

PHILADELPHIA ELECTRIC COMPANY'S
LIMERICK GENERATING STATION
CONTROL ROOM DESIGN REVIEW
SUPPLEMENTAL REPORT 2
TO THE
FINAL REPORT OF JUNE 1984

JUNE 1985

8507160177 850628
PDR ADDCK 05000352
F PDR

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
	Introduction	1
I	Methodology	3
II	General Findings/Implementation	8
III	Modified HEDs/Assessment of Outstanding HEDs	14

LIST OF APPENDICES

<u>APPENDIX</u>	<u>TITLE</u>	<u>PAGE</u>
A	Limerick Task Analysis Worksheet	A-1
B	Team Brief for Task Analysis	B-1
C	Key to Task Analysis Worksheet	C-1
D	Task Analysis Guidelines	D-1
E	Resume of Task Analysis Expert	E-1
F	Limerick Task Analysis HEDs (Human Engineering Discrepancies)	F-1
G	Modified HED Resolutions	G-1
H	Assessment of Outstanding HEDs	H-1

LIMERICK GENERATING STATION
CONTROL ROOM DESIGN REVIEW
SUPPLEMENTAL REPORT 2

INTRODUCTION

This is Philadelphia Electric Company's (PECo) Detailed Control Room Design Review (DCRDR) Supplemental Report 2 for the Limerick Unit 1 Nuclear Generating Station. This report documents the results of the formal task analysis conducted as part of the overall DCRDR effort. On November 2, 1984, PECo submitted to the Nuclear Regulatory Commission (NRC) the DCRDR Supplement 1 of the Final Report, which documented results of DCRDR activities that had been completed subsequent to the submittal of the DCRDR Final Report of June 25, 1984.

Plant-specific emergency operating procedures (EOPs) were prepared and implemented for Limerick in accordance with a Procedure Generation Package sent to the NRC with a June 19, 1984 letter from S.L. Daltroff to A. Schwencer. This procedure generation package was found to be acceptable by the NRC in the Limerick SER, Supplement 2, Section 13.5.2.3.

The process by which these plant-specific EOPs were developed and proofed was described in the Limerick DCRDR Program Plan, dated August 1983. These procedures form the Transient Response Implementation Plan (TRIP). There are 11 TRIP procedures that cover the symptom-oriented EOPs for the Limerick plant. The DCRDR Supplement 1 of the Final Report of November, 1984, described the validation walkthrough conducted using the TRIP

procedures. PECO committed to perform a Task Analysis to complete the DCRDR in a letter from J.S. Kemper to A. Schwencer, dated August 16, 1984.

This document consists of three major sections: Methodology, Findings and Implementation, and Modified HEDs/Assessment of Outstanding HEDs.

Section 1, Methodology, discusses the specific methods used in performing the actual task analysis and verification, including the use of the control room mockup.

Section 2, Findings and Implementations, delineates the types of Human Engineering Discrepancies (HEDs) identified during the task analysis process and discusses the actual resolution of the HEDs identified. Copies of HED Assessment sheets from the task analysis appear as Appendix F.

Section 3, Modified HEDs/Assessment of Outstanding HEDs, contains two subsections, Modified HED Resolutions, and Assessment of Outstanding HEDs. The Modified HED Resolution section deals with HEDs that have had resolution modifications based on engineering and design considerations. These 22 HEDs appear as Appendix G. The Assessment of Outstanding HEDs section discusses those HEDs that remained unresolved when the Limerick Plant CRDR Final Report was submitted. These four HEDs have been assessed and appear as Appendix H.

SECTION I

METHODOLOGY

The task analysis process used the approved TRIP procedures as the functional analysis. The plant specific procedures developed from the BWROG EPGs are satisfactory for use as a functional analysis per the BWROG meeting with the NRC on May 4, 1984. These procedures provided the definition of functions from which the task analysis was conducted. The task analysis was performed in accordance with NUREG 0700, paragraph 3.4.2.4., and SRP 18.1, Appendix A, Sections 2.2 and 2.3. The analysis commenced on March 12, 1985 and was completed on April 16, 1985. The analysis was performed by a team consisting of a nuclear/I&C engineer (Thomas Cabrey); two human factors specialists (Richard Morrison and Ralph Chidley), and two licensed operators on Limerick Unit 1 (Rick Cendrella; Joe Coyle). The Task Analysis Expert's resume appears as Appendix E. The analysis team had ready access to, and used, other licensed operators and engineering personnel for support as required.

