator movement while performing the events.

d. Independent Review

The final step in the validation process will be to have a reactor operator who did not walk or talk through the events review the analyses in an attempt to uncover any operator task difficulties from an independent, objective viewpoint.

3.8 Review Phase Documentation

All findings from the Review Phase will be documented on HED forms. The forms will contain a description of the findings as well as the source, panel, and instruments found discrepant from Human Factors Criteria. The HED forms will be maintained in the computerized DBMS for retrieval and update during the Assessment and Implementation Phase.

4. ASSESSMENT AND IMPLEMENTATION PHASE

4.1 Assessment and Implementation Activities

The DCRDR Team will assess identified HEDs and recommend corrective actions for their resolution in an iterative process. The three major activities in this Assessment and Implementation process are:

- Analyze and Categorize HEDs
- Recommend and Evaluate HED Resolutions
- Document and Schedule Resolution Implementation

These activities are discussed below.

4.2 Analyze and Categorize HEDs

The importance of an HED is assessed on the basis of the potential for operating crew error and its potential impact on safety. This assessment is accomplished by analyzing and evaluating the problems that could arise from the identified HEDs. Before Assessment, a human factors specialist will make an initial recommendation of resolutions for each HED.

The DCRDR Team will assess the HEDs identified during the previous phases of the DCRDR in a manner similar to the guidance given in NUREG-0801. The two primary criteria presented in NUREG-0801 are: (1) whether or not the HED has resulted in a documented error or provides the potential for operator error, and (2) what impact the HED has on plant safety. Each of the criteria is discussed separately below.

Information from the Operating Experience Review will be used to help assess whether an HED resulted in an operator error or provides the potential for operator error. If an HED is a result of a documented error, e.g., in an LER or in an operator interview, then the HED is automatically assessed as having an effect on operator performance. HEDs not associated with documented errors must be systematically assessed to determine their impact on operating crew performance. Information gathered during the survey of operating personnel will be considered regarding problems that resulted in, or provide the potential for, operator error.

HEDs that may affect operating crew performance are subjected to a series of criteria similar to that in NUREG-0801 (Section 4.2.1). Other performance shaping factors such as training, operator experience, procedure adequacy, and situational requirements will be considered. The responses to this line of questioning should aid the reviewers in identifying those HEDs that degrade operating crew performance enough to cause, or contribute to the potential for, operator error.

HEDs considered to have resulted in documented errors or contribute to the potential for error will be assessed according to impact on plant safety based on the following criteria:

- An unsafe condition may result.
- Violation of a Technical Specification may result.

HEDs will be assessed as to their impact on safety by subjecting each to a series of criteria similar to that in NUREG-0801 (Section 4.2.2). The responses to these criteria will aid the reviewers in identifying those HEDs that impact plant safety. Also, task element tables from the plant specific System Functions Review and Task Analysis will be consulted as an aid in establishing consequences of error for HEDs found during Verification and Validation.

Categories in which HEDs are to be grouped are defined below. This categorization will be an aid to the reviewer in further assessing the importance of HEDs and will provide a means of prioritizing HEDs for corrective action. This method will allow for distinguishing between those discrepancies that are known to have contributed to operator error and those that have been evaluated to have potential for contributing to operator error.

The categories are:

- Category I - HEDs associated with documented errors that resulted in unsafe conditions or Technical Specification violations.
- Category II - HEDs associated with high potential errors that may result in unsafe conditions or Technical Specification violations.
- Category III - HEDs associated with low potential errors that may result in unsafe conditions or Technical Specification violations.
- Category IV - HEDs not important to safety.

Table 1 provides a summary of the HED categories to assist in the categorization process, as presented in NUREG-0801.

The primary purpose in categorizing the HEDs is to assist in prioritizing HEDs for resolution. HEDs having the most significant impact on plant operations, i.e., Categories I and II, will need resolution first. The DCRDR Team will assess and categorize HEDs in preparation for their resolution.

To reach a consensus concerning category assignment among DCRDR Team members, the following approach will be used. All HEDs will be categorized independently by the DCRDR Team members. The first round of categorization results will be summarized by the DCRDR Team Leader to determine the distribution of category assignments for each HED. The predominant category will be indicated for each HED and the results

Table 1. Summary of HED Categories

	Unsafe Condition or Tech Spec Violation	Not Important to Safety
Documented Error	I	NA
High Potential Errors	II	IV
Low Potential Errors	III	IV

redistributed to the evaluators. Each evaluator will have the opportunity to defend his category choice if it deviates from the predominant category. If no comments are forthcoming, then the predominant category becomes the consensus. For HEDs on which comments are received, a meeting will be held with all evaluators to determine which category should be assigned. The evaluator who had provided comments earlier will be allowed to defend his choice. A final choice will be made at that meeting by a vote of the attendees.

4.3 Recommend and Evaluate HED Resolutions

The DCRDR Team will provide recommendations to resolve each HED documented during the DCRDR. Questions addressed in determining the proposed resolutions will be similar to those in NUREG-0801 (Section 4). Consideration will be given to the effectiveness of the improvement and to assurance that no new deviations from the Human Factors Criteria will result from the improvement. The resolution of Category IV HEDs will be optional, and will depend on the nature and complexity of the discrepancy.

Developing a final list of resolutions will require several iterations of review. The review will begin with the distribution of HEDs and initial proposed resolutions to the members of the DCRDR Team. Team members will then obtain input from their respective departments. Meetings will be held to obtain consensus on the selection of the optional resolution for each HED. Attendees will have the opportunity to suggest alternative resolutions and to present the basis for their choice.

A list of HEDs and proposed resolutions will then be evaluated by MP&L engineering and operations personnel to decide how each HED may best be resolved. Implementation of all the recommendations provided by the DCRDR Team is not likely; alternate solutions are possible. Feasibility studies and scope reviews will be performed as necessary to evaluate the recommendations. The results of the engineering and operations review will then be forwarded to all DCRDR Team members for consideration.

