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

MAR 6 1985

Docket No. 50-461

APPLICANT: Illinois Power Company

FACILITY: Clinton Power Station

SUBJECT: SUMMARY OF MEETING TO DISCUSS DETAILED CONTROL ROOM DESIGN REVIEW (DCRDR) FOR CLINTON POWER STATION

A meeting was held on February 27, 1985 in Bethesda, Maryland between the NRC staff and Illinois Power Company (IPC) to discuss the staffs comments, transmitted in a letter dated January 9, 1985, related to the IPC's program plan for conducting the DCRDR for Clinton Power Station. Enclosure 1 is a list of meeting attendee's. Copies of the view graphs presented by IPC and their contractor Torry Pines Technology (TPT) are contained in Enclosure 2. Enclosure 3 identified the NRC and its consultant, Science Applications International (SAIC), concerns related to the Clinton Power Station DCRDR and Enclosure 4 contains sample worksheets, data sheets and forms to be used by IPC as part of their DCRDR.

After the applicant's presentation, they were informed that their presentation had addressed the staff's concerns. However, the staff questioned whether the task analysis methodology proposed will meet the requirements of Supplement 1 to NUREG-0737, for use of function and task analysis. In a subsequent telephone conversation with IPC's T. Riley, the staff explained that IPC should expand the scope of the task analysis to include all operator tasks during emergency operations. That is, if a system is used during emergency operations, the operator tasks associated with the use of that system during emergency operations should be analyzed.

During the meeting, IPC stated that it would provide the staff with the following additional information:

(1) A description, in the DCRDR Summary Report, of any review methodologies used that differ from those described in the DCRDR Program Plan.

(2) Sample data sheets from the task analysis effort showing the identification of information and control requirements and display and control characteristics.

(3) Inclusion in the summary report of a more thorough description of how information and control requirements and associated control and display characteristics were identified independent of the existing control room design.

The staff told the IPC that if it should choose to submit a revised task analysis proposal, the staff would provide IPC with comments on its acceptability.

B Siegel

B. Siegel, Project Manager
Licensing Branch No. 2
Division of Licensing

Enclosures: As stated

cc: w/o enclosure 2 - meeting attendee's

The staff told the IPC that if it should choose to submit a revised task analysis proposal, the staff would provide IPC with comments on its acceptability.

Original signed by:

B. Siegel, Project Manager
Licensing Branch No. 2
Division of Licensing

Enclosures: As stated

cc: w/o enclosure 2 - meeting attendee's

Distribution:
Docket File
NRC PDR
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BSiegel:lb
03/06/85

LB#2/DL/BC
ASchwencer
03/06/85

Clinton

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Enclosure 1

2-27-85

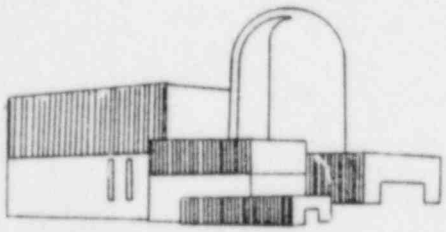
ATTENDEE'S AT MEETING TO DISCUSS IPC PROGRAM PLAN FOR DCRDR

Name	Affiliation
Byron Siegel	NRC/DL/LPM
Max Hollinden	IP/Plant Staff
Terry L. Riley	IP/Licensing
F. A. Spangenberg	IP/Director of Licensing
Paul Telthorst	IP/Licensing
Errol P. Gagnon	Torrey Pines Technology
Sal F. Luna	Torrey Pines Technology
Ellen Levine	SAIC
Phuoc Le	SAIC
John R. Stokley	SAIC/NRC
Ann Ramey-Smith	NRC/DHFS/HFEB Control Room
George Lapinsky	NRC/DHFS/HFEB - SPDS
W. G. Kennedy	NRC/DHFS/PSRP - PGP

Enclosure 2

DETAILED CONTROL ROOM DESIGN REVIEW

PROGRAM PLAN REVIEW WITH THE NRC



CLINTON POWER STATION

ILLINOIS POWER COMPANY

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Clinton Power Station
DCRDR - Program Plan - Review

MEETING WITH NRC

FEBRUARY 27, 1985

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OBJECTIVES:

- RESOLVE NRC CONCERNS
- DISCUSS KEY ELEMENTS OF DCRDR PLAN
- SOLICIT FINAL NRC ACCEPTANCE OF PROGRAM PLAN

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PRESENTATION TOPICS

- CHRONOLOGY
- BRIEF OVERVIEW
- PROGRAM PLAN TASK REVIEW
- COORDINATION OF DCRDR ACTIVITIES WITH OTHER NUREG 0737-1 ACTIVITIES

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CHRONOLOGY

- PDA PERFORMED & SUBMITTED – 1981
- NRC CRDR AUDIT – 1981
- PDA EVALUATION & PROGRAM PLAN SUBMITTAL
  U-0741 9/28/84
- NRC REVIEW COMMENTS
  A. SCHWENCER/F. A. SPANGENBERG 1/9/85
- PDA EVALUATION
  U-0790 2/5/85

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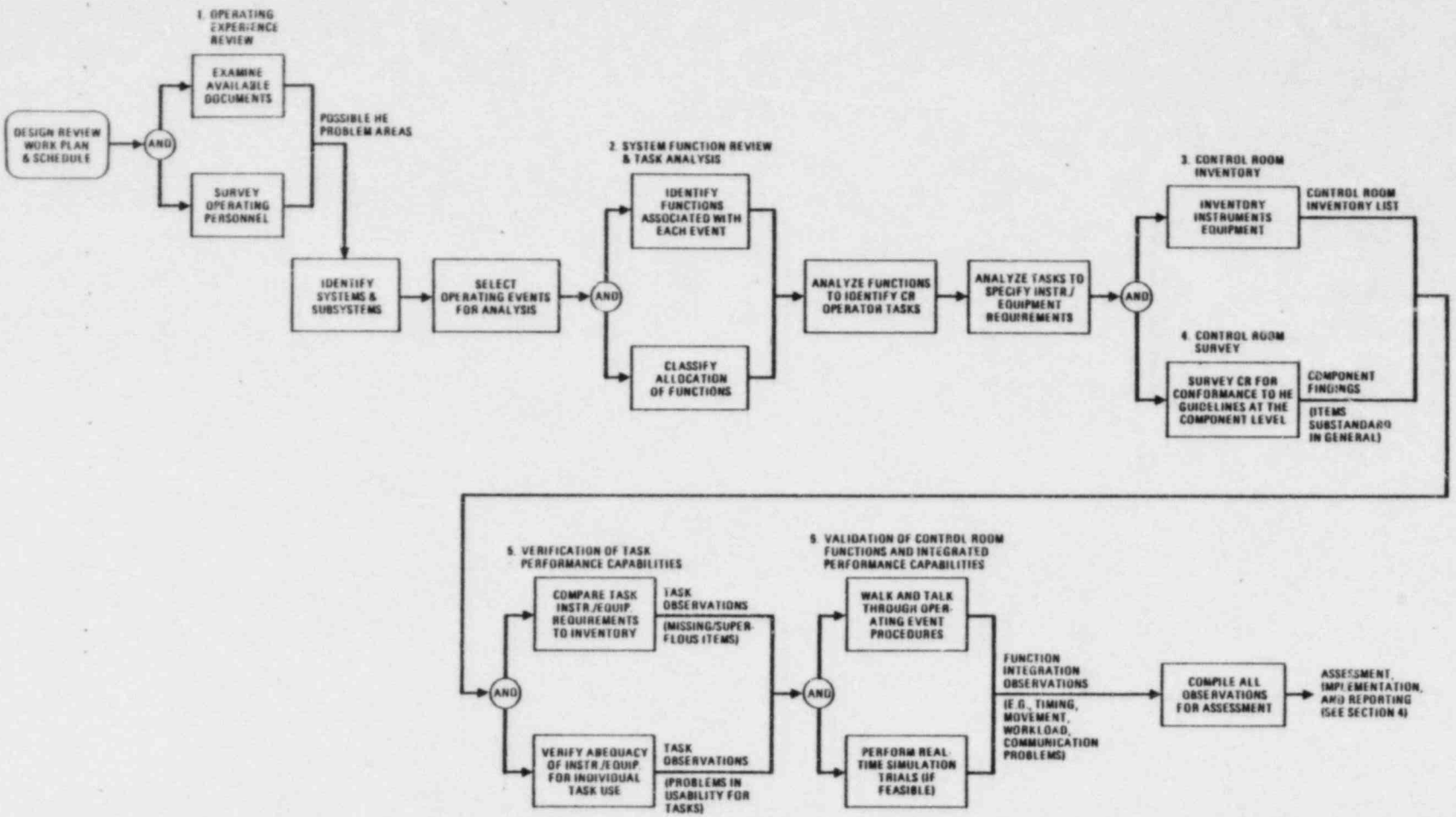
BRIEF OVERVIEW

- DCRDR PROCESS
- ERCIP ORGANIZATION
- DCRDR TASK STRUCTURE
- MAIN CONTROL ROOM LAYOUT
- REVIEW TEAM MEMBERS & ASSIGNMENTS
- LEVEL OF EFFORT - HUMAN FACTORS SPECIALISTS


1. OPERATING EXPERIENCE REVIEW
DESIGN REVIEW WORK PLAN & SCHEDULE
AND
EXAMINE AVAILABLE DOCUMENTS
SURVEY OPERATING PERSONNEL
POSSIBLE HE PROBLEM AREAS
IDENTIFY SYSTEMS & SUBSYSTEMS
SELECT OPERATING EVENTS FOR ANALYSIS
2. SYSTEM FUNCTION REVIEW & TASK ANALYSIS
AND
IDENTIFY FUNCTIONS ASSOCIATED WITH EACH EVENT
CLASSIFY ALLOCATION OF FUNCTIONS
ANALYZE FUNCTIONS TO IDENTIFY CR OPERATOR TASKS
ANALYZE TASKS TO SPECIFY INSTR./ EQUIPMENT REQUIREMENTS
3. CONTROL ROOM INVENTORY
AND
INVENTORY INSTRUMENTS EQUIPMENT
CONTROL ROOM INVENTORY LIST
4. CONTROL ROOM SURVEY
SURVEY CR FOR CONFORMANCE TO HE GUIDELINES AT THE COMPONENT LEVEL
COMPONENT FINDINGS
(ITEMS SUBSTANDARD IN GENERAL)
5. VERIFICATION OF TASK PERFORMANCE CAPABILITIES
AND
COMPARE TASK INSTR./EQUIP REQUIREMENTS TO INVENTORY
TASK OBSERVATIONS
(MISSING/SUPERFLOUS ITEMS)
VERIFY ADEQUACY OF INSTR./EQUIP FOR INDIVIDUAL TASK USE
TASK OBSERVATIONS
(PROBLEMS IN USABILITY FOR TASKS)
6. VALIDATION OF CONTROL ROOM FUNCTIONS AND INTEGRATED PERFORMANCE CAPABILITIES
AND
WALK AND TALK THROUGH OPERATING EVENT PROCEDURES
PERFORM REAL-TIME SIMULATION TRIALS (IF FEASIBLE)
FUNCTION INTEGRATION OBSERVATIONS
(E.G., TIMING, MOVEMENT, WORKLOAD, COMMUNICATION PROBLEMS)
COMPILE ALL OBSERVATIONS FOR ASSESSMENT
ASSESSMENT, IMPLEMENTATION, AND REPORTING (SEE SECTION 4)

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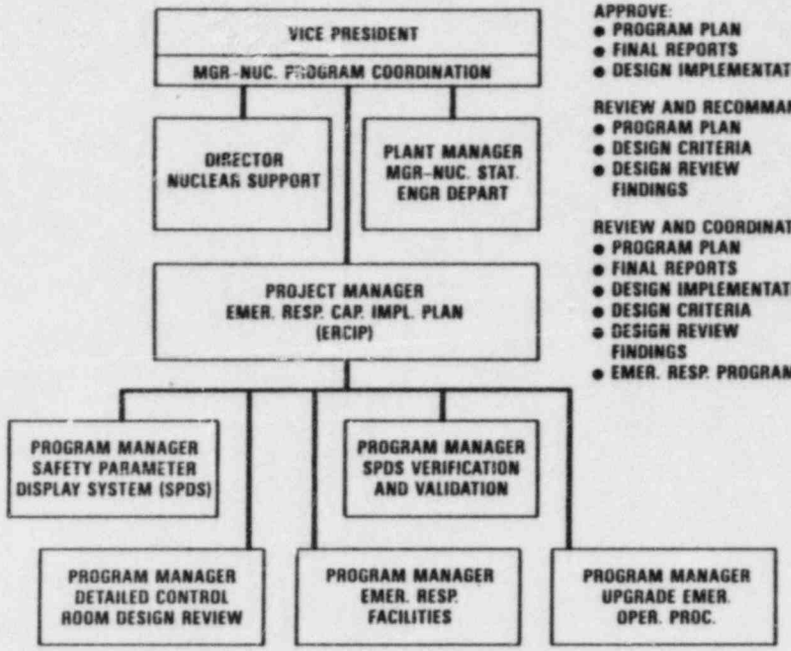