The process was performed in two separate steps. The first was to determine the display and control requirements for the control room instruments. In order to do this, an analysis of tasks required to accomplish the functions was performed. These tasks included defining the parameters necessary for the operators to determine the need to perform an action, performing the action as directed by the TRIP procedure, and defining the parameters

necessary to determine that the action had been performed successfully. The second step was to conduct a verification that the control room inventory met the stated display and control requirements that resulted from the analysis of tasks to identify missing displays and controls. The form used to record the information generated from these two steps is enclosed in Appendix A.

In the first step, the analysis was conducted in a location where the team would be less likely to think about the existing controls and displays on the control panels. A written briefing of task analysis was provided to the team by the Task Analysis Expert to educate the team on what was to be done and how it was to be done. This briefing is enclosed as Appendix B. The team then discussed the written briefing. All questions and key points were explained. During this step of the analysis, only the left half of the Task Analysis Worksheet, labeled Task and Requirements, was completed. The information was recorded in accordance with the Key to Task Analysis Work Sheet, which is enclosed in Appendix C. All 11 TRIP procedures were talked through in this manner.

TRIP Procedures:

T-100's

T-99	Post Scram Restoration
T-100	Scram
T-101	RPV-Control
T-102	Containment Control
T-111	Level Restoration
T-112	Emergency Blowdown
T-113	Blowdown Cooling
T-114	Spray Cooling
T-115	Alternate Shutdown Cooling
T-116	RPV Flooding
T-117	Level/Power Control

After the completion of the requirements section of the Task Analysis, the team reconvened in the control room of Limerick, Unit 1. The control room itself was used for the control room inventory. The team reviewed the verification procedure provided in the written briefing, and the key points were discussed. Using the task steps and the display and control requirements, the availability section of the form was completed by talking through each step, having the operators indicate which instruments and controls would be used to accomplish the steps, and recording the characteristics of the designated existing instruments. The team then performed a comparison of the designated instrument with the display and control requirements of the task analysis. Any verification entry that did not meet the display and control requirements section was documented as a note at the bottom of the Task Analysis form and subsequently written as a HED.

During this verification process, the team also addressed the suitability of those designated instruments. This included a consideration of the relationship of control and displays. To aid the team in assessing human factors considerations for the suitability of the instruments, each team member was provided with a copy of the Task Analysis Guidelines during the briefing for the Verification phase. A copy of the Guidelines is included in Appendix D. The final overall suitability of each entry was then determined by the team to be either satisfactory, or to require preparation of a Human Engineering Discrepancy (HED)

Assessment sheet. Where necessary, information and corroboration were sought from other licensed operators available in the control room during the verification. Information was recorded on the form in accordance with the Verification section of the Key to Task Analysis Work Sheet (Appendix C).

This process for the determination of the control and display requirements, HED assessment, and verification is the same as that used at the Peach Bottom plant, which was reviewed by the NRC during the In-Progress Audit for Peach Bottom on February 19 to 22, 1985. The NRC Audit Report, transmitted in the April 19, 1985 letter from J.F. Stolz to E.G. Bauer, Jr., found this process to be satisfactory.

The T-200 procedure series supports the TRIP Procedures. The T-200 procedures were reviewed and found to contain mostly system lineup instructions for both control room and floor operators. Since the lineup instructions called for specific controls in the control room, the availability of these controls was verified. (These procedures were used during the validation walkthroughs reported in the Limerick Supplement Number 1 Report of November 2, 1984.) For each of the T-200 Procedures that pertain to control room operators, a task analysis similar to that conducted on the TRIPs was performed to identify information needed, actions required, and feedback information required to determine that the action was performed successfully. These actions typically involved only one or two steps after a system lineup

had been completed. For these entries, characteristics were identified and the verification section was completed as previously described.

During the analysis of TRIP procedure tasks described above, there were certain system lineups for specific operations that were lengthy and were required in several procedures. These involved merely providing controls with appropriate feedback for accomplishing these system lineups. These sections were referred to a separate lineup analysis for the specified operations. The analysis consisted of using existing lineup sheets also used for Limerick Unit 1, and identifying those controls that were required to be in the control room. Availability of these controls in the control room was verified as having appropriate indicating lights, which provide appropriate feedback to the operator. This completed the task analysis of emergency procedures and supporting procedures.