After further meetings, a revised list of proposed resolutions will be tabulated and distributed to the DCRDR Team members. If disagreements

over a particular item still exist, the DCRDR Team Leader will make the final determinaton. A review of HED resolutions will be performed to ensure that the recommended resolutions can be properly integrated with other functions and systems in the Control Room. The resolutions will be compared against the Human Factors Criteria, examined for effects on task performance, and/or reviewed by operations personnel.

When final consensus is reached, the proposed resolutions will be tabulated and forwarded to MP&L management for review and approval. Management approval will be obtained before the Final Summary Report is submitted to the NRC. For all HEDs with a decision not to resolve, or to partially resolve, justification will be provided. Management personnel, as well as the DCRDR Team, will assure that adequate justification exists for disallowing (complete) resolution. The justification for each Category I, II, or III HED not resolved, or partially resolved, will be included in the Final Summary Report.

4.4 Document and Schedule Resolution Implementation

Approved HED resolutions will be documented by the DCRDR Team and implemented by the existing MP&L design change process. MP&L will prepare an implementation schedule for HED resolution considering:

- Safety consequences of operator errors that could be caused by the HED
- Degree of deviation from the Human Factors Criteria
- Operator training/retaining requirements
- Integration with other ERC programs and activities
- Potential for partial or temporary correction (e.g., through enhancement)
- Outage schedules
- Procurement schedules

5. REPORTING PHASE

5.1 NRC Final Summary Report

At the completion of the DCRDR, a Final Summary Report will be prepared for submittal to the NRC in accordance with NUREG-0737 Supplement 1 (Section 5.2.b). This report will document in summary form the processes and activities utilized in the DCRDR. Any departures from the methodologies described in this Program Plan will be noted and justified.

The Final Summary Report will also describe the results of the DCRDR Review Phase. All HEDs identified during the DCRDR will be included, along with the determinations for correction and/or resolution for each HED. A proposed implementation schedule will be provided.

5.2 MP&L Executive Summary Report

An Executive Summary Report will be prepared for submittal to MP&L management. The report will summarize the overall review process, HEDs, and HED resolutions. These resolutions will be incorporated into the existing MP&L design change process upon NRC approval.

5.3 Documentation Storage

The DCRDR Team Leader will be responsible for storing and/or distributing all DCRDR documentation so that it is:

- Readily auditable by the NRC
- Readily accessible for future reference and use by MP&L

6. PROGRAM INTEGRATION

6.1 General Comments

The DCRDR process is one part of an overall program to provide Control Room improvement and Control Room operator ERC. Effective Control Room emergency operations are dependent on a complete analysis of all Control Room functions and operator needs during an accident.

6.2 DCRDR Integration with Other ERC Programs

MP&L has developed an ERC Project Plan that addresses the integration of NUREG-0737 Supplement 1 activities. The ERC Project Plan specifically addresses the task activities, integration requirements, MP&L division of responsibility, document control, and integrated scheduling. The integration process includes the SPDS, DCRDR, upgrade of EOPs, Regulatory Guide 1.97 implementation, and ERC training. The interrelationships of the DCRDR with other NUREG-0737 Supplement 1 activities are discussed below and are shown in Figure 8.