APPROVE:
- PROGRAM PLAN
- FINAL REPORTS
- DESIGN IMPLEMENTATIONS

REVIEW AND RECOMMAND APPROVAL:
- PROGRAM PLAN
- DESIGN CRITERIA
- DESIGN REVIEW FINDINGS

REVIEW AND COORDINATE:
- PROGRAM PLAN
- FINAL REPORTS
- DESIGN IMPLEMENTATION
- DESIGN CRITERIA
- DESIGN REVIEW FINDINGS
- EMER. RESP. PROGRAMS

DESIGN REVIEW TEAM

ILLINOIS POWER COMPANY
- PRINCIPAL INVESTIGATOR
- ENGINEERING, OPERATIONS & LICENSING AS REQUIRED

GENERAL ELECTRIC/SARGENT & LUNDY
- ENGINEERING AS REQUIRED

TORREY PINES TECHNOLOGY
- PROJECT ENGINEER
- ASS'T PROJECT ENGINEER
- TASK ANALYSIS SPECIALISTS
- HUMAN FACTORS SPECIALISTS
- CORRECTIVE ACTION SPECIALISTS
- LICENSING PERSONNEL

DEVELOP/PERFORM/EVALUATE:
- PROGRAM PLAN
- FINAL SUMMARY REPORT
- CRITERIA
- CHECKLISTS
- SURVEYS
- INVENTORY
- SYSTEM FUNCTION & TASK ANALYSIS
- WALK/TALK-THROUGHS
- PROCEDURES
- OBSERVATIONS
- OBSERVATIONS
- EOP VERIFICATION AND VALIDATION
- ASSESSMENTS
- DESIGN IMPLEMENTATION RECOMMENDATIONS

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DCRDR - Program Plan - Review

DCRDR TASK STRUCTURE

- FOUR PHASES OF NUREG-0700 USED
  - — PLANNING
  - — REVIEW
  - — ASSESSMENT & IMPLEMENTATION
  - — REPORTING (DOCUMENTATION)

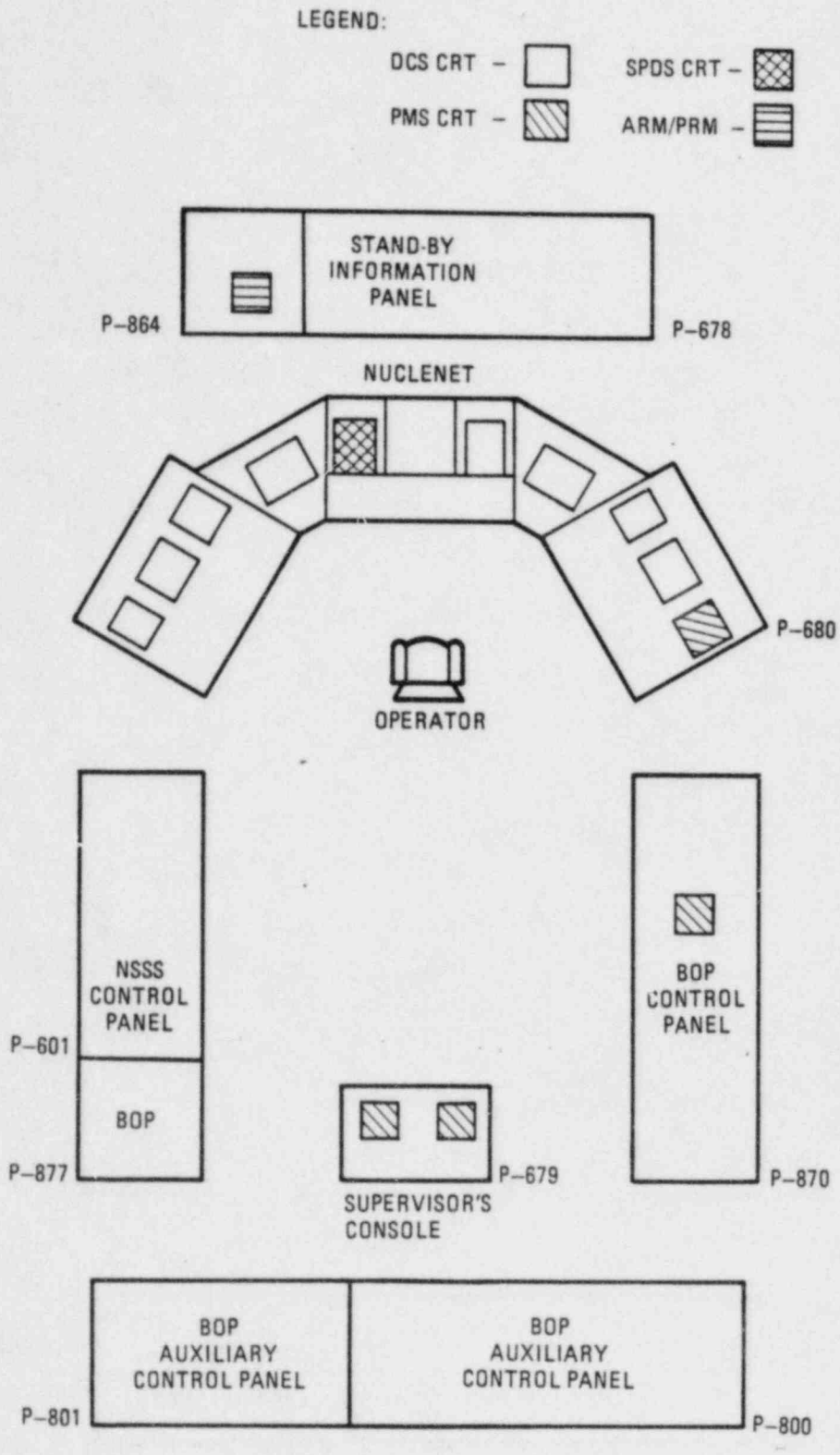
LEGEND:
DCS CRT –
SPDS CRT –
PMS CRT –
ARM/PRM –
STAND-BY
INFORMATION
PANEL
P–864
P–678
NUCLENET
P–680
OPERATOR
NSSS
CONTROL
PANEL
P–601
BOP
P–877
BOP
CONTROL
PANEL
P–870
P–679
SUPERVISOR'S
CONSOLE
BOP
AUXILIARY
CONTROL PANEL
BOP
AUXILIARY
CONTROL PANEL
P–801
P–800

TABLE 2-1

DCRDR DESIGN REVIEW TEAM MEMBERS AND ASSOCIATED TASK ASSIGNMENTS

Program Manager

R. P. Bichel

Principal Investigator

M. J. Hollinden
P. J. Telthorst (Alternate)

Project Engineer
Sr. Human Factors Specialist

S. F. Luna

Planning	
S. F. Luna	R. P. Bichel*
R. Sabeh	M. A. Krause*
	M. J. Hollinden
	P. J. Telthorst

Operating Experience Review	
S. F. Luna	D. M. Antonelli
R. Sabeh	R. P. Bichel
	M. J. Hollinden

Control Room Survey	
W. R. Arnold	D. M. Antonelli
E. P. Gagnon	R. P. Bichel
S. F. Luna	M. J. Hollinden
R. Sabeh	
W. Welch	

Control Room Inventory	
E. P. Gagnon	R. P. Bichel
F. P. Scaletta	M. J. Hollinden
T. A. Sgammato	
W. Welch	

System Function and Task Analysis (EOP & DCRDR)	
W. R. Arnold	D. M. Antonelli
E. P. Gagnon	J. M. Hall
S. F. Luna	M. J. Hollinden
R. C. Potter	M. A. Krause*
R. Sabeh	P. J. Telthorst
M. A. Verdugo	

Verification of Task Capabilities and EOPs	
W. R. Arnold	D. M. Antonelli
E. P. Gagnon	J. M. Hall
F. Scaletta	M. A. Krause*
R. Sabeh	J. R. Patten
	E. A. Schweitzer

Validation of Control Room Functions and EOPs	
E. P. Gagnon	D. M. Antonelli
R. Sabeh	J. M. Hall
S. F. Luna	M. A. Krause*
	J. R. Patten

*also a member of the EOP upgrade program.

TABLE 2-1 (cont.)

DCRDR DESIGN REVIEW TEAM MEMBERS
AND ASSOCIATED TASK ASSIGNMENTS

Assessments/and Implementation		Documentation	
W. R. Arnold	D. M. Antonelli	E. P. Gagnon	M. J. Holliden
E. P. Gagnon	R. P. Bichel	S. F. Luna	P. J. Telthorst
S. F. Luna	M. J. Hollinden	R. Sabeh	
R. Sabeh	M. A. Krause		
	J. P. O'Brien		
	T. L. Riley		
	P. J. Telthorst		

Table 2-2

LEVEL OF EFFORT (MAN-HOURS)
OF VARIOUS DISCIPLINE GROUPS
IN PERFORMING THE DCRDR FOR
CLINTON POWER STATION

DCRDR PHASE/TASK	HUMAN FACTORS ENGINEERS	REACTOR OPERATORS	I&C ENGINEERS	NUCLEAR SYSTEMS ENGINEERS
Planning	220		100	120
Review:				
Operating Experience Review	220	140	40	40
Inventory			200	200
Control Room Survey	200	120	40	
Task Analysis	130	40	300	400
Verification and Validation	130	120	100	400
Assessments	200	80	200	40
Correction/Effectiveness	120	80	80	80
Documentation	120		100	80
Project Meetings	80	40	100	80

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Clinton Power Station
DCRDR - Program Plan - Review

NRC CONCERN

REVIEW TEAM

- **RESUMES**

RC

N/C-3
S/C-2

AI

CPS RESPONSE

RESUMES SUBMITTED TO NRC 2/27/85

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DCRDR - Program Plan - Review

NRC CONCERN

REVIEW TEAM

- INCREASED PARTICIPATION IN ALL TASKS BY HUMAN FACTORS SPECIALISTS

N/C-4
S/C-3
S/C-17
S/C-18

CPS RESPONSE

REVISED PROGRAM PLAN TABLE 2-2

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DCRDR - Program Plan - Review

PROGRAM PLAN TASK REVIEW

- OPERATING EXPERIENCE REVIEW (OER) OVERVIEW
- SYSTEM FUNCTION AND TASK ANALYSIS (SFTA)
- CONTROL ROOM INVENTORY
- CONTROL ROOM SURVEY (CRS)
- HED ASSESSMENT
- SELECTION OF DESIGN IMPROVEMENTS
- VERIFICATION OF DESIGN IMPROVEMENTS

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OER OVERVIEW

- OPERATING HISTORY REVIEW
- QUESTIONNAIRE
- INTERVIEWS

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SAIC CONCERN

OER

- PRETEST SURVEY AND INTERVIEW QUESTIONS

S/C-4

CPS RESPONSE

QUESTIONS DEVELOPED USING EXPERIENCE FROM 5 PLANTS

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SAIC CONCERN

OER

- PLANNING & CONDUCT OF INTERVIEWS (CONFIDENTIALITY)

S/C-5

CPS RESPONSE

ITEMS COVERED IN TORREY PINES TECHNOLOGY METHODOLOGY

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SFTA
(System Function Task Analysis)

MAJOR CHARACTERISTICS

- TOP-DOWN APPROACH
- INDEPENDENT OF CONTROL ROOM ENVIRONMENT
- BASED ON PLANT-SPECIFIC EOPs
- INTEGRATED WITH EOP V&V REQUIREMENTS PER EOP UPGRADE PROGRAM
- IDENTIFIED INFO & CONTROL REQUIREMENTS TO IMPLEMENT EOPs
- IDENTIFIES INFO & CONTROL REQUIREMENTS TO PERFORM EMERGENCY OPERATIONS
- DATA BASE MANAGEMENT SYSTEM (DBMS) USED