SECTION II

FINDINGS AND IMPLEMENTATION

This section delineates the findings resulting from the task analysis portion of the Detailed Control Room Design Review (DCRDR) effort and the solutions implemented in each case. In summary, 36 HEDs were identified during the course of the task analysis process. The HEDs have been classified, and assigned a safety significance as follows:

Panel Design:	2	Priority 2:	18
Instrumentation:		Priority 4:	1
Suitability	15	Acceptable, or	
Resolution	19	Not a	
	-----	Discrepancy	17
Total	36		

Panel Design

Because of the high density of components in the control room, controls and associated instrumentation were found to conform to human factors distance guidelines. In certain instances, the lateral distance between related components was felt to be excessive, but still within guidelines; this was the case on panel 10C-653, where the "Bypass Jack Control" (HED TA-05) was separated from the "Reactor Pressure" indication by a distance of 6 feet. A related "Steam Line Pressure" gauge was located

immediately above the jack control. This provided the operator with immediate feedback regarding jack operation and reduced the necessity for immediate operator movement to view the "Reactor Pressure" indicator.

The selection of similar scales for indicators used for comparative reading during control room operations was very effective. The narrow range Reactor Pressure recorder XR01-IR609 located on the 10C-603 panel however, was found to use a different multiplier (x10) than other reactor pressure indicators (x100) (HED TA-03). It was determined by the team that the use of a 100 multiplier on the narrow range Reactor Pressure recorder would be unsatisfactory, as it would require a pressure reading of 8.5 and 10.5 PSIG on the scale and the decimal could cause operator error during time-sensitive operations. The team resolved the problem by recommending that the scale not use a multiplier at all. This resolution will allow personnel to more easily determine pressure on the scale without the potential problems of a decimal. The remaining reactor pressure scales all use a 0-12 or 0-14 PSIG scale with a x100 multiplier and were considered adequate for their purpose.

Instrumentation

The majority of discrepancies identified during the task analysis involved panel instrumentation and fell within two categories: instrument suitability and instrument resolution.

Instrument Suitability - In almost all operational situations, the proper instrumentation was readily available to personnel in the control room. In several cases, however, the team identified instrumentation that was not convenient for operator use. This was especially noted with regard to a summary of containment isolations. In situations where containment isolations would occur, no summary of isolations exist (HEDs TA-01, TA-02, TA-15, TA-16). Operators currently have to review the various system valve position indications in order to properly determine if isolation has occurred. This will be remedied upon the completion and turnover of the Safety Parameter Display System (SPDS), which will provide a summary of all isolations to the operators. Control panel enhancements reported in the Final Report enable operators to more clearly identify system and containment isolations.

On two occasions, the team identified where additional alarms appeared to be needed in the control room. Upon more detailed investigation, the team recommended that "Suppression Pool Low Level" (HED TA-20) and "Drywell High Temperature" (HED TA-22) annunciator alarms be added to the appropriate panels.

The Boron Injection instrumentation lacks a flow meter for direct determination of system flow. This was not considered a discrepancy because the addition of a flow meter would not add to or alter the process of performing the TRIP function (HED TA-17). In addition, no direct instrumentation for the determination of

the amount of boron injected was identified. However, the procedures describe in detail the calculation required for the operators to determine the amount of boron injected. The operators are not subject to time pressure when they perform this calculation because the system is not shut down until the calculation is completed. Consequently, this was not considered to be a discrepancy. Similarly, HEDs TA-04, 07, 08, 12, 19, 21, 23, 24, 25, 26, 28, 32, 35, and 36 were not determined to be HEDs as discussed on HED assessment sheets in Appendix F.

The ADS Timer does not provide the operator with sufficient feedback to indicate that the logic has been reset (HED TA-09). This problem has been temporarily resolved by placing the internal switch on the "ADS Timer Initiated" system annunciator in the auto-reset mode to allow the annunciator to automatically clear when the timer reset button is depressed, the annunciator will annunciate when the reset button is released. This will provide the operator with sufficient feedback to indicate that the logic has been reset. The final resolution will revise the TRIP procedure prior to the completion of the first refueling outage to use newly installed auto-inhibit switches that defeat auto-initiation of ADS. All other instrumentation in the control room was sufficient.