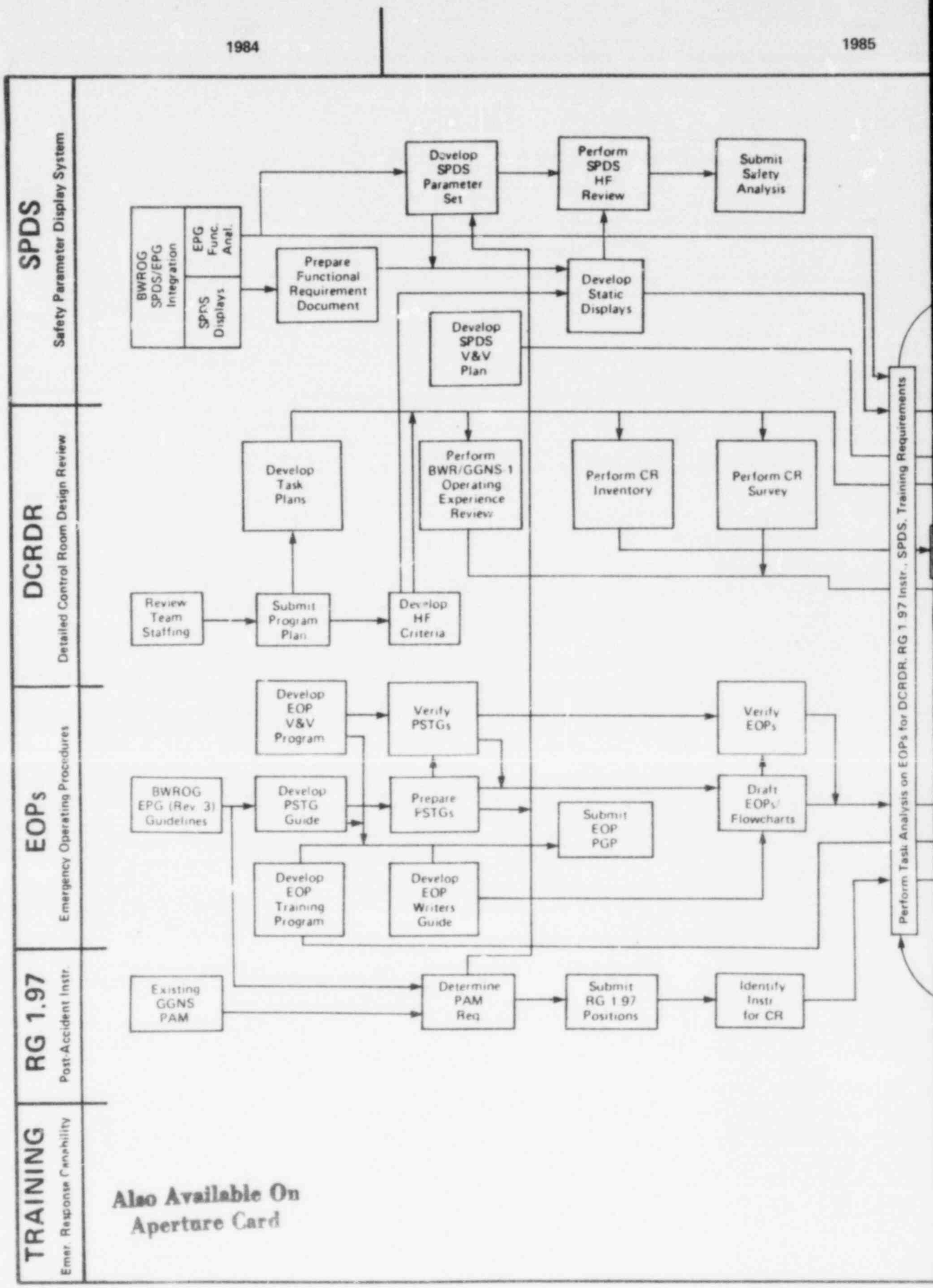
6.2.1 Safety Parameter Display System

The GGNS-1 SPDS is a part of the overall Emergency Response Facility Information System that is being developed to provide plant status and radiological information to the Control Room operators during an emergency.

The GGNS-1 SPDS displays are being developed to specifically aid the Control Room staff in obtaining plant status information for use in following the EOPs. The integration of the SPDS and EOPs is discussed below.

The BWROG Display/Procedures Integration Committee, of which MP&L is an active member, is developing a set of human factored SPDS displays to support the EPG operator tasks. SPDS parameter sets and supporting computer software will be developed for tailoring to plant specific applications. An EPG functional (cognitive) task analysis has been prepared for developing the SPDS displays. This analysis, which will be made plant specific to GGNS-1, will be useful during the DCRDR Task Analysis and the determination of information and control needs.

As noted on the Task Analysis Worksheet (Figure 5), the availability of the SPDS parameters as compared to the required Control Room I&C will be determined during the DCRDR. This will be important to determine whether the Control Room operators have sufficient information on the SPDS to provide consistent monitoring for the EOPs. In addition, a man-machine validation process will be conducted, in a manner similar to the DCRDR and EOP validation, which will include procedure usage, Control Room compatibility, and effective emergency recognition.



Also Available On
Aperture Card

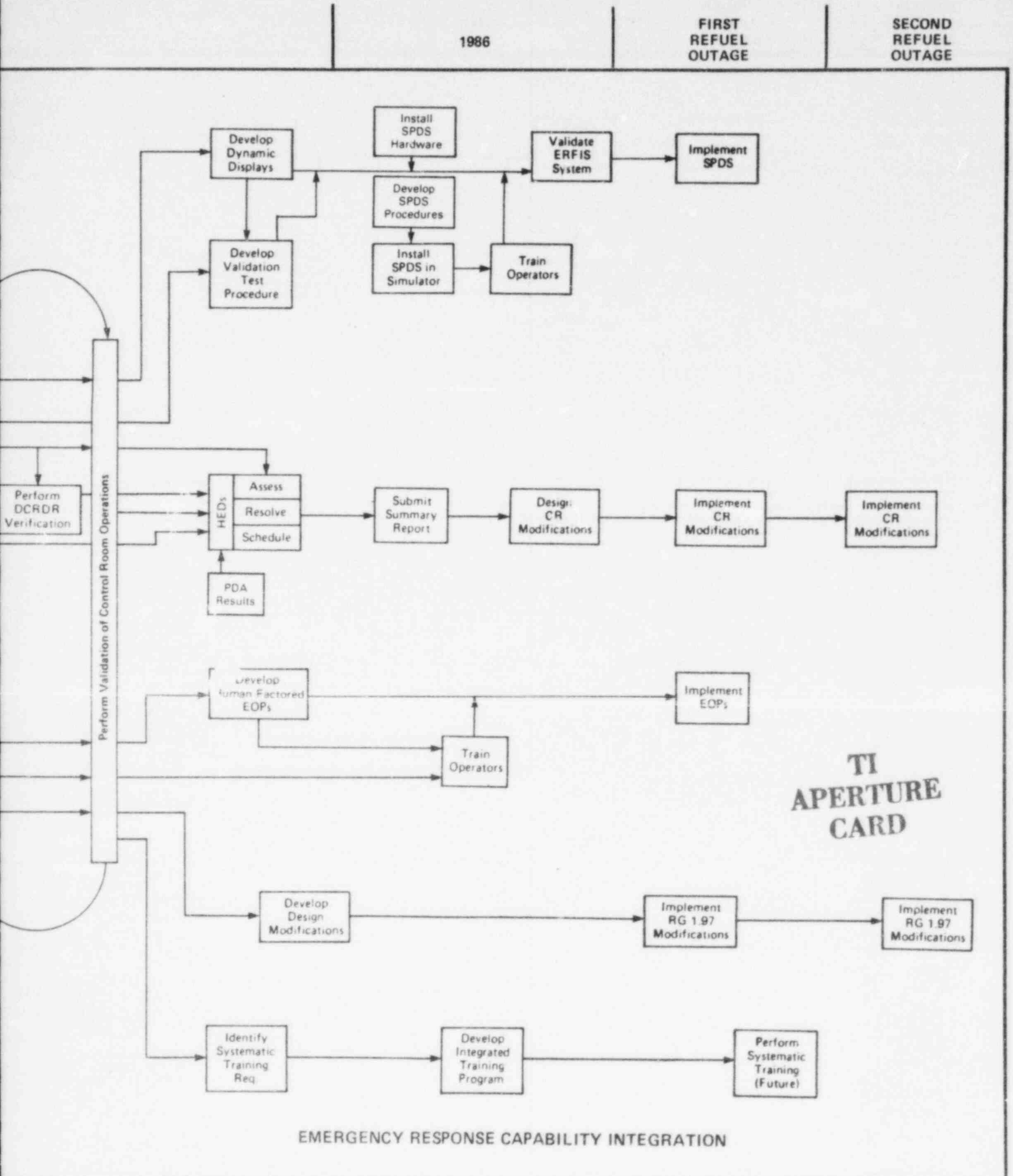


Figure 8. Integration of NUREG-0737 Supplement 1 Activities

8501020302 -02

The SPDS displays will be designed to incorporate accepted human factors principles so that the displayed information can be readily perceived and comprehended by the SPDS operator. The human factors review should include readability, parameter responsiveness, glare, labeling, alarm anthropometrics, and SPDS location. This review will be based on a GGNS-1 Control Room computer convention to be used on all Control Room computer systems. SPDS procedures for use with the EOPs will be developed to describe the timely and correct safety status assessment of the plant.