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SFTA

BASES FOR USING PLANT-SPECIFIC EOPs

- DERIVED FROM BWROG EPGs, REV 3, VIA PLANT-SPECIFIC EPGs

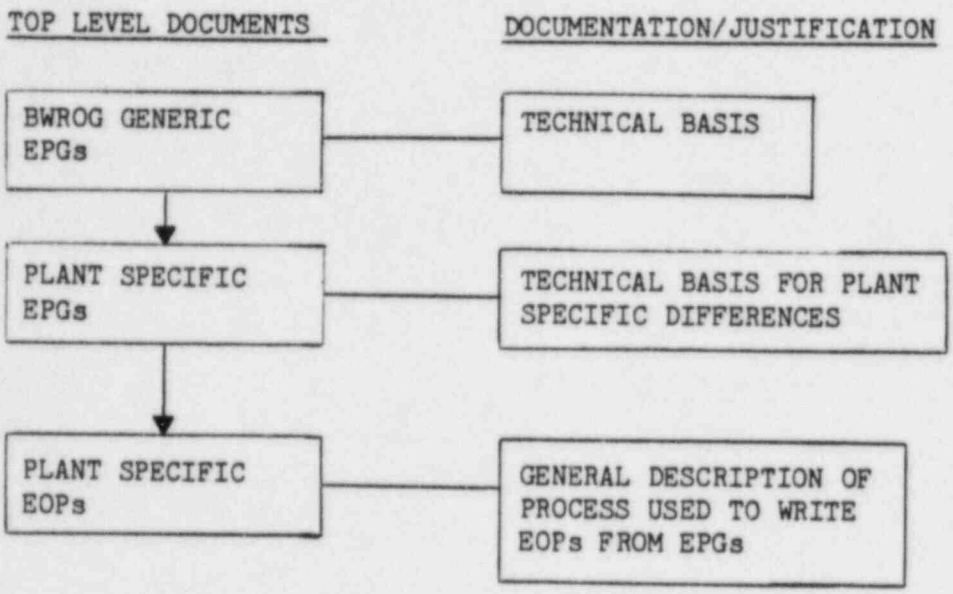
S/C-10

- PLANT-SPECIFIC EPGs CONTAIN BASES FOR PLANT-SPECIFIC NEEDS

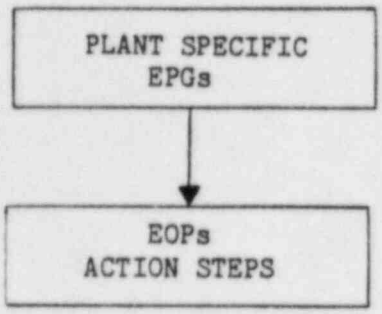
N/C-6
S/C-6

- TECHNICAL BASES FOR DEVIATIONS FROM BWROG EPGs DOCUMENTED IN PGP
- VERIFICATION OF EPG/EOP TECHNICAL ACCURACY INTEGRATED WITH SFTA

SYSTEM FUNCTION AND TASK ANALYSIS



SYSTEM FUNCTION AND TASK ANALYSIS
AUDITABLE DOCUMENTATION



- GENERAL FUNCTIONAL STEPS

- FOR EACH FUNCTIONAL STEP IN EPG - SHOW SPECIFIC CORRESPONDING STEPS IN EOPs THAT COMPLETE THE EPG FUNCTIONAL TASK
- ARE THE SPECIFIC STEPS IN EOPs SUFFICIENT FOR THE OPERATOR TO COMPLETE THE TASK
- DEVELOP INSTRUMENT AND CONTROL NEEDS FROM EOP TASKS
- DEVELOP INSTRUMENT CHARACTERISTICS
- PERFORM ABOVE STEPS INDEPENDENT OF CONTROL ROOM
- COMPARE FINAL INSTRUMENT LIST TO CONTROL ROOM INVENTORY (ACTUAL CONTROL ROOM INSTRUMENTS)

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SFTA

DETERMINATION OF EOP INFO & CONTROL REQUIREMENTS (INDEPENDENT OF CONTROL ROOM ENVIRONMENT)

- REVIEW PLANT DOCUMENTS
- COLLECT PLANT SYSTEM & EOP DATA
  - — RELATES SYSTEMS TO CRITICAL SAFETY FUNCTION TO EOPs
- COLLECT OPERATOR PRIMARY & ALTERNATE TASK DATA
  - — FORMULATE TASK DESCRIPTION FROM EOP ACTION STEPS
  - — DETERMINE TASK LEVEL INFO & CONTROL REQUIREMENTS FROM EOP ACTION STEPS
  - — OPERATORS PARTICIPATE
  - — OPERATOR QUESTIONNAIRE USED

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DETERMINATION OF EOP INFO & CONTROL REQUIREMENTS (CONTINUED)
(INDEPENDENT OF CONTROL ROOM ENVIRONMENT)

- COLLECT OPERATOR STEP DATA TO EXECUTE TASKS
  - — FORMULATE STEP DESCRIPTION
  - — DETERMINE STEP LEVEL INFO & CONTROL REQUIREMENTS
  - — OPERATORS PARTICIPATE
  - — OPERATOR QUESTIONNAIRE USED

S/C-12

- REPORT EOP OPERATOR TASK, STEP, INFO & CONTROL REQUIREMENT DATA
  - — ENTER DATA TO DBMS
  - — PRODUCE STANDARD DATA SHEET #1, OPERATOR PRIMARY & ALTERNATE TASKS (PER EOP)
  - — PRODUCE STANDARD DATA SHEET #2, OPERATOR STEPS IN TASK SEQUENCE (PER EOP)
  - — REVIEW DATA SHEETS FOR CORRECTNESS

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DETERMINATION OF EOP INFO & CONTROL REQUIREMENTS (CONTINUED)
(INDEPENDENT OF CONTROL ROOM ENVIRONMENT)

- PERFORM EOP VERIFICATION – PART 1
  - — PERFORMED IN PARALLEL WITH ABOVE ACTIVITIES
  - — VERIFY PLANT-SPECIFIC CALCULATIONS
  - — VERIFY ENTRY CONDITIONS/SYMPTOM INFORMATION
  - — VERIFY INSTRUMENTATIONAL STEP, CAUTION, NOTE INFORMATION
  - — VERIFY QUANTITATIVE INFORMATION
  - — REPORT DISCREPANCIES PER EOP V&V PROGRAM
  - — REVISE EOPs AND EOP TASK/STEP DATA AS REQUIRED

S/C-7	S/C-13
S/C-8	N/C-5
S/C-9	N/C-6
S/c-11	N/C-7

ALL INFO & CONTROL REQUIREMENTS TO IMPLEMENT EOPs DETERMINED

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**PERFORM EOP VERIFICATION - PART 2 (INSTRUMENTATION ADEQUACY)
(COMPARES EOP INFO & CONTROL REQUIREMENTS WITH EXISTING CONTROL ROOM CHARACTERISTICS)**

- **COLLECT EOP INSTRUMENT DATA**
  - **— OPERATOR IDENTIFIES CONTROL ROOM DEVICE NO. TO ACCOMPLISH EACH STEP**
  - **— DEVICE NO. IS AN ARBITRARY NO. ASSIGNED IN CONTROL ROOM INVENTORY PHASE**
  - **— ADD DEVICE CHARACTERISTICS FROM CONTROL ROOM INVENTORY**

N/C-7
S/C-13

- **REPORT REQUIRED/EXISTING EOP INFO & CONTROL DATA**
  - **— ENTER DATA TO DBMS**
  - **— PRODUCE STANDARD DATA SHEET #3, INFORMATION & CONTROL, REQUIRED VS. AVAILABLE (PER EOP)**
  - **— PRODUCE STANDARD DATA SHEET #4, INFORMATION & CONTROL, REQUIRED VS. AVAILABLE (ALL EOPs)**
  - **— REVIEW DATA SHEETS FOR CORRECTNESS**

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DCRDR - Program Plan - Review

SFTA

PERFORM EOP VERIFICATION - PART 2 (INSTRUMENTATION ADEQUACY) (CONTINUED) (COMPARES EOP INFO & CONTROL REQUIREMENTS WITH EXISTING CONTROL ROOM CHARACTERISTICS)

- **EVALUATE REQUIRED/EXISTING EOP INFO & CONTROL DATA**
  - **— USING PRINCIPALLY DATA SHEETS #3 & #4**
- **REPORT DISCREPANCIES PER EOP V&V PROGRAM**
- **REVISE EOPs AND EOP TASK/STEP DATA AS REQUIRED**

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DETERMINATION OF EMERGENCY OPERATION INFO & CONTROL REQUIREMENTS
(INDEPENDENT OF CONTROL ROOM ENVIRONMENT)

- SELECT OPERATING EVENTS (SOEs)
  - ESTABLISH SELECTION CRITERIA
  - IDENTIFY INITIATING EVENTS
  - ADD ASSUMPTIONS OF CONCURRENT OR SUBSEQUENT SYSTEM FAILURES
  - VERIFY CRITERIA IS SATISFIED
  - OPERATORS PARTICIPATE

- COLLECT OPERATOR PRIMARY & ALTERNATE TASK/STEP DATA
  - IDENTIFY SOE FLOW PATH THROUGH EOPs
  - IDENTIFY EXISTING EOP TASK/STEP DATA IN SEQUENCE FOR SOE
  - ADD SOE-SPECIFIC DEVIATIONS FROM EOP TASK/STEP DATA
  - OPERATORS PARTICIPATE
  - OPERATOR QUESTIONNAIRE USED

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DETERMINATION OF EMERGENCY OPERATION INFO & CONTROL REQUIREMENTS (CONTINUED) (INDEPENDENT OF CONTROL ROOM ENVIRONMENT)

- REPORT SOE OPERATOR TASK, STEP, INFO & CONTROL REQUIREMENT DATA
  - — SIMILAR TO CORRESPONDING EOP ACITVITY
  - — PRODUCE DATA SHEET #1 & #2 (PER SOE)
  - — REVIEW DATA SHEETS FOR CORRECTNESS

S/C-7	S/C-13
S/C-9	N/C-5
S/C-11	N/C-6
S/C-12	N/C-7

ALL INFO & CONTROL REQUIREMENTS TO PERFORM EMERGENCY OPERATIONS DETERMINED

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COMPARE EMERGENCY OPERATION INFO & CONTROL REQUIREMENTS WITH EXISTING CONTROL ROOM CHARACTERISTICS
(VERIFICATION PHASE)

- COLLECT SOE INSTRUMENT DATA
  - — SIMILAR TO CORRESPONDING EOP ACTIVITY
  - — IDENTIFY DEVICE NO. FOR SOE-SPECIFIC STEPS
  - — ADD DEVICE NO. CHARACTERISTICS FROM CONTROL ROOM INVENTORY
- REPORT REQUIRED/EXISTING SOE INFO & CONTROL DATA
  - — SIMILAR TO CORRESPONDING EOP ACTIVITY
  - — PRODUCE DATA SHEET #3 & #4 (PER SOE)

N/C-7
S/C-13

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COMPARE EMERGENCY OPERATION INFO & CONTROL REQUIREMENTS WITH EXISTING CONTROL ROOM CHARACTERISTICS (CONTINUED) (VERIFICATION PHASE)

- EVALUATE REQUIRED/EXISTING SOE INFO & CONTROL DATA
  - — ASSEMBLE CHECKLISTS FROM CONTROL ROOM SURVEY PER CRITERIA MATRIX
  - — REVIEW STANDARD DATA SHEETS USING CHECKLISTS
  - — PRODUCE GUIDELINE-SPECIFIC OR TASK-SPECIFIC DATA GROUPINGS OR DIAGRAMS AS REQUIRED
  - — REPORT NON-COMPLIANCE ON HEO FORM
  - — IDENTIFY POTENTIAL NON-COMPLIANCE FOR EVALUATION IN VALIDATION PHASE

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EMERGENCY OPERATION PERFORMANCE CAPABILITY
(VALIDATION PHASE)

- SELECT SOEs AND OPERATOR TASKS FROM THE EXISTING SOEs
  - — ESTABLISH SELECTION CRITERIA
  - — IDENTIFY SOEs & TASKS
  - — OPERATORS PARTICIPATE
- WALK/TALK THROUGH AT CONTROL ROOM MOCKUP
  - — OPERATORS WALK THROUGH STEPS TO ACCOMPLISH TASKS
  - — OBSERVERS EVALUATE USING OPERATOR QUESTIONNAIRE & GUIDELINES IDENTIFIED IN CRITERIA MATRIX
  - — REPORT NON-COMPLIANCE ON HEO FORM
  - — IDENTIFY TIME-DEPENDENT TASKS FOR EVALUATION ON SIMULATOR

S/C-12

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SFTA

EMERGENCY OPERATION PERFORMANCE CAPABILITY (CONTINUED)
(VALIDATION PHASE)

- EVALUATION ON CONTROL ROOM SIMULATOR
  - — OPERATOR RESPONSE RECORDED ON VIDEO
  - — OBSERVERS & OPERATORS EVALUATE VIDEO USING OPERATOR QUESTIONAIRE & GUIDELINES IDENTIFIED IN CRITERIA MATRIX
  - — REPORT NON-COMPLIANCE ON HEO FORM
- SUBMIT ALL HEOs FOR ASSESSMENT
- COMPLETE EOP VALIDATION FORMS

S/C-12

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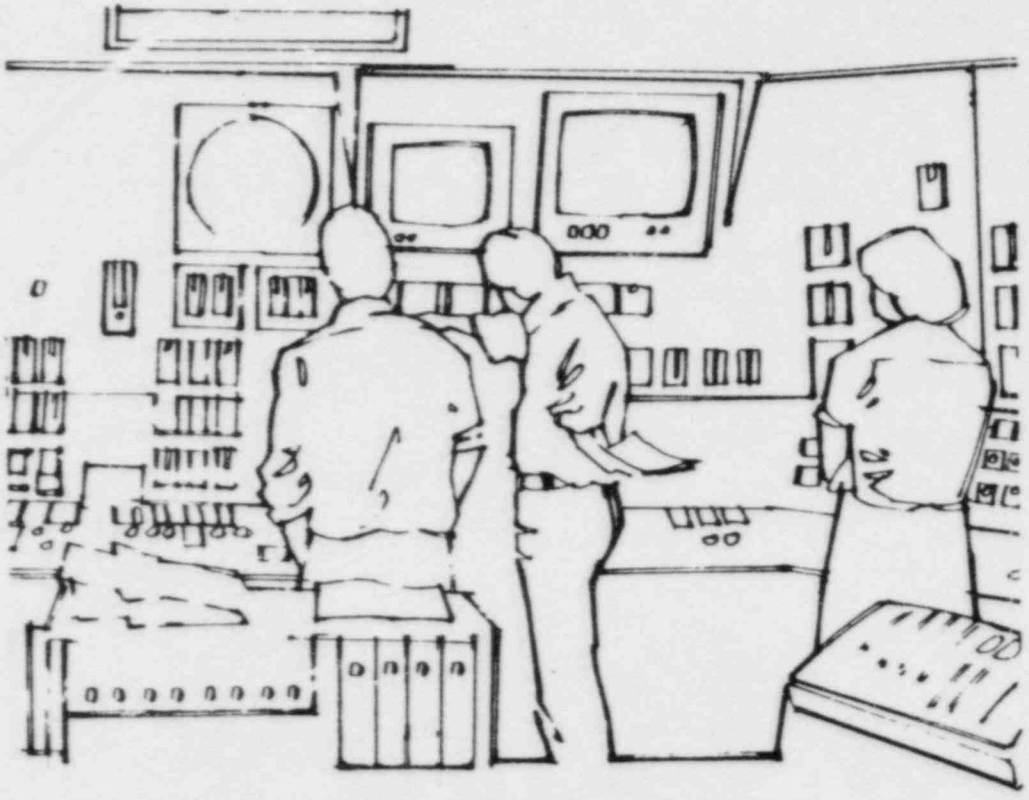
CONTROL ROOM INVENTORY



ITEMS INCLUDED IN INVENTORY LIST

- DEVICE NUMBER
- INSTRUMENT NUMBER
- SERVICE DESCRIPTION
- SYSTEM NUMBER
- RANGE UNITS
- MINIMUM SCALE INCREMENT
- PANEL ID

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CONTROL ROOM SURVEY

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CONTROL ROOM SURVEY

TASK TEAM

- HUMAN FACTORS SPECIALIST
- I&C ENGINEER
- OPERATIONS MANAGER

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CONTROL ROOM SURVEY

ACTIVITIES:

- PREPARE CRITERIA MATRIX REPORT
- PREPARE NINE CHECKLIST BOOKLETS N/C-8
- DETERMINE HOW AND WHERE DATA COLLECTED
- CONDUCT THE SURVEY
- PREPARE HEOs
- PREPARE A TASK REPORT

CRITERIA REPORT

- INTRODUCTION
- GENERAL
- CONTROL ROOM LAYOUT AND FEATURES
- MAIN CONTROL PANEL LAYOUTS AND FEATURES
- CRITERIA MATRIX
- HUMAN ENGINEERING GUIDELINES (SPECIFIC ADAPTATIONS OF NUREG-0700, SECTION 6, AND OTHER GUIDELINES NOT COVERED IN OTHER MAJOR TOPICS)
- SPECIAL GUIDELINES ASSOCIATED WITH THE APPLICATION OF HUMAN FACTORS ENGINEERING TO CONTROL ROOM DESIGN
- CONTROL ROOM CONVENTIONS
- PLANT STANDARD ABBREVIATIONS

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CONTROL ROOM SURVEY

CRITERIA MATRIX

CLINTON POWER STATION
DETAILED CONTROL ROOM DESIGN REVIEW

CRITERIA MATRIX

6.3 Annunciator Warning Systems

NUREG-0700 GUIDELINE	CRITERIA		DATA COLLECTION METHOD			COMMENTS/REFERENCE
6.3.1 Gen. Sys Characteristics	0700	INPO	OER	CRS	SFTA	
6.3.1.1 General System Design	X		S	P		Will observe and query operators to assure the following general annunciator system general characteristics: 1) an auditory alert, 2) visual alarms indication,3) operator response capability.
6.3.1.2 Alarm Parameter Selection	X		P	S		6.3.1.2a thru c: OER primary source for these items. 6.3.1.2d: NA for Clinton Power Station (single unit).
6.3.1.3 First Out Annunciators	X		S	P		
6.3.1.4 Prioritization	X		S	P		6.3.1.4b(2): Related to 6.2.2.3. 6.3.1.4b(1): Related to 6.5.1.6b(1) & 6.6.6.3.
6.3.1.5 Cleared Alarms	X		S	P		6.3.1.5a: Related to 6.2.2.3a and 6.3.2.1a. 6.3.1.5b(1): Use stop watch to measure flash rates.

CRITERIA REPORT - SAMPLE CONVENTIONS

CHANNELS

I	-	Red
II	-	White
III	-	Blue
IV	-	Yellow

B. Other component and function nameplates.

Background to match the basic panel front surface color; lettering shall be black.

G. CONTEXT 7 - MIMIC LINES

1. Electric Power Lines
   - o Light Blue - 345 kV
   - o Black - 138 kV
   - o Dark Blue - 25 kV
   - o Orange - 13.8 kV
   - o Yellow - 4.16 kV
   - o Ivory - 480 V
2. Process Mimic Lines
   - o Orange

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CONTROL ROOM SURVEY

GUIDELINE/CHECKLIST BOOKLETS S/C-16

- CONTROL ROOM WORKSPACE
- COMMUNICATIONS
- ANNUNCIATOR WARNING SYSTEMS
- CONTROLS
- VISUAL DISPLAYS
- LABELS & LOCATION AIDS
- PROCESS COMPUTERS
- PANEL LAYOUT
- CONTROL/DISPLAY INTEGRATION

GUIDELINE

COMPLIANCE CHECKLIST

N/A	Yes	No	Reference/Comment

6.2.1.1 GENERAL REQUIREMENTS FOR VOICE COMMUNICATION SYSTEMS

Generally there are six varieties of voice communication systems found in control rooms: Conventional-powered telephones, sound-powered telephones, walkie-talkie radio transceivers, fixed-band UHF transceivers, announcing systems, and point-to-point intercom systems. Human factors requirements specific to each type of voice communication system will be considered individually in Guidelines 6.2.1.2 through 6.2.1.7 while 6.2.1.8 will address voice communication by the operator wearing an emergency mask. The following requirements are relevant to communication systems in general.

a. INSTRUCTIONS—Instructions should be provided for use of each communication system, including suggested alternatives if a system becomes inoperable.

b. PERIODIC MAINTENANCE TESTS—These should be performed on all communication systems to ensure that the system is normally operative and effective under changes in ambient noise levels that may have occurred since the last check.

c. EMERGENCY MESSAGES

(1) OUTGOING—Priority procedures should be established for the transmission of emergency messages from the control room by any of the communication systems.

(2) INCOMING—Procedures should be established for handling communications during an emergency and these procedures must be known by all operators.

DETAILED CONTROL ROOM DESIGN REVIEW
CONTROL ROOM SURVEY
REFERENCE/COMMENT FORM

OBSERVER: _____ DATE: _____ PAGE ___ OF ___

LOCATION: _____

GUIDELINE CRITERIA ITEM NO.: _____ HEO REFERENCE NO.: _____

CRITERIA ELEMENT NO.	PANEL/ CONSOLE NO.	SUBPANEL	REFERENCE/COMMENT
DIAGRAM/PHOTO NO.:			

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Clinton Power Station
DCRDR - Program Plan - Review

CONTROL ROOM SURVEY

DATA GATHERING

- MOCK-UP
- CONTROL ROOM
  - SOUND
  - VENTILATION
  - WORKSPACE
  - COMMUNICATIONS

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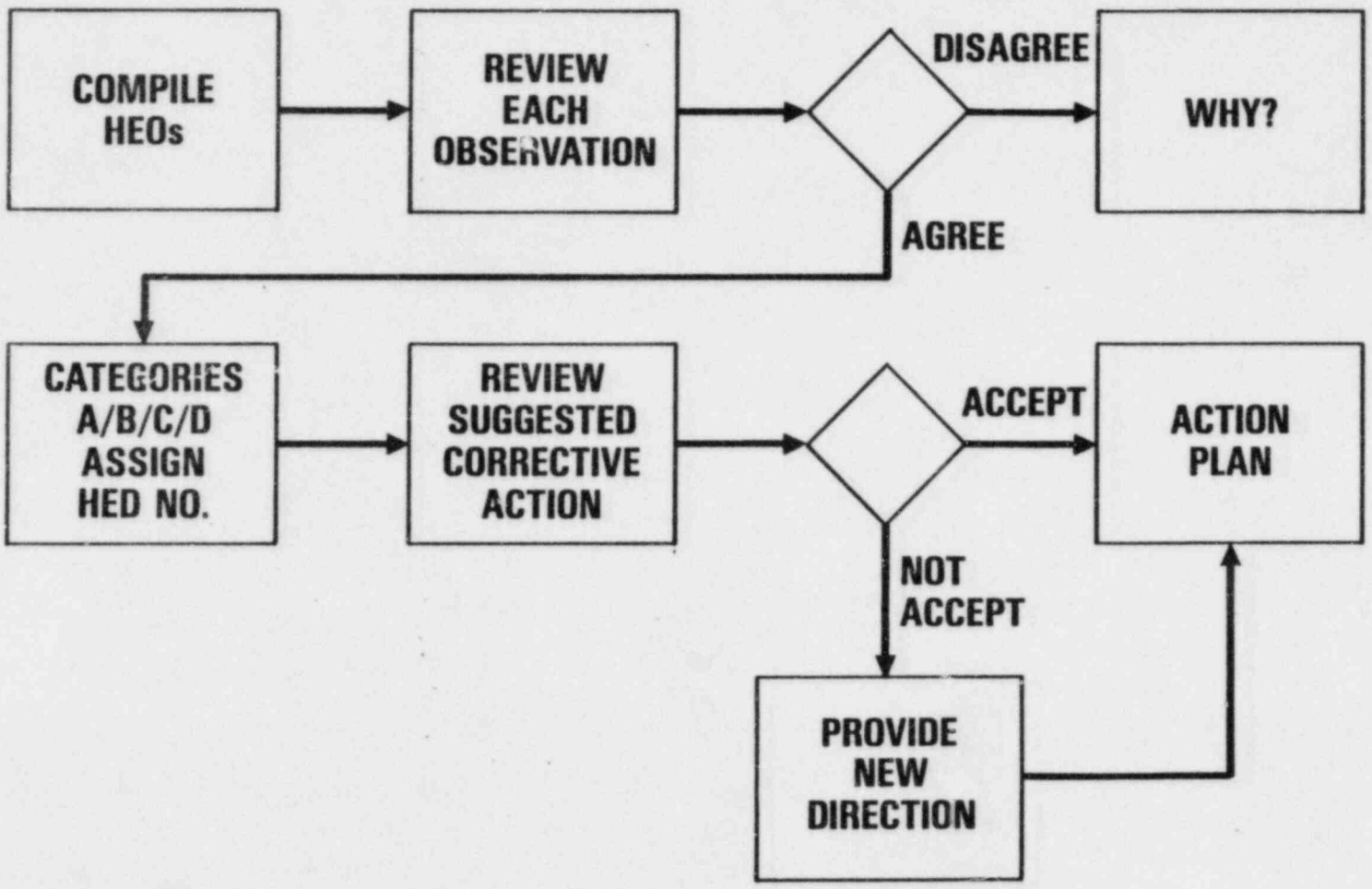
DCRDR - Program Plan - Review

ASSESSMENT & IMPLEMENTATION



HUMAN ENGINEERING OBSERVATION ASSESSMENT

OBSERVATION

PLANT Clinton Power Sta | Sabeh/Welch EVALUATOR | HED# _____

TASK Control Rm Survey | SIGNATURE | HEO# 6.5.004

CL# 6.5 CL ITEM# 6.5.3.1 | DATE 1/29/85

CL TITLE VISUAL DISP c(2) | HEO CATEGORY _____

PANEL TITLE ALL | PANEL # ALL

HEO DESCRIPTION

GUIDELINE - CHARACTERISTICS AND PROBLEMS OF LIGHT INDICATORS
(Precautions to Avoid Misinterpretation)

There is no provision to prevent interchanging of indicator lenses. Green and Amber lenses were reversed on P801 #032 and 053.