6.2.2 EOP Upgrade Program

GGNS-1 PSTGs will be developed from the BWROG generic EPGs (Revision 3). The PSTG Preparation Guide, EOP Writers Guide, Verification and Validation Program, and the EOP Training Plan will be prepared and submitted to the NRC in the GGNS-1 Procedures Generation Package. The GGNS-1 PSTGs or draft EOPs will be the basis for the DCRDR Task Analysis.

The validation process of the DCRDR addresses the same generic concerns that must be addressed in the EOP Upgrade validation process described in NUREG-0899. Specifically, item 3.3.5.1d of NUREG-0899 states "that there is a correspondence between the procedures and the control room/plant hardware," and it is noted in NUREG-0899 that this item can only be adequately addressed using control room/plant walk-throughs. Therefore, the validation process of the DCRDR will be done in conjunction with that for the EOP Upgrade effort if possible. Also, the necessary instrumentation, controls, and displays referenced in the upgraded EOPs will be compared to the parameters displayed on the SPDS.

6.2.3 Program for Implementation of Regulatory Guide 1.97, Revision 2

The GGNS-1 Regulatory Guide 1.97 Compliance/Position Report will consist of: (1) a compliance summary on how GGNS-1 presently meets the PAM requirements of Regulatory Guide 1.97, including instrument ranges, qualification, power supply, and redundance; (2) the MP&L position to further meet the requirements of Regulatory Guide 1.97 and justification for deviation from the requirements; and (3) its application to Emergency Response Facilities (ERFs).

The instrumentation requirements identified in this report will be determined before the DCRDR Review Phase. However, the GGNS-1 Type A variables for Regulatory Guide 1.97 will be determined based on the EPGs and the existing symptom-based emergency procedures and Control Room requirements. The total instrumentation identified in the Regulatory Guide 1.97 Compliance/Position Report will be compared against the results of the instrumentation availability and suitability requirements

of the DCRDR Verification to help assure that the identified instrumentation requirements have been met.

6.2.4 ERC Training

An ERC Training Plan will be developed that will provide the systematic requirements for training operators to comprehend plant conditions and cope with emergencies effectively. The scope of the training plan will involve overall ERC training including the use of the SPDS, EOPs, Control Room features, and PAM instrumentation.

6.2.5 Emergency Response Facilities

The ERFs (including the Emergency Operations Facility, Technical Support Center, and the Operations Support Center) are virtually complete, except for the addition of the ERF Information System/SPDS and the inclusion of the appropriate Regulatory Guide 1.97 instrumentation. The ERFs are therefore not specifically addressed further in the ERC integration process; however, the ERF requirements for determining plant and radiological status will be provided through the ERF Information System/SPDS.

6.2.6 HED Assessment Integration

The HED resolution phase of the DCRDR will involve the integration of the EOPs, SPDS, ERC training, Regulatory Guide 1.97, previous work, and other planned future Control Room changes. The resolution of HEDs might necessitate additions to the EOPs or to the SPDS parameters displayed. For example, HEDs that cannot be easily corrected due to conflicting requirements can be explicitly flagged in the upgraded EOPs. Missing or inappropriately located information identified during the DCRDR can be displayed on the SPDS. Missing instrumentation or inappropriate instrument ranges will be compared to Regulatory Guide 1.97. The total integration process will involve a GGNS-1 Training Program based on the guidance of the Institute of Nuclear Power Operations.

6.3 DCRDR Integration with Future Design Changes

The DCRDR Team will develop a documented process for the review of future Control Room design changes, and will modify the Human Factors Criteria for this use if required. This review will also utilize the Control Room Inventory and Task Analysis information on the DBMS. The process will ensure that the GGNS-1 Control Room continues to incorporate good human engineering practices after the DCRDR is completed.

APPENDIX A

BIBLIOGRAPHY

BIBLIOGRAPHY

Boiling Water Reactor Owners Group Emergency Procedures Committee, "Emergency Procedure Guidelines," Revision 3, November 1982.

Generic Letter 82-33, "Supplement 1 to NUREG-0737 - Requirements for Emergency Response Capability," December 17, 1982.

GGNS-1 Final Safety Analysis Report, Chapter 15.

"Human Factors Engineering Evaluation of the Grand Gulf Unit 1 Control Room," September 30, 1980.

Kemeny Commission Special Transcript of the Draft Report, Nucleonics Week, McGraw-Hill, Inc., October 1979.

NUREG-0700, "Guidelines for Control Room Design Review," September 1981.

NUREG-0801 (Draft), "Evaluation Criteria for Detailed Control Room Design Review," October 1981.

NUREG-0831 and Supplements 1-6, "Safety Evaluation Report Related to the Operation of Grand Gulf Nuclear Station, Units 1 and 2," September 1981 - August 1984.

NUREG-0899, "Guidelines for the Preparation of Emergency Operating Procedures," August 1982.

NUREG-1000, "Generic Implications of ATWS Events at the Salem Nuclear Power Plant," April 1983.

NUREG/CR-1250, "Three Mile Island: A Report to the Commission and to the Public," January 1980.

Quadrex Corporation, "Human Factors Review of the Control Room CRT Displays," Report No. QUAD-1-82-242, 1982.

Regulatory Guide 1.97, Revision 2, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions during and following an Accident," December 1980.

APPENDIX B

DCRDR TEAM MEMBERS RESUMES

- Page B-1 Herbert E. Kook, Jr.
- Page B-2 Charles Andrew Bottemiller
- Page B-3 William Joseph Hendry
- Page B-5 Manzoor A. Memon
- Page B-7 Donald C. Burgy
- Page B-9 Lothar R. Schroeder
- Page B-11 Robert J. Liddle

HERBERT E. KOOK, JR.
Electrical Engineer
Mississippi Power & Light Company

EDUCATION	B.S. Electrical Engineering, Memphis State University

EXPERIENCE

1984 - Present **Mississippi Power & Light Company**

Mr. Kook currently serves as program manager for the Grand Gulf Nuclear Station - Unit 1 Detailed Control Room Design Review (DCRDR) and the Emergency Operating Procedure (EOP) Upgrade. He is responsible for all aspects of these programs, including: budgeting and scheduling, coordination of MP&L support, selection and procurement of non-MP&L support, and program technical direction.

1981 - 1984 **Tennessee Valley Authority**

Mr. Kook worked in the Electrical Engineering Support Branch, Instrumentation and Controls (I&C) Group. He was involved primarily in procurement and regulatory compliance activities, including:

- Preparing cost estimates and procurement recommendations for planning purposes
- Preparing I&C technical specifications for procurement requisitions
- Reviewing vendor bids for technical adequacy
- Technical administration of awarded contracts
- Reviewing electrical equipment type-testing reports against TVA contract specifications, NUREG-0588, and IE 79-01B
- Issuing TVA "Nonconforming Condition Reports"
- Preparing 10 CFR 50.55(e) reports for submittal to NRC

1980 - 1981 **United States Air Force**

Mr. Kook assisted project lead engineers in providing cost estimates, technical assistance, system configuration, and installation packges to requesting Communications Command field units. He was also involved in the technical supervision of the contractor on a $50 million high frequency radio project for the Strategic Air Command, including coordinating Air Force support and layout of the system components at various air bases.

PROFESSIONAL AFFILIATIONS

Member, The Institute of Electrical and Electronics Engineers
Member, The Instrument Society of America

CHARLES ANDREW BOTTEMILLER
Senior Reactor Operator
Mississippi Power & Light Company

EDUCATION	Presently enrolled in a Bachelor of Professional Studies in Nuclear Plant Technology degree program
	Completed 60 hours of college credits at various universities
	Graduate Sequoia High School, Redwood City, California
TRAINING	Grand Gulf Nuclear Station Senior Reactor Operator License
	Brunswick Steam Electric Plant Reactor Operator License Program
	U.S. Navy Interior Communications Electrician A School

EXPERIENCE

1982 - Present	<u>**Mississippi Power & Light Company**</u> At Grand Gulf Nuclear Station, stood watch as Shift Supervisor, Simulator Instructor, and Operator Instructor, with SRO License.
1978 - 1981	<u>**Carolina Power & Light Company**</u> Brunswick Steam Electric Plant Power Plant Operator, with Reactor Operator License for 1.3 years.
1974 - 1978	<u>**U.S. Navy**</u> USS FRANCIS SCOTT KEY SSBN657G Power Plant Operator - Senior watch EWS.

WILLIAM JOSEPH HENDRY
Nuclear Engineer
Enercon Services, Incorporated

EDUCATION	B.S. Nuclear Engineering, Mississippi State University
	BWR-SRO Certification
	Station Nuclear Engineers Course (GE)
	Grand Gulf Technology (GE)

EXPERIENCE

1983 - Present — **Enercon Services, Incorporated - Grand Gulf Nuclear Station**
Providing consultant services for Nuclear Safety and Compliance. Main duty involves processing Technical Specification changes to ensure that the Technical Specifications are in compliance with the FSAR, as-built plant and regulatory requirements. Supervised up to 15 consultants during a five-month period to provide descriptions of technical specification problems; problem resolutions by interfacing with engineering, plant staff, NSSS supplies and AE; and Technical Specification change packages to the NRC for an operating license amendment. Over 500 changes have been processed since job assignment began.

1980 - 1983 — **Gulf States Utilities - River Bend Nuclear Station**
As shift supervisor, main duties included writing and supervising consultant and operations personnel in the preparation of administrative system operating, alarm response, and surveillance test procedures. Responsible for supervising future Reactor Operators and Foremen to accomplish cold license training, reviewing plant design changes, and preparing FSAR responses to NRC. Developed initial program to provide Emergency Operating Procedures in compliance with NUREG-0737, Supplement 1. Served as co-chairman of the BWR Owners Group for development of the Safety Parameter Display System (SPDS).

1980 — **Energy Incorporated - Three Mile Island Unit 1**
Worked as a consultant for Plant Staff. Responsible for revising procedures to reflect plant modifications and updates in regulatory positions as a result of the TMI-2 accident. Worked to support restart of TMI-1.

1976 - 1980 — **Mississippi Power & Light Company - Grand Gulf Nuclear Station**
Worked as a shift supervisor (engineer) in plant operations. This position required an engineering degree for the time frame indicated. Duties included providing

engineering support for the Technical Grou, operator license training material (System obtaining cold license SRO certification, r reactor operators in the cold license program, d. operations in the preoperational testing program writing administrative, system operating, alarm integrated operating, and surveillance testing procedures. Completed Station Nuclear Engineers course and Grand Gulf Technology, both taught by GE.

Worked as the Lead Design Change Engineer in the plant Technical Support Group. Wrote procedures to implement the Grand Gulf design change program and accomplished 50 plant design changes. Interfaced with the A-E, vendors, and project engineering. Performed cost-benefit analyses, changed prints and specifications, and updated plant procedures to reflect changes made to the plant.

1974 - 1976 **<u>Georgia Power Company - E. I. Hatch Nuclear Plant Unit 1</u>**
Worked as a combination Startup and Reactor Engineer from initial vessel heatup through 100% power testing. Directed startup testing on shift. Predicted criticals and directed rod pulls during plant startups to stay within fuel preconditioning limitations (PCIOMR). Directed rod pattern swaps, ran TIP's to update process computer, responsible for process computer programs, logs, and fuel warranty data. Directed fuel movement on the refueling floor during LPRM vibration outage and replacement of 126 fuel bundle channels. Performed control rod drive friction and scram time testing. Monitored and performed core thermal limit calculations. Wrote first annual operating report.