[ ] SUPPORT MATERIAL ATTACHED

POTENTIAL OPERATOR ERROR(S)

Increased probability of error in determining plant status if lenses are inadvertently interchanged.

RECOMMEND[illegible] REVISION

Provide keyed lenses or strict administrative controls to prevent interchanging of lenses.

RECOMMENDED IMPLEMENTATION:

TECHNICAL REVIEW

CHAIRMAN _____ DATE _____

[ ] Concur.

[ ] Concur With Comment/Note.

[ ] Reevaluate & Resubmit For Following Reason:

Comment/Note/Reason: _____

MANAGEMENT REVIEW

DATE _____

[ ] Concur.

[ ] Concur With Comment/Note.

[ ] Reevaluate & Resubmit For Following Reason:

Comment/Note/Reason: _____

Sample Human Engineering Observation Assessment Form

ILLINOIS IP POWER

HEO PROCESSING

ASSESSMENT FACTOR CRITERIA		
CATEG.	ASSESSMENT FACTOR	IMPLEMENT
A	HIGH SAFETY IMPORTANCE – UNSAFE CONDITION OR TECH SPEC VIOLATION	PROMPTLY
B	SAFETY CONSIDERATION	NEAR TERM
C	RELIABILITY/AVAILABILITY	CONV. OUTAGE
D	MINOR AND NON-SIGNIFICANT	OPTIONAL

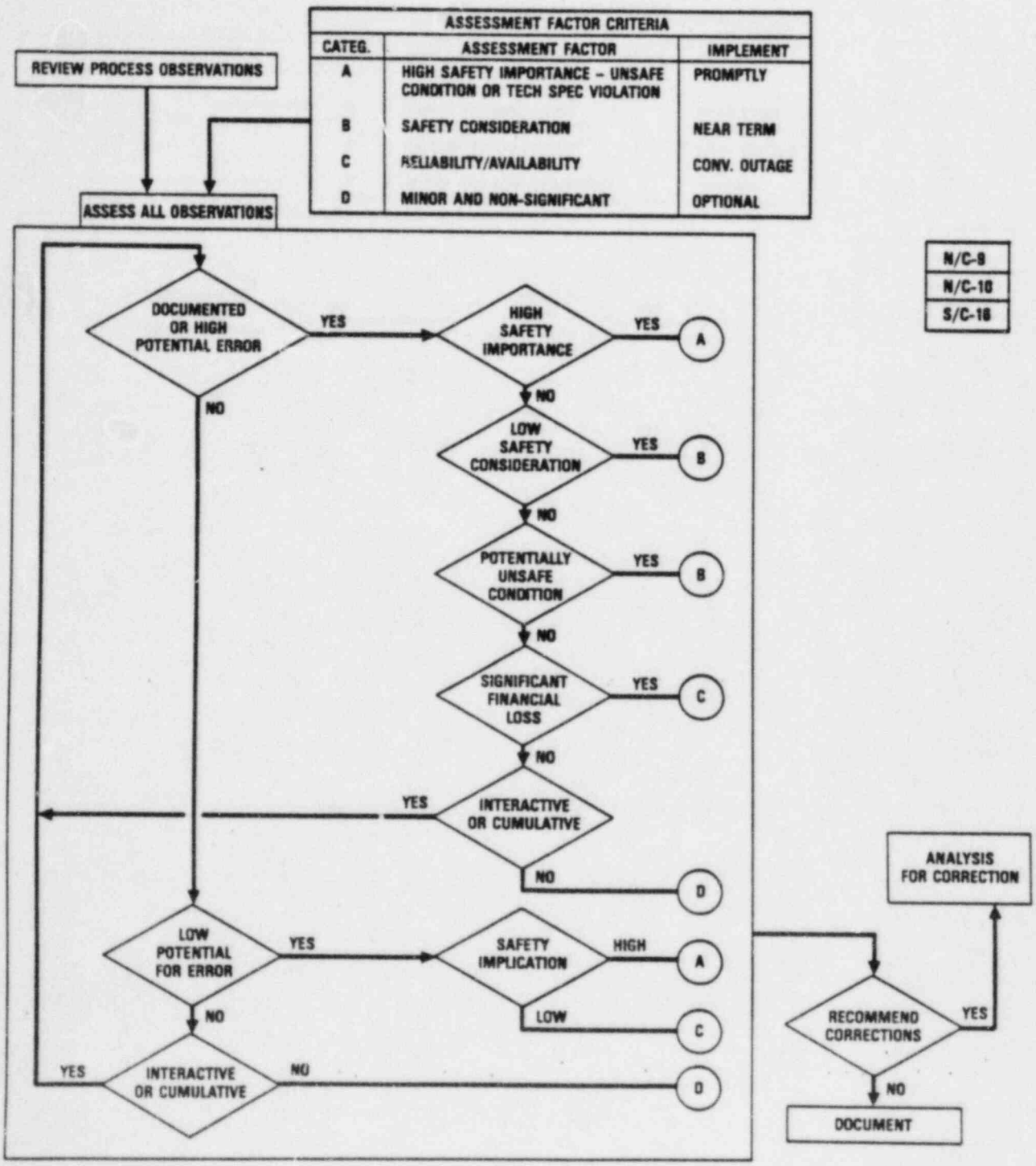


TABLE 6-1

CRITERIA FOR EVALUATING HEOs

(MODIFIED FROM NUREG-0801)

Consider the following.

	Yes	No	Possibly	Probably	Not Likely
1. Is the HEO really a deficiency?	___	___	___	___	___
2. Is the HEO part of a larger or generic HEO?	___	___	___	___	___
3. Could this HEO result in significant plant downtime or personnel injuries?	___	___	___	___	___
4. Could resolution of this HEO provide increased operator productivity and morale?	___	___	___	___	___
Will this HEO:					
5. cause undue operator fatigue?	___	___	___	___	___
6. cause operator confusion?	___	___	___	___	___
7. cause operator discomfort?	___	___	___	___	___

TABLE 6-1 (cont.)

	Yes	No	Possibly	Probably	Not Likely
8. present a risk of injury to control room personnel?	—	—	—	—	—
9. increase the operator's mental workload (for example, by requiring interpolation of values, remembering inconsistent or unconventional control positions, etc.).	—	—	—	—	—
10. distract control room personnel from their duties?	—	—	—	—	—
11. affect the operator's ability to see or read accurately?	—	—	—	—	—
12. affect the operator's ability to hear correctly?	—	—	—	—	—
13. degrade control room personnel performance?	—	—	—	—	—
14. degrade the operator's ability to manipulate controls correctly?	—	—	—	—	—

TABLE 6-1 (cont.)

	Yes	No	Possibly	Probably	Not Likely
15. cause a delay of necessary feedback to the operator?	—	—	—	—	—
16. degrade positive feedback about control task(s)?	—	—	—	—	—
17. violate control room conventions or practices?	—	—	—	—	—
18. violate nuclear industry conventions?	—	—	—	—	—
19. violate societal stereotypes?	—	—	—	—	—
20. involve highly stressful situations (i.e., highly time constrained, of serious consequences, etc.)?	—	—	—	—	—
21. lead to inadvertent activation or deactivation of controls?	—	—	—	—	—
22. cause a specific error? Is it probable that another error of equal or more serious consequences will be committed?	—	—	—	—	—

TABLE 6-2

HEO PLANT IMPACT EVALUATION CRITERIA

	Yes	No	Possibly	Probably	Not Likely
Does the HEO involve controls or displays that are used by operators while executing emergency procedures?	—	—	—	—	—
It is likely that the error caused by this HEO would result in:					
A violation of a technical specification, safety limit, or a limiting condition for operation?	—	—	—	—	—
The unavailability of a safety-related system needed to mitigate transients or system needed to safely shut down the plant?	—	—	—	—	—
Does this HEO involve controls or displays that are part of an engineered safety function or are associated with a reactor trip function?	—	—	—	—	—
Does this HEO involve control or display problems that would not be readily identified or corrected by alarms, interlocks or other instruments?	—	—	—	—	—

TABLE 6-3

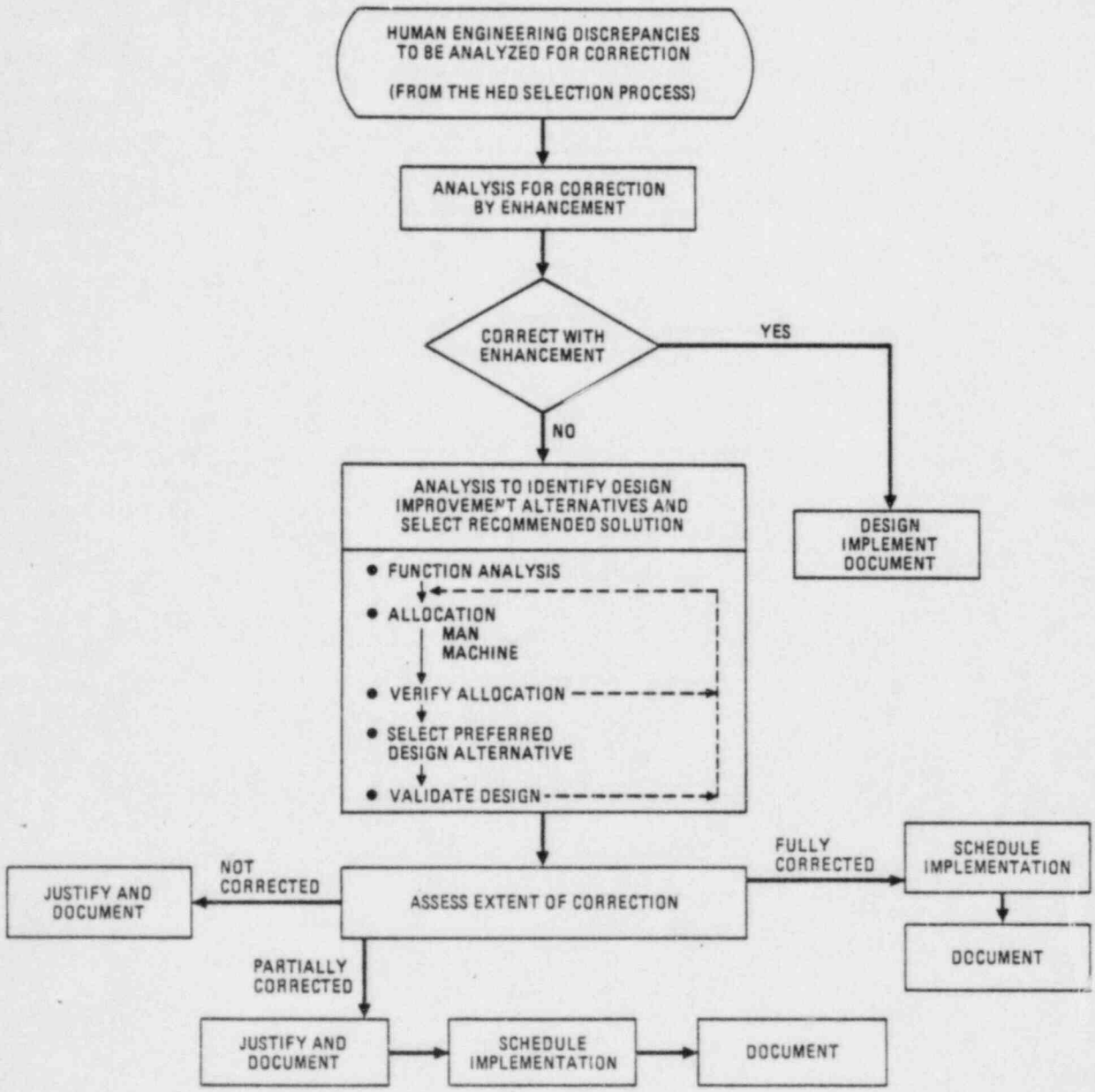
HEO RESOLUTION CRITERIA

In evaluating how to resolve a given HEO, the AIT will consider the following questions:

	Yes	No	Possibly	Probably	Not Likely
1. Due to its unique nature, does the HEO require further study or assessment?	___	___	___	___	___
2. Can the HEO be resolved with paint/tape/label enhancements?	___	___	___	___	___
3. Should the HEO be resolved to maintain consistency with control room conventions or standards?	___	___	___	___	___
4. Is the HEO so minor that no physical change is needed and the only action required is to establish operator awareness in routine training?	___	___	___	___	___
5. Does the recommended fix really address the issue of concern?	___	___	___	___	___

TABLE 6-3 (cont.)