1972 - 1974 **<u>Ingalls Shipbuilding - Nuclear Power Division</u>**
Worked as Nuclear Engineer in new submarine construction and as a Shift Refueling Engineer in Nuclear Submarine refueling and overhaul. Duties in new submarine construction included reactor component and pressure boundary piping and valve installation. Duties in submarine refueling included refueling procedure writing and classroom instruction for all submarine refueling operations being performed on my assigned shift.

MANZOOR A. MEMON
Electrical Engineer
Mississippi Power & Light Company

EDUCATION

B.S. Electrical Engineering
Candidate, MBA

TRAINING

- Six months' certificate course in Electrical Systems used in airport development
- Certificate course in National Electric Code, 1981 and 1984
- Certificate course in Field Leadership for Supervisory Development
- Special Training in Rychem termination kits
- Seminar for Nuclear Equipment Qualification to perform various analysis for equipment qualification per NUREG Guide 1.89 and 10CFR50.49
- Seminar for Nuclear Equipment Qualification (spare parts only)
- Seminar for Plant Reliability and Availability included reliability, maintainability, and availability analysis for nuclear power plants
- Two-week course for Modicon Programmable Controllers (584 Basic and Advance Applications)
- University Computing Co. Training (BASIC, CYBER, and FORTRAN languages)

EXPERIENCE

1983 - Present

<u>Mississippi Power & Light Company, Grand Gulf Nuclear Station</u>
Leading a group of seven engineers to review all the design changes since 1980 to update GGNS Training Simulator System. Responsibilites include developing procedures to verify and approve Simulator Design Change Packages and provide technical guidance to the group to modify the Training Simulator according to NRC's proposed rule 10 CFR 50 and 55, "Training and Qualifications of Civilian Nuclear Power Plant Personnel and Operators' Licenses"; to maintain and control a Computer Database giving all the Plant Design Documents to which the Simulator has been updated; and to control and verify Simulator System vendor supplied documents including incorporation of "As Built" information after implementation of hardware and software changes. Member Detailed Control Room Design Review (DCRDR) Team. Responsible for installation of Safety Parameters Display System (SPDS) in GGNS Training Simulator. Also worked as Group Leader Design Group; responsibilities included design and engineering work involved in development of design change packages, safety evaluations per 10 CFR 50.59, and fire protection analyses per 10 CRF 50.48 and 10 CFR 50 Appendix R, ALARA applicability per Reg. Guide 8.8, and environmental reviews per 10 CFR 51.5(b) (2) & (3) and

NUREG-0777. Reviewed and checked contractor- (Bechtel & GE) and vendor-prepared design. Responsible for maintaining design control of BOP computer system.

1981 - 1983

<u>Daniel International Corporation, Wolf Creek Nuclear Power Plant</u>

Responsible for scoping of systems to identify all electrical components included in assigned systems; to monitor construction activities ensuring that all system completion activities were timely completed; to identify material and design deficiencies from walkdowns and generate a construction punchlist; to prepare turnover packages to start up and QC; and to issue and coordinate FCRs, NCRs, DRs, DCPs, SFRs, etc. Fully familiar with EE580 Computerized Tracking and Control System.

1981

<u>Bechtel Power Corporation, Palo Verde Nuclear Generating Station</u>

Responsible for cable pulling and termination in Containment and Radwaste Buildings and Yard Areas; processing FCRs, DCR/DCNs, NRCs and subsequently coordination with Engineering and Design office. Developed bulk cable pull packages and provided cable pull tension calculations. Performed pre-installation, in-process, and final inspection; provided technical guidance; and interpreted schematics, PIDs, etc., to draft and coordinate work with QC and QA groups. Fully familiar with EE580 Computerized Tracking System.

1975 - 1981

<u>Pakistan International Airlines, Karachi International Airport</u>

Supervised and maintained electrical facilities all over airport. This included design, evaluation, planning, scheduling, execution, and inspection of new power facilities like establishment of power substations, HV, MV & LV Load Centers, Switchgear, MCCs, and Power Factor Improvement Equipment; installation of transformers; laying of HT/LT power cables; and lighting schemes for hangers and workshops. Performed regular and preventive maintenance of 15 power substations including replacement of centrifuging transformer oil, setting and calibration of relays, and overhauling of OCBs and ACBs, etc. Performed periodical surveys to study power requirements for the airport to establish new power facilities and maintain two standby power plants.

1974 - 1975

<u>Karachi Shipyard and Engineering Works, Karachi, Pakistan</u>

Duties included design, planning, testing, and inspection of electrical systems; material indentifying; installation of generators, load centers, switchgear, MCCs, and distribution panels and all types of heavy duty machinery along with laying of lighting and LV power cables required for ocean-going ships of 13,500 tons and higher capacity. Also prepared load analysis to ensure proper sizing of generators, cables, and switchgear equipment.

DONALD C. BURGY
Director, Human Factors Engineering
General Physics Corporation

EDUCATION

Ph.D. Candidate, Applied-Experimental Psychology, The Catholic University of America

M.A. Applied-Experimental Psychology, The Catholic University of America

B.A. Psychology, Swarthmore College

EXPERIENCE
1979 - Present

General Physics Corporation

Mr. Burgy directs all human factors engineering and man-machine systems design and evaluation work in the Company. His human factors expertise includes system analysis, information processing, man-computer interactions, performance evaluation, training systems, and speech/non-speech communications. Representative projects include:

- Control Room Design Reviews
  Directed or participated in nuclear power plant control room design reviews at twelve nuclear power plants: River Bend Station; Plant Hatch; North Anna and Surry Power Stations; Zion, LaSalle, and Dresden Stations; William H. Zimmer Nuclear Power Station; Susquehanna Steam Electric Station; Clinton Nuclear Power Plant; Salem Nuclear Generating Station; and Trojan Nuclear Plant. Managed DCRDR program plan development for thirteen plants, both BWR and PWR, to meet U.S. Nuclear Regulatory Commission (NRC) licensing requirements.

- Task Analysis of Nuclear Power Plant Control Room Crews, NRC
  Managed a major 18-month NRC research program in which a crew task analysis data collection methodology and approach were developed and used to collect data at eight power plants by teams of human factors and operations personnel. Directed the compilation of the results of the data collection effort in a computerized task data base.

- Guidelines for Internal Plant Communications, Electric Power Research Institute (EPRI)
  Participated in a study of communications problems in nuclear power plants and then managed project to

develop Guidelines for Internal Plant Communications based on these problems. Developed methodolcgy for collection and analysis of real-time communications data in operating power plants.

- Prototype Large Breeder Reactor (PLBR) Operability Study, EPRI
  Participated in an operability study of the two major PLBR designs--pool and loop types; coauthored a PLBR design familiarization course text; and conducted task analysis for initial design evaluations of PLBR control console layout and instrumentation and control needs.

- Submarine Design Human Factors, U.S. Navy
  Developed task analysis format and collection methodology to promote team performance improvement and training enhancement in the Navy Submarine Advanced Combat Systems (SUBACS) program.

1976 - 1978 **The Catholic University of America Human Performance Laboratory**
Mr. Burgy conducted applied and basic research experiments on auditory signal classification of complex underwater sounds in research sponsored by the Human Factors Engineering branch of the Office of Naval Research.

PROFESSIONAL AFFILIATIONS

Member, Acoustical Society of America
Member, American Psychological Association
Member, Human Factors Society

PUBLICATIONS

Applied Human Factors in Power Plant Design and Operation, General Physics Corporation, 1980. Coauthor with P. A. Doyle, H. F. Barsam, and R. J. Liddle.

"Survey and Analysis of Communications Problems in Nuclear Power Plants," EPRI Report NP-2035, September 1981. Coauthor with D. A. Topmiller, D. R. Roth, P. A. Doyle, and J. J. Espey.

"Task Analysis of Nuclear Power Plant Control Room Crews," NUREG/CR-3371, 1983. Coauthor with C. Lempges, A. Miller, L. Schroeder, H. VanCott, and B. Paramore.

"Nuclear Power Plant Control Room Crew Task Analysis Database: SEEK System Users Manual," NUREG/CR-3606, 1984. Coauthor with L. Schroeder.

LOTHAR R. SCHROEDER
Senior Scientist
General Physics Corporation

EDUCATION

Ph.D. Experimental/Applied Psychology, Lehigh University

M.S. Engineering Psychology, Lehigh University

B.S. General Engineering, University of Illinois

B.A. Psychology, University of Illinois

EXPERIENCE

1982 - Present

General Physics Corporation

Dr. Schroeder's areas of expertise include task and error analysis, procedures validation equipment design studies, operations research, and organizational design and management. He is currently managing the control room design review at the Trojan Nuclear Power Plant and NUREG-0737 integration services for Plant Hatch. He has also assisted in developing a task analysis methodology for River Bend. Other representative projects include: supporting NRC research in the application of control room crew task analysis data for human engineering design and staffing areas, evaluating SPDS placement, reviewing emergency operating procedures, assessing the human factors aspects of EOP Flowcharts, and reviewing equipment tagging procedures in nuclear plants. Dr. Schroeder has also developed and given numerous supervisory skills workshops for ROs and STAs.

He is currently providing human factors integration services to Georgia Power Company to meet Supplement 1 to NUREG-0737 requirements.

1981 - 1982

U.N.C. Nuclear Industries

Dr. Schroeder worked as a human factors specialist, interfacing with engineers and other staff in identifying and solving problems relating to equipment design, the use of procedures, and training efforts at Hanford's N-Reactor. He also performed a human factors review of the 105-N control room in support of an ongoing control room upgrade program.

1974 - 1980	**Department of Psychology, Moravian College** Dr. Schroeder's responsibilities as Assistant Professor and Department Chairperson included planning and coordinating a day and evening program in psychology involving over 100 majors; serving on several college committees; supervising individual field study, independent study, and honors projects; and serving as academic advisor to day and evening session students having an interest in applied psychology.
1973	**Wigdahl Electric Company** Dr. Schroeder worked as a consultant, identifying potential organization problems and conducting problem solving sessions.
1972	**Jewish Employment and Vocational Services** As an industrial psychologist, Dr. Schroeder consulted with several industries and governmental agencies in order to develop, validate, and administer "job-related" personnel selection tests under a Department of Labor contract.
PROFESSIONAL AFFILIATIONS	Member, Human Factors Society Member, American Nuclear Society
PUBLICATIONS	"Human Factors Review of N-Reactor Control Room," U.N.C. Nuclear Industries Report UN1-2097, June 1982. "A Human Factors Guided Survey for Systems Development," American Nuclear Society Winter Meeting, December 1981, coauthor with D.R. Fowler. "Control Room Human Factors in Context," American Nuclear Society Winter Meeting, November, 1982, coauthor with D. R. Fowler and D. E. Friar. "Learning Style Data Applied to Nuclear Power Plant Training Programs." American Nuclear Society Annual Meeting, June 1983. "Task Analysis of Nuclear Power Plant Control Room Crews, Vol. I & II", NUREG/CR-3371, U.S. Nuclear Regulatory Commission, June 1983. Coauthor with D. Burgy, C. Lempges, A. Miller, H. Van Cott, and B. Paramore.

ROBERT J. LIDDLE
Manager, Human Factors Power Services
General Physics Corporation

EDUCATION

M.S. Industrial Engineering and Operations Research, Virginia Polytechnic Institute and State University

B.S. Psychology, Virginia Polytechnic Institute and State University

EXPERIENCE
1980 - Present

General Physics Corporation

Mr. Liddle is a human factors engineer responsible for managing power plant control room design reviews with regard to methodology, staffing, and training programs. He provides in-house staff instruction in technical and administrative aspects of control room reviews. Mr. Liddle serves as project manager for several human factors projects and has had experience with utility/Nuclear Regulatory Commission negotiations involving human factors issues. Representative projects include:

- Procedures Generation Package
  Developed plant-specific Procedures Generation Packages for utilities in response to Item 7.2.b of Supplement 1 to NUREG-0737. These PGPs contain descriptions of procedure verification and validation methodologies and technical writing guidelines.