	Yes	No	Possibly	Probably	Not Likely
6. Is the operator's ability to respond to any plant transient or accident degraded by implementing the recommended change?	___	___	___	___	___
7. Are there other, more cost-effective methods to resolve the HEO?	___	___	___	___	___
8. Is the HEO in the process of resolution with an existing design change?	___	___	___	___	___
9. Is the recommendation consistent with present control room characteristics and practices?	___	___	___	___	___
10. Does the proposed change create any new HEOs?	___	___	___	___	___


HUMAN ENGINEERING DISCREPANCIES TO BE ANALYZED FOR CORRECTION
(FROM THE HED SELECTION PROCESS)
ANALYSIS FOR CORRECTION BY ENHANCEMENT
CORRECT WITH ENHANCEMENT
YES
NO
DESIGN IMPLEMENT DOCUMENT
ANALYSIS TO IDENTIFY DESIGN IMPROVEMENT ALTERNATIVES AND SELECT RECOMMENDED SOLUTION
• FUNCTION ANALYSIS
• ALLOCATION
MAN
MACHINE
• VERIFY ALLOCATION
• SELECT PREFERRED DESIGN ALTERNATIVE
• VALIDATE DESIGN
ASSESS EXTENT OF CORRECTION
NOT CORRECTED
JUSTIFY AND DOCUMENT
FULLY CORRECTED
SCHEDULE IMPLEMENTATION
DOCUMENT
PARTIALLY CORRECTED
JUSTIFY AND DOCUMENT
SCHEDULE IMPLEMENTATION
DOCUMENT

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SELECTION OF CORRECTIVE METHOD

- DESIGN ENHANCEMENT
- DESIGN CHANGE
- DESIGN IMPROVEMENT STUDY
- OPERATING PROCEDURE CHANGE
- ADMINISTRATIVE PROCEDURE CHANGE

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DESIGN ENHANCEMENT

- PROVIDES SIGNIFICANT IMPROVEMENT
  - — QUICKLY
  - — LOW COST

ENHANCEMENT:

DEFINITION - CONTROL ROOM IMPROVEMENT BY SURFACE TREATMENT TECHNIQUES.

ACTION WORDS - ADD, REMOVE, REPLACE, RE-LOCATE, MODIFY, ADJUST ORGANIZE.

EXAMPLES:

- LABELS:

CONTROLS	FUNCTIONS
DISPLAYS	ANNUNCIATOR TITLES
SYSTEMS	

- DEMARCATION & MIMICS:

LINES	ZONES
SYMBOLS	CODING(COLOR, SHAPE, ETC.)

- ENVIRONMENT:

FURNISHINGS	VENTILATION
ROOM COLOR(S)	LIGHTING
CABINET COLOR(S)	NOISE LEVEL
TEMPERATURE	FURNITURE LOCATION

- DISPLAYS:

RECORDER PAPER & SCALE	COLOR CODING
LABELING	

- HARDWARE:

HANDLES	METER FACES
KNOBS	

ENHANCEMENT SUITABILITY CHECKLIST
CLINTON POWER STATION
DETAILED CONTROL ROOM DESIGN REVIEW

ILLINOIS IP POWER

Clinton Power Station
DCRDR - Program Plan - Review

DESIGN CORRECTIONS

- ASSESSMENT & IMPROVEMENT TEAM (AIT) WILL:
  - — STATE PROBLEM
  - — STATE DESIGN OBJECTIVE
  - — SCOPE CORRECTIVE WORK
  - — PROVIDE ANALYSES IF NECESSARY

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DCRDR - Program Plan - Review

DESIGN CORRECTION ANALYSIS

- INCLUDE ALTERNATE SOLUTION
- COMPARISON OF ALTERNATIVES
- RATIONALE FOR SELECTION
- CONCEPTUAL DESIGN

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DCRDR - Program Plan - Review

DESIGN IMPROVEMENT STUDIES INVOLVES:

- PLANT SAFETY SYSTEMS
- MANY PANEL DEVICES
- INTEGRATION WITH OTHER SYSTEMS OR EQUIPMENT

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DCRDR - Program Plan - Review

TYPICAL DESIGN IMPROVEMENT STUDIES

- ANNUNCIATOR SYSTEM
- LABELING AND DEMARCATION
- HABITABILITY
- PANEL LAYOUTS
- COMMUNICATIONS
- DESIGN MANUALS

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DCRDR - Program Plan - Review

PROCEDURE CORRECTION PROBLEM SOLVED BY:

- REALLOCATION OF DUTY
- CHANGE IN TASK STEP SEQUENCE
- IMPROVEMENT IN PROCEDURE WORDING (CLARIFICATION OR EMPHASES ON ACTION)
- ADDITION OF CAUTIONS

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DCRDR - Program Plan - Review

ADMINISTRATIVE PROCEDURES

- SIMPLIFICATION OF REPORTING TASKS & FORMS
- PROVIDE ASSISTANCE TO REDUCE OPERATOR LOAD

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Clinton Power Station
DCRDR - Program Plan - Review

DESIGN CORRECTIVE VERIFICATION

- CORRECTIVE DESIGN REALISTICALLY PICTURED:

N/C-11
S/C-19
S/C-20

  - — MOCKUP
  - — DRAWING

- HUMAN FACTORS SPECIALIST CHECK USING APPLICABLE CHECKLIST GUIDELINES

- TASK ANALYSIS SPECIALIST REVIEW USING TASK ANALYSIS PROCEDURE AS APPLICABLE

  - — TRAFFIC LINK DIAGRAMS
  - — OPERATIONAL SEQUENCE DIAGRAMS

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DCRDR - Program Plan - Review

DESIGN CORRECTIVE VERIFICATION

- OPERATIONS PERSONNEL REVIEW AND PERFORM MINI WALK-THRU AS NECESSARY (EOP STEPS THAT INVOLVE AFFECTED MAN/ MACHINE INTERFACES)

- COMPLETE VERIFICATION SIGNOFF FORM

SAMPLE

PROBLEM REPORTED

L. PANEL LAYOUT/INTEGRATION

	PROBLEM CORRECTED	PROBLEM NOT CORRECTED	NO NEW PROBLEM	CREATES NEW PROBLEM
1. NEED MORE LOGICAL AND FUNCTIONAL GROUPINGS				
2. NEED BETTER DEMARCATION AND BETTER LABELING				
3. 004, 005, 006 AND 007 ARE ESPECIALLY POORLY LAID OUT				
4. MANY OF PERIPHERAL PANELS THAT ARE OUTSIDE OF THE PRIMARY OPERATING AREA NEED TO BE INCLUDED IN MAIN PANEL LAYOUT				
5. ELECTRICAL CONTROLS ARE MUCH TOO FAR FROM TURBINE CONTROLS				

REMARKS: _____

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Clinton Power Station
DCRDR - Program Plan - Review

COORDINATION OF DCRDR ACTIVITIES WITH OTHER NUREG 0737-1 ACTIVITIES

- EOP–SPDS V & V
- REGULATORY GUIDE 1.97
- OPERATOR TRAINING

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Clinton Power Station
DCRDR - Program Plan - Review

NRC CONCERN

COORDINATION OF ACTIVITIES

N/C-12
S/C-21

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Clinton Power Station
DCRDR - Program Plan - Review

CPS RESPONSE

COORDINATION OF ACTIVITIES

N/C-12
S/C-21

- ERCIP SUBMITTAL – 4/15/83
- BIWEEKLY ERCIP MEETINGS
- MONTHLY ERCIP STATUS REPORTS TO EXECUTIVE VP & NRC (RESIDENT)
- DETAILED INTEGRATED SCHEDULE
- USE OF COMMON PERSONNEL
- SPECIFIC PROCEDURES FOR COORDINATION NOT NEEDED
- APPLICATION OF HUMAN FACTOR PRINCIPLES TO FURTHER CONTROL ROOM CHANGES

CLINTON POWER STATION
DETAILED CONTROL ROOM DESIGN REVIEW
NRC CONCERNS

CONCERN #	CONCERN
N/C-1	The Program Plan for the Clinton Power Station indicates that the equipment and tasks necessary for remote shutdown will be included in the scope of DCRDR. To the extent practicable, without delaying completion of the DCRDR, the NRC staff recommends that the DCRDR address any control room modifications and additions (such as controls and displays for inadequate core cooling and reactor system vents) made or planned as a result of other post-TMI actions, as well as the lessons learned from operating reactor events such as the Salem ATWS events.
N/C-2	The Program addressed all of the DCRDR requirements stated in Supplement 1 to NUREG-0737. However, the contents of the program plan are not detailed or complete enough to allow us to conclude that all these requirements will be met.
N/C-3	Clinton's auditable documentation should include the resumes of the review team members.
N/C-4	Illinois Power Company should give serious consideration to increasing the degree of participation by the human factors specialists, especially during the conduct of the task analysis, HED assessment, selection of design improvements, and verification and validation tasks. It appears that the human factors specialist has an advisory role rather than participating as an active integral part of the control room review team.
N/C-5	Function and Task Analyses The Plan does not describe a methodology sufficient to ensure that the determination of the operator information and control needs for emergency operations is done independently from the existing control room design.
N/C-6	Illinois Power Company should retain auditable documentation of the methodology used by Clinton to make the transition from the BWROG generic guidelines to the plant-specific EOPs and to independently identify operator information and control needs. The applicant's documentation should include sufficient details of the procedures and methodologies used and the results

CONCERN #	CONCERN
N/C-6 (cont.)	obtained to enable the NRC staff to determine that an acceptable top-down function and task analysis was performed. Such an analysis must be conducted to satisfy the requirement in Supplement 1 to NUREG-0737 for a function and task analysis to identify, independent of the existing control room design, control room operator tasks and information and control requirements during emergency operations.
N/C-7	Comparison of Display and Control Requirements With a Control Room Inventory: The applicant has described an inventory development effort that is consistent with guidelines provided in NUREG-0700. However, given the concerns discussed above regarding the identification of display and control characteristics, it is not clear whether an adequate comparison will be performed.
N/C-8	Control Room Survey: The control room survey methodology should be completely and adequately documented and available for NRC audit. Since all checklists and criteria to be used have not been submitted, it is not possible to fully evaluate the acceptability of the applicant's proposal.
N/C-9	Assessment of Human Engineering Discrepancies: The approach for assessing human engineering discrepancies (HEDs) to determine which are significant and should be corrected seems generally adequate. However, it is not clear whether all "human engineering observations" will be assessed. Also, many of the evaluation criteria presented in Table 4-2 should be able to be definitively answered based on the results of the task analysis rather than answered "probably, possibly, and not likely."
N/C-10	Selection of Design Improvements: Although the selection process generally appears adequate, the staff questions the distinction between the proposed HEO evaluation criteria and the HEO resolution criteria. The Program Plan states that the "Criteria for Evaluating HEOs, "Table 401, and "HEO Plant Impact Criteria," Table 4-2, are used to assess the significance of HEOs. The team selects a correction method using the "HEO Resolution Criteria, " Table 4.3. However, some questions in Table 4.3 appear more appropriately placed in Table 4-1. The staff will audit the corrective actions selected.

CONCERN #	CONCERN
N/C-11	Verification That Selected Design Improvements Will Provide the Necessary Correction and Not Introduce New HEDs: Although reference is made to verifying that the fixes correct the problems and introduce no new HEDs, the lack of detail makes it impossible to assess this portion of the applicant's program plan.
N/C-12	Coordination of the DCRDR With Other Programs: A detailed description of how the DCRDR will be coordinated with the SPDS, Reg. Guide 1.97 instrumentation and training was not provided so a complete evaluation was not performed.

CLINTON POWER STATION
DETAILED CONTROL ROOM DESIGN REVIEW
SAIC CONCERNS

CONCERN #	CONCERN
S/C-1	Also submitted concurrently with the program plan was PDA HED Evaluation materials (Reference 2). It should be noted, however, that Parts B-3 through B-9 and Part C of the evaluation materials were not submitted for review. They will be dealt with as part of the DCRDR.
S/C-2	Qualifications and Structure of the DCRDR Team: Illinois Power has specified personnel assignments by task. For the most part, the staff members seem suited for the tasks to which they have been assigned. As the function of Principal Investigator has not been defined, it is difficult to assess the degree to which a somewhat junior level staff member is suited for the position. Since no resumes have been provided for review team members Hall and Welsh, it is impossible to evaluate their qualifications relative to responsibilities. This section of the program plan could be enhanced by the provision of information regarding the qualifications and experience of Hall and Welsh and a description of the role of the Principal Investigator.
S/C-3	One concern is the level of effort of human factors specialists during the conduct of the task analysis and verification and validation tasks. Since the success of a DCRDR depends heavily on the contribution of human factors personnel in accomplishing these technical tasks, increasing the number of hours of human factors participation relative to I & C and Nuclear Systems Engineers hours would increase the likelihood of a successful DCRDR at Clinton.
S/C-4	Operating Experience Review: To ensure that survey and interview questions are simple, clear, and objective, it is recommended that the survey instrumentation and procedures be pretested.
S/C-5	A plan for analysis of open-ended responses will need to be developed as will procedures to ensure confidentiality and anonymity of respondents.
S/C-6	System Function and Task Analysis (SF&TA): The licensee then indicates that it will gather EOP-specific and SOE-specific data which consist of information in two major areas including: (1) operator tasks, and (2) operator steps. Operator task data include description and requirements for primary and alternate operator tasks, while operator step data consist of information on

CONCERN #	CONCERN
	discrete steps for each task. However, the licensee has not described in sufficient detail the process(es) to identify plant-specific parameters and other plant-specific information and control capability required for operator task performance.
S/C-7	Also, IPC has not described if and how the characteristics of needed instruments and controls will be determined.
S/C-8	First, as stated on page 3-15 of the program plan, the licensee will be using the generic BWR EPGs and plant-specific EPGs as inputs to the SF&TA. However, examples of how this generic documentation will be used are absent from the remaining discussion of the SF&TA. This lack of specific information concerning procedures for integrating BWR EPGs into the SF&TA effort is necessary to assess the licensee's understanding of the NRC requirement.
S/C-9	The licensee should be aware that, as a result of the NRC review of the BWR Owner's Group EPGs (Reference 8), a licensee is required to provide information on "the process used to identify plant-specific parameters and other plant-specific information and control capabilities used," and "how the characteristics of the needed instruments and controls will be determined."
S/C-10	Also, the specific revision number of the BWROG EPGs has not been cited. In the same reference (8) the NRC has clarified that revision 3 of the EPGs, "provides a functional analysis that identifies, on a high level, generic information and control needs." Revision 3 is specified by the NRC because it includes additional emergency operating procedures not included in earlier revisions.
S/C-11	Secondly, IPC proposes to conduct an operator task analysis following the methodology outlined in the "EOP and SOE Data Collection" activity (p. 3-18). Review of this task indicates that the licensee intends to define the operator tasks "independently of the control room panels." However, on page 3-18 of the program plan the licensee states that the "formulation of the step description ... and identification of control room devices that the operator could use for each step of the EOP flowpath uses principally the

CONCERN #	CONCERN
	photomosaic mock-up of the control room." This suggests a contradiction in that the information and control needs, and the associated characteristics of instrumentation and controls to meet the requirements will not be determined independently of the control room panels. A task analysis should be performed independently of existing instrumentation and control capabilities presently available to the operator in order to provide an objective, unbiased analysis to the fullest extent possible. This apparent contradiction in the intentions of the licensee should be resolved.
S/C-12	It should be noted that none of the procedures for walk/talk-throughs for verification and validation include interview techniques which will cause the operators to fully consider the adequacy of the indications described in the EIP steps, or for that matter the necessary accuracy, range and location of these indications and controls. The licensee is strongly urged to develop such techniques not only in the front-end analysis for EOP development, but also for the various V&V activities.
S/C-13	A Comparison of Display and Control Requirements With a Control Room Inventory: This approach is consistent with guidelines provided in NUREG-0700. Therefore the results of Illinois Power's inventory effort, as described, can be used in the process of verifying task performance capabilities. The licensee intends to use the inventory as a reference data base for comparison with the requirements established during the task analysis. The licensee, however, has not adequately described a method for identifying these requirements and other associated characteristics independent of the control room. Thus it is unclear whether the inventory activity will actually result in the identification of missing and/or inappropriate controls and displays as required by NUREG-0737, Supplement 1.
S/C-14	A Control Room Survey to Identify Deviations From Accepted Human Factors Principles: IPC has not stated whether is intends to comply with the requirements of Generic Letter 83-18 (for BWROG Control Room Survey Plan).

CLINTON POWER STATION
DETAILED CONTROL ROOM DESIGN REVIEW
SAIC CONCERNS

CONCERN #	CONCERN
S/C-15	Furthermore, rather than using NUREG-0700 survey criteria directly, IPC has stated that it intends to develop its own survey using NUREG-0700 and other criteria as appropriate for this survey. As Illinois Power has not provided all checklists and criteria to be used during this activity and has not documented differences between its versions and those guidelines of NUREG-0700, it is not possible to evaluate fully the survey portion of the program plan at this time.
S/C-16	Assessment of Human Engineering Discrepancies to Determine Which HEDs are Significant and Should be Corrected: Illinois Power has stated that the Assessment and Implementation Team (AIT) will systematically assess and categorize human engineering observations (HEOs) identified during previous DCRDR activities using criteria similar to those suggested in NUREG-0800, Appendix A. From a review of Figure 4.3, it is not clear whether all HEOs that have been identified will be subjected to the assessment process.
S/C-17	The licensee states that the human factors specialist will be available to answer questions during this phase of the assessment process. Because the human factors personnel can make a potentially significant contribution to the HED assessment process, it is recommended that they play an integral rather than an advisory role to the AIT in the conduct of the assessment of human engineering discrepancies (Reference 1. pp. 4-2 and 4-8). Information on specific tasks to be completed by the human factors personnel should be documented in the Summary Report.
S/C-18	Selection of Design Improvements: Recommendations for HED resolutions will be made by the Assessment and Implementation Team for each identified HED. Illinois Power states that the human factors specialist will be available for clarifications, if necessary. Because the human factors personnel can play a significant role in the selection of design improvements, it is recommended that they participate actively, rather than merely in an advisory capacity during this process (Reference 1. pp. 4-5 and 4-8).

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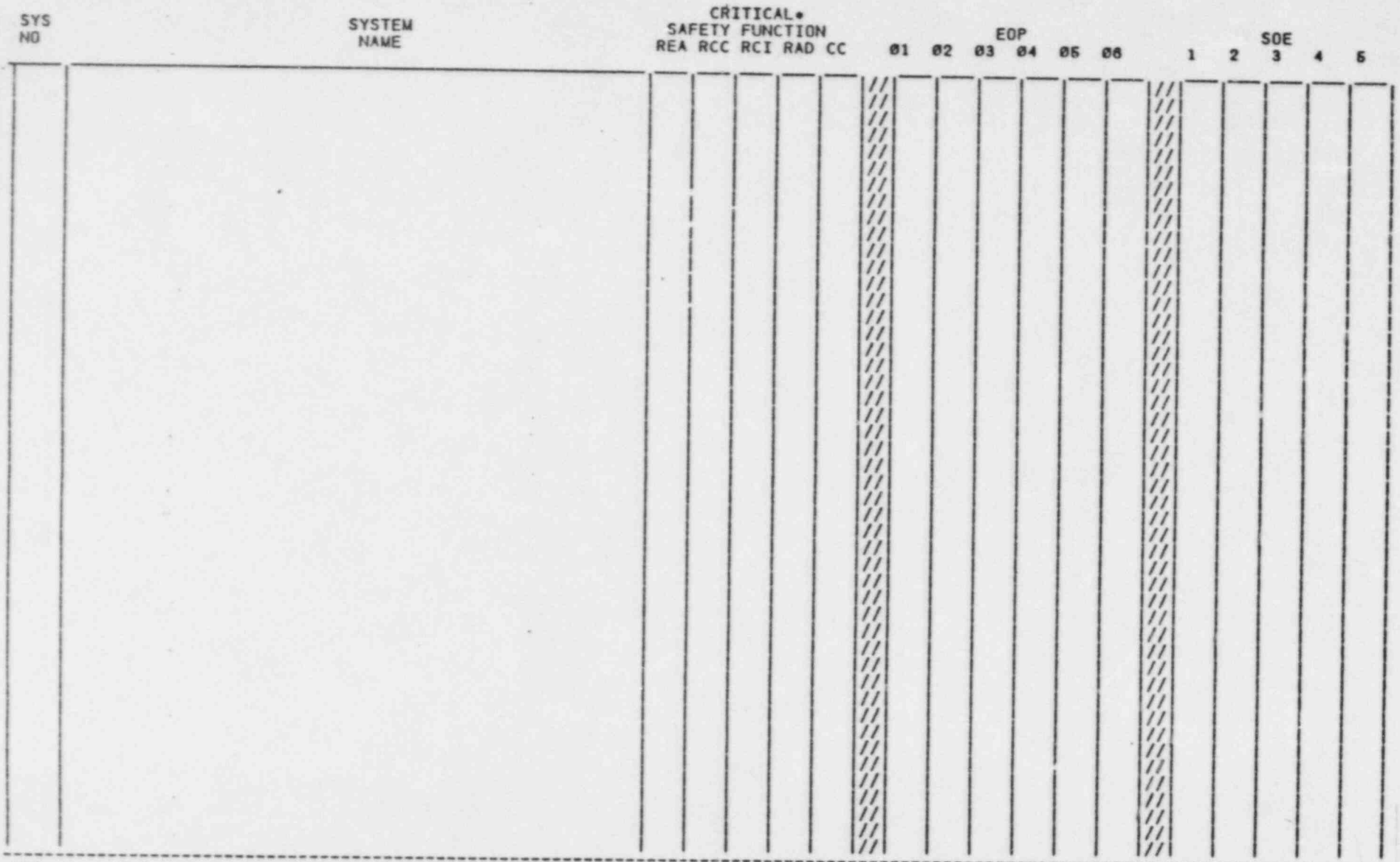
CONCERN #	CONCERN
S/C-19	As described, the process for selection of design improvements is consistent with NRC guidance. Once design improvements are selected, the AIT will determine which recommendations need to be mock-up and will define the need and method for further verification and/or validation. It is recommended that the licensee consider using mock-up techniques to assure that the total correction package provides a consistent, coherent, and integrated interface between operators and the control room. This should help reduce the possibility of piecemeal correction of HEDs. Furthermore, the mockup provides a valuable tool to assist the AIT in differentiating the effectiveness of alternative design improvements proposed for any individual HED.
S/C-20	Verification That Selected Design Improvements Will Provide Necessary Correction and Verification That Improvements Will Not Introduce New HEDs: Illinois Power has indicated an intent to verify that the fixes correct the problems and that the fixes introduce no new HEDs in several places in its program plan (e.g., p. 2-3; pp. 2-10, 2-11; p. 3-3; Figures 3-16, 4-4; and Table 4-3). However, these references are frequently only one or two work headings in a flow-chart box and do not describe a specific mechanism for accomplishing these two tasks. The use of mock-up and/or simulator techniques in conjunction with walk-throughs are recommended processes for completing these two tasks. Due to the lack of detail, it is not possible to assess this portion of the licensee's program plan.
S/C-21	Coordination of the DCRDR With Other Programs: Illinois Power has not provided a formal, detailed description of the integration of DCRDR activities with other post-TMI programs other than the EOP program. However, coordination of DCRDR activities with other activities such as SPDS, Reg. Guide 1.97, and training have not been described formally in the program plan. Without information on the coordination of the DCRDR with these remaining programs, a complete evaluation of the degree to which the licensee's program plan will satisfy the requirement of Supplement 1 to NUREG-0737 cannot be accomplished.

ILLINOIS POWER COMPANY - CLINTON POWER STATION
DCRDR & EOP INTEGRATED SFTA
EOP & SYSTEM DATA WORKSHEET
(EXAMPLE)



*REA= Reactivity Control/ RCC= Reactor Core Cooling & Heat Removal From Primary System/ RCI= Reactor Coolant Sys Integrity
RAD= Radioactivity Control/ CC= Containment Conditions

Figure 1 EOP & System Data Worksheet

Enclosure 4

DCRDR & EOP INTEGRATED SFTA
OPERATOR STEP QUESTIONNAIRE

TASK 5

1. To what accuracy must the information be read?
2. How quickly must the information be obtained?
3. Must the information be accessible from several places in the control room?
4. Is the information required by the EOP in the most direct form?
5. Is post/historical information required?
6. Is the rate of information change required (Analog, Digital, auto-trending, direct rate)?
7. What type of control function is required (Discrete, Continuous)?
8. Is the control function required in the control room?