- Program Plan Development
  Developed program plans for various utilities which present detailed methodologies utilized in the performance of control room design reviews. The program plans encompass management, staffing and data collection, and interpretation issues.

- Control Room Des Review
  Managed detailed control room design review projects at the Gulf States Utilities Company River Bend Station, Vermont Yankee Nuclear Power Station, and Pennsylvania Power and Light Company Susquehanna Steam Electric Station, and Washington Public Power Supply System No. 2; acted as lead human factors engineer in control room design review for Georgia Power Company's Plants Vogtle and Hatch; managed human factors preliminary design review at Long Island Lighting Company's Shoreham Nuclear Power Station; and was project manager for

the Surry Interim Control Room Upgrade project for Virginia Electric & Power Company.

- Selection Testing
  Administers General Physics Basic Mathematics and Science Test (BMST) for operator training and selection; assists in human reliability analysis with emphasis on nuclear plant applications and the accompanying task analytic procedures.

- Development of Human Engineering Standards
  Compiled and developed standards for control coding, legend plate design, mimic and demarcation lines, and color coding practices.

- Human Factors Training
  Instructs utility and industrial personnel in performance evaluation techniques, experimental methodology, and control room design review procedures.

1977 - 1978 **Virginia Polytechnic Institute and State University**

In his research project, Mr. Liddle investigated the use of videotape recording apparatus in an assessment center process. He assisted in scheduling and debriefing participants, in data collection and interpretation, and in report writing.

PROFESSIONAL AFFILIATIONS

Member, Human Factors Society

PUBLICATIONS

Applied Human Factors in Power Plant Design and Operation, General Physics Corporation, 1980, Coauthor with D. C. Burgy, P. A. Doyle, H. F. Barsam.

Susquehanna Steam Electric Station Detailed Control Room Design Review Program Plan, General Physics Corporation, 1982.

Shoreham Nuclear Power Station Detailed Control Room Design Review Program Plan, General Physics Corporation, 1983, Coauthor with D. C. Burgy.

APPENDIX C
SAMPLE DCRDR FORMS

- Figure C-1 HED Form
- Figure C-2 LER HED Review Summary Form
- Figure C-3 I&C Equipment Characteristics Form
- Figure C-4 Equipment Suitability HED Form
- Figure C-5 Information and Control Requirement Sources Form

HUMAN ENGINEERING DISCREPANCY RECORD
GRAND GULF NUCLEAR STATION UNIT-1

HED NO.: 1
PRIORITY RATING:3

DATE:12/23/84
PREPARER:LIDDLE/MATSON/BISHOP

STATUS:3

DATA SOURCE:8

CHECKLIST NO:B2.3

CHECKLIST AREA:

LOCATION OF DISCREPANCY

PANEL:P870 INSERT:54C SYSTEM:MS
I&C NO:1GMC-PIEPR-15:

I&C DESC:MS FLOW METER

DESCRIPTION OF DISCREPANCY:SCALE IS IN PERCENT AND SHOULD BE IN PSI

RECOMENDATIONS:INVESTIGATE CHANGING SCALE TO READ IN PSI

IMPLEMENTATION SCHEDULE:

HISTORICAL DOCUMENTATION REVIEW

LER HED Review Summary

LER ______ Other (Specify) ________

Report Number: Report Date: Occurrence Date:

Error Categorization: Work Station:

Instruments Involved: Procedures Involved:

Major Systems Involved:

Identification of Occurrence:

Summarize Events Preceding Occurrence:

Summarize Events During Occurrence:

Identification of Probable Cause:

Corrective Action Taken/Proposed:

Additional Recommendations:

EQUIPMENT CHARACTERISTICS

I & C (Equipment) Identification	Display Characteristics				Control
	Parameter	Range	Units	Scale Units/Type	State(s)

EQUIPMENT SUITABILITY HEDs

Plant: ____________________

Scenario: ____________________

Completed by: ____________________

Date: ____________________

TAW REFERENCE		I&C Equipment Identified	Information Not Appropriate	Direct Sys. Status Not Provided	Not Fully Useable	Comments
Scenario	Task I.D.					

INFORMATION AND CONTROL REQUIREMENT SOURCES

Completed by: __________
Date: __________

TAW REF.		SOURCE OF INFORMATION & CONTROL REQUIREMENT									
Scenario	Task I.D.	SME	EPG	EOPs	EOP Basis	SPDS/AMI	FSAR/ Design Bases	Tech. Specs.	EPRI GDG	Other	Location of Source

MISSISSIPPI POWER & LIGHT COMPANY
Helping Build Mississippi
P. O. BOX 1640, JACKSON, MISSISSIPPI 39205

December 19, 1984

NUCLEAR LICENSING & SAFETY DEPARTMENT

U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D. C. 20555

Attention: Mr. Harold R. Denton, Director

Dear Mr. Denton:

SUBJECT: Grand Gulf Nuclear Station
Unit 1
Docket No. 50-416
License No. NPF-29
File: 0272/L-814.5/15743
Submittal of GGNS Detailed Control Room Design Review Program Plan
AECM-84/0537

In accordance with the requirements of Generic Letter 82-33 (NUREG-0737 Supplement 1) and the GGNS Operating License Condition 2.C(36), MP&L is hereby submitting the GGNS Detailed Control Room Design Review (DCRDR) Program Plan for your review.

Yours truly,

S H Hobbs

for L. F. Dale
Director

SAB/SHH:rw
Attachment

cc: Mr. J. B. Richard (w/a)
Mr. R. B. McGehee (w/a)
Mr. N. S. Reynolds (w/a)
Mr. G. B. Taylor (w/o)

Mr. Richard C. DeYoung, Director (w/a)
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Mr. J. P. O'Reilly, Regional Administrator (w/a)
U.S. Nuclear Regulatory Commission
Region II
101 Marietta St., N.W., Suite 2900
Atlanta, Georgia 30323

A003
1/40