Figure 2 SFTA Operator Questionnaire

ILLINOIS POWER COMPANY - CLINTON POWER STATION
DCRDR & EOP INTEGRATED SFTA
OPERATOR PRIMARY AND ALTERNATE TASK DATA

EOP	TASK SEQ NO	PRI or ALT TASK DESCRIPTION	PRI or ALT INFO or CONTROL REQUIREMENT	ALTERNATE TASK	REF

Figure 3 EOP Operator Task Data Sheet

ILLINOIS POWER COMPANY - CLINTON POWER STATION
DCRDR & EOP INTEGRATED SFTA
EOP OPERATOR STEP DATA

EOP _____
TASK SEQ NO. _____

OPER STEP NO	OPERATOR STEP DESCRIPTION	STEP INFO or CONTROL REQUIREMENT	REF

Figure 4 EOP Operator Step Data

ILLINOIS POWER COMPANY - CLINTON POWER STATION
DCRDR & EOP INTEGRATED SFTA

EOP (or SOE): _____

DATA SHEET #1: OPERATOR PRIMARY & ALTERNATE TASKS

EOP (or SOE)	SEQ NO	PRI(P) or ALT(A) TASK DESCRIPTION	TASK INFO or CONTROL REQUIREMENT	ALTERNATE TASK
____	_____	PT: _____	_____	_____
		PST: _____	_____	_____
		PST: _____	_____	_____
____	_____	PT: _____	_____	Alt task executed
	_____	AT: _____	_____	_____
		AST: _____	_____	_____
		AST: _____	_____	_____

Figure 5

ILLINOIS POWER COMPANY - CLINTON POWER STATION
DCRDR & EOP INTEGRATED SFTA

EOP (or SOE): _____

DATA SHEET #2: OPERATOR STEPS IN TASK SEQUENCE

EOP (or SOE)	SEQ NO	PRI(P) or ALT(A) TASK or STEP DESCRIPTION	TASK or STEP INFO or CONTROL REQUIREMENT	ALTERNATE TASK
____	_____	PT: _____	_____	_____
	_____	PST: _____	_____	_____
	_____	_____	_____	
	_____	_____	_____	
	_____	PST: _____	_____	_____
	_____	_____	_____	
	_____	_____	_____	
____	_____	PT: _____	_____	Alt task executed
	_____	AT: _____	_____	_____
		AST: _____	_____	_____
	_____	_____	_____	
	_____	_____	_____	
		AST: _____	_____	_____
	_____	_____	_____	
	_____	_____	_____	

Figure 6

EOP VERIFICATION CRITERIA

I. PROCEDURE-GENERAL

A. Legibility

Are the text, tables, graphs, and figures legible to the evaluator?

2. EOP Format Consistency

a. Do the following sections exist in each EOP:

Section 1.0 - SYMPTOMS
Section 2.0 - AUTOMATIC ACTIONS
Section 3.0 - OPERATOR ACTIONS
Section 4.0 - CONTINGENCIES
Section 5.0 - FINAL CONDITIONS
Section 6.0 - DISCUSSION

b. Is the page layout consistent with the sample page format given in FSAR Table 13.5-7 Emergency Offnormal Procedure Format?

3. Identification Information

a. Is the procedure title descriptive of the purpose of the procedure?

b. Does the cover sheet correctly provide the following:

1. procedure title
2. procedure number
3. revision number
4. number of pages

c. Does each page contain as a minimum:

1. title
2. procedure number
3. revision number
4. page number (Page ___ of ___)

d. Does the procedure have all its pages in the correct order?

II. STEP, CAUTION, NOTE-SPECIFIC

A. Written Correctness

Figure 7 EOP Verification Criteria

1. Information Presentation

   a. Does information displayed:

      1. minimize clutter?
      2. facilitate uninterrupted flow of information?

   b. Are instruction steps numbered correctly?

   c. Does the beginning of each procedure or sub-procedure start on a new page?

   d. Are instruction steps constructed to comply with the following:

      1. Steps deal with only one idea.
      2. Sentences are short and simple.
      3. Operator actions are specifically stated.
      4. Ojects of operator actions are specifically stated.
      5. Objects of operator actions are adequately stated.
      6. If there are three or more objects, they are listed (and space is provided for operator check-off).
      7. Punctuation and capitalization are proper.
      8. Abbreviations are correct and understandable to the operator.

   e. Do instruction steps make proper use of logic structure?

   f. When an action instruction is based on receipt of an annunciator alarm, is the setpoint of the alarm identified?

   g. Are cautions used appropriately?

   h. Are cautions placed properly?

   i. Are cautions written so they can be read completely without interruption by intervening steps or page turning?

   j. Are cautions constructed to comply with the following:

      1. They do not contain operator actions.
      2. They do not use extensive punctuation for clarification.
      3. They make proper use of emphasis.

   k. Are notes properly used?

   l. Are notes properly placed?

Figure 7 (cont.)

m. Are notes written so they can be read completely without interruption by intervening steps or page turning?

n. Are notes worded so that they do not contain operator actions?

o. Are numerical values properly written?

p. Are values specified in such a way that mathematical operations are not required of the user?

q. Is a table or graph provided in the procedure for necessary operator calculations?

r. Are units of measurement in the EOP the same as those used on equipment.

2. Procedure Referencing and Branching

a. Do the referenced and branched procedures identified in the EOPs exist for operator use?

b. Is the use of referencing minimized?

c. Are referencing and branching instructions correctly worded?

1. "go to" (branching)
2. "refer to" (referencing)

d. Do the instructions avoid routing users past important information such as cautions preceding steps?

e. Are the exit conditions compatible with the entry conditions of the referenced or branched procedure?

B. Technical Accuracy

1. Entry Conditions or Symptoms Information

a. Are the entry conditions of the BWR Generic EPG listed correctly in the EOP?

b. If additional entry conditions have been added, do they comply with the following:

1. appropriate entry conditions for which the EOP should be used
2. not excessive.

Figure 7 (cont.)

2. Instructional Step, Caution, and Note Information

   a. Are EOP/BWR Generic EPG differences:

      1. documented
      2. explained

   b. Is the BWR Generic EPG technical foundation (strategy) changed by the following changes in EOP steps, cautions, or notes:

      1. elimination
      2. addition
      3. sequence
      4. alteration

   c. Are correct, plant-specific adaptations as defined in the CPS EPG's, Appendices A, B, & C and the CPS Tech Specs incorporated per EPG:

      1. systems
      2. instrumentation
      3. limits
      4. controls
      5. indications

   d. Have licensing commitments applicable to EOPs been addressed?

   e. are differences between the licensing commitments and the EOPs or EPGs documented?

3. Quantitative Information

   a. Where plant-specific parameter calculated values are used in the EOP, do CPS EPGs, Appendices A, B, & C demonstrate that values were computed accurately?

   b. Do quantitative values, including tolerance bands, used in the EOP comply with CPS EPG's, and Appendices A, B, & C and CPS Tech Specs?

   c. When calculations are required by the EOP, are equations presented with sufficient information for operator use?

Figure 7 (cont.)

Figure 8

(Typical)
DCRDR CONTROL ROOM INVENTORY

DEVICE NO	INSTRUMENT NUMBER	SERVICE DESCRIPTION	SYSTEM NUMBER	MANUFACTURER MODEL	RANGE UNITS	MIN SCALE INCR	BOARD NUMBER	PANEL ID
128.	XAN-3	(TURBINE BENCH BOARD C2 ANNUNCIATORS)	42	PANALARM	-	-	C2	1A/1B
129.	ZI-3822	BYPASS VLVS OPENING JACK POS	51	FOXBORO	0-100 PERCENT	2	C2	1A
130.	ZI-3821	MECH PRESS REQ HND WHEEL POS	51		150-1050	50	C2	1A
131.	ZI-3820	MECH PRESS REQ RELAY PISTON POS	51	FOXBORO	0-100 PERCENT	2	C2	1A
132.	ZI-3814	ELECT PRESS REQ SERVO MTR POS	51	FOXBORO	0-100 PERCENT	2	C2	1A
133.	ZI-3813	PRESS CONTROL POS	51		910-1010 PSI	2	C2	1A
134.	ZI-3823	LOAD LIMIT PISTON POS	51	FOXBORO	0-100 PERCENT	2	C2	1A
135.	ZI-3824	SPEED & LOAD CHANGER POS	51	FOXBORO	0-100 PERCENT	2	C2	1B
136.	PI-3849	STEAM CHEST PRESS	1	FOXBORO	0-2 PSIG X 1000	0.05	C2	1B
137.	PI-3852	TURB 1ST STAGE PRESS	1		0-600 PSIG	25	C2	1B
138.	XZI-8	NO. 1 CNTR VLV ABOVE SEAT DRAIN	1		O-R LITES	-	C2	1B
139.	XZI-9	NO. 2 CNTR VLV ABOVE SEAT DRAIN	1		O-R LITES	-	C2	1B
140.	XZI-10	NO. 3 CNTR VLV ABOVE SEAT DRAIN	1		O-R LITES	-	C2	1B

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DCRDR & EOP INTEGRATED SFTA

EOP (or SOE): _____
DATA SHEET #3: INFORMATION & CONTROL CAPABILITY, REQUIRED vs AVAILABLE

EOP (or SOE)	REF	SEQ NO (or OPER STEP)	PRI(P) or ALT(A) TASK or STEP DESCRIPTION	TASK or STEP INFO or CONTROL REQUIREMENT	DEVICE AVAILABLE	SERVICE DESCRIPTION, RANGE, UNITS	MIN SCALE INCR	SYSTEM NO	LOCATION BOARD NO	LOCATION PANEL NO	OPER
____	____	_____	PT: _____	_____							
			PST: _____	_____							
			_____	_____	_____	_____	____	____	____	____	____
			_____	_____	_____	_____	____	____	____	____	____
			PST: _____	_____							
			_____	_____	_____	_____	____	____	____	____	____
	____	_____	PT: _____	_____							
			AT: _____	_____							
			AST: _____	_____							
			_____	_____	_____	_____	____	____	____	____	____
			_____	_____	_____	_____	____	____	____	____	____
			AST: _____	_____							
			_____	_____	_____	_____	____	____	____	____	____

Figure 9

. . . . .

ILLINOIS POWER COMPANY - CLINTON POWER STATION
DCRDR & EOP INTEGRATED SFTA
ALL EOPs (or SOEs)
DATA SHEET #4: INFORMATION & CONTROL CAPABILITY, REQUIRED vs AVAILABLE

EOP (or SOE)	REF	SEQ NO (or OPER STEP)	PRI(P) or ALT(A) TASK or STEP DESCRIPTION	TASK or STEP INFO or CONTROL REQUIREMENT	DEVICE AVAILABLE	SERVICE DESCRIPTION, RANGE,UNITS	MIN SCALE INCR	SYSTEM NO	LOCATION BOARD NO	LOCATION PANEL NO	OPER
___	___	_____	_____	_____	#1	_____	___	___	___	___	___
___	___	_____	_____	_____	#1	_____	___	___	___	___	___
___	___	_____	_____	_____	#1	_____	___	___	___	___	___
___	___	_____	_____	_____	#1	_____	___	___	___	___	___
___	___	_____	_____	_____	#2	_____	___	___	___	___	___
___	___	_____	_____	_____	#2	_____	___	___	___	___	___
___	___	_____	_____	_____	#2	_____	___	___	___	___	___

Figure 10

DETAILED CONTROL ROOM DESIGN REVIEW
VERIFICATION/ VALIDATION
REFERENCE/COMMENT FORM

OBSERVER: _____ DATE: _____ PAGE ___ OF ____

LOCATION: _____

GUIDELINE CRITERIA ITEM NO.: _____ HED REFERENCE NO.: _____

CRITERIA ELEMENT NO.	DATA SOURCE	PANEL/ CONSOLE NO	REFERENCE/COMMENT
DIAGRAM/PHOTO NO.:			

Figure 11 Sample Verification/Validation Reference/Comment Form

DCRDR & EOP INTEGRATED VALIDATION
OPERATOR QUESTIONNAIRE

A. Questions Concerning Control or Display Location, Layout, Type etc.

1. Is this a good location for the device or would you recommend another location?

2. Does the indication (instrument) provide the most direct reading?

3. What other instruments provide redundant or confirmatory readings?

4. Is this the right type of control or display or would you recommend a different type?

5. Have you had any trouble or know of any problems using this control or display for plant operations?

6. Are you satisfied with the accuracy, minimum increments, scale markings and range of this device?

7. Should any controls/displays be added or moved to another control panel or should it be duplicated on another control panel?

8. Should any controls be moved from outside the control room or from a back panel to the control panels?

B. Questions Concerning Plant Response

1. How does the operation of this control affect the plant system being controlled?

2. What changes in plant parameter do you expect to see (identify instruments) when this control is changed?

3. When monitoring rate of change (heatup/cooldown rate) are the devices used acceptable? How do you determine what is acceptable?

4. Do you have any problems in maintaining proper control of any parameters? Or any system?

Figure 12 Validation Operator Questionnaire

5. Does this controller provide good sensitivity and is the system design such that the device performs all the actions necessary?

6. Do any sequences cause a time, workload, or work flow related problem?

C. Questions concerning Procedure

1. Is the sequence or order of operations shown in the procedure adequate or can the steps be rearranged for more efficiency with regard to operator movement?

2. Do procedures have sufficient (or too much) detail or should steps, or other information be added (or removed)? Do you see the need for support information (graphs)?

3. Are any systems or systems steps not covered in the procedures?

4. Any problems understanding any parts of the procedures?

Figure 12 (cont.)