Instrument Resolution - As discussed in the previous section, appropriate instrumentation required by procedures was available in the control room, however, several procedures required operators to identify values that were not readily available on

the associated indicator display scales. For example, the reactor level indicator LI42-1R604 uses a scale of +60 to -150 inches with increments of five inches. Procedure T-101 RC/Q requires the operator to identify a value of -38 inches (HED TA-13). Clearly this level cannot be easily determined by operations personnel. Discrepancies such as this (HEDs TA-06, 10, 11, 27, 29, 30, 31) were resolved through the development of an enhancement philosophy which uses a combination of zone markings to modify necessary meter faces to provide the operator with the appropriate information. Care was taken to ensure that colors used for zones conformed to the overall control room enhancement philosophy delineated in the Limerick CRDR Final Report.

Reactor power recorders C51-R603A, B, C, and D use a 0-125 percent scale accurate to ± 2.5 percent. Several procedures require operators to identify a power level of 3 percent (HEDs TA-14, TA-18). While this is not identifiable on the existing scale, no modification was considered necessary since all APRM downscale indicator lights are energized at less than 3 percent power, IRM's selected to range 10 will provide an adequate scale resolution at 3 percent power, and accurate information provided by the plant process computer.

In one instance, the team determined that modifying the display scale would violate human factors guidelines and the availability of computer backup was not felt to be sufficient (HED TA-33).

RPV Pressure recorder LR42-1R623A, B uses a scale of 0-1500 PSIG and can be read to a resolution of +10 PSIG. Procedures T-115 and T-117 require operator identification of 154 and 255 PSIG pressures. These scales will be revised and enhanced to clearly identify these pressures. Similarly, the drywell reference leg temperature must be read to determine saturation at 212 degrees, but can be read only to an accuracy of 10 degrees F (HED TA-34). The SPDS will provide more convenient identification of these points when operational.

SECTION III

MODIFIED HEDs/ASSESSMENT of OUTSTANDING HEDs

Modified HEDs

This section discusses previously submitted HEDs that have since had minor changes. These HEDs appear as Appendix G. These modifications in no way change the intent of the original resolutions.

- Eight HEDs were updated with regard to the schedule for implementation of their resolutions:

- A1-03	- SA2-02
- A1-06	- SDV-03
- A1-07	- SPV-06
- A1-08	
- A1-09	

- HEDs changed for the purpose of clarification:

- HED SD4-02: revised in order to clarify color conventions.
- HED SI1-03: revised to specifically address human engineering discrepancy as listed.
- HED SI1-06: ID or Number was changed to reference an FSAR table to clarify exact instruments involved. The original attachment deleted.
- HED A1-01: revised to clarify intended numbering sequence.
- HED D2-13: revised 2nd paragraph of attachment to say "...recombiner inlet valve" instead of "...recombiner cooling water inlet valve."
- HED I2-11: minor changes in wording to clarify intent.
- HED D3-09: reference added to clarify intent.
- HED SD4-02: revised to clarify color conventions.
- HED D2-10: provides for interim resolution until the final resolution is implemented.

- HED D5-02: corrected typographical error in ID.
- HED SPV-02: clarify identification of opening sequence.
- Three HEDs were modified so as to prevent occurrence of a new HED:
 - HED I2-03d and I2-14: original resolution clarified so as to prevent creation of a new HED.
 - HED SI5-05: operators to be supplied with a portable adapter instead of a mushroom handle, which would have caused another HED.

Outstanding HEDs

At the time of submittal of the Limerick DCRDR Final Report, four HEDs remained outstanding. These HEDs, with final Resolutions, appear as Appendix H.

Appendix A

Limerick Task Analysis Worksheet

LIMERICK
TASK ANALYSIS WORKSHEET

Page ____ of ____

TASK: _____

[illegible]

NOTES

Appendix B

Team Brief for Task Analysis

Appendix B

TEAM BRIEF FOR TASK ANALYSIS

The task analysis will be performed by the team using the Limerick Transient Response Information Plan (TRIP) procedures. The analysis is divided into two distinct phases. The first phase determines the REQUIREMENTS for panel instruments and controls to support the TRIP. The second is a VERIFICATION that the available panel instruments and controls meet the requirements of the first phase.

REQUIREMENTS PHASE

In this phase of the analysis, the team must establish the requirements for control room panels to support TRIP. To do this, team members are asked not to think of the controls and instruments that exist in the control room, but to concentrate on systems requirements and actions. Think in terms of what the systems are doing and what is required to be done in the systems. Operators will find it difficult not to think of the control room components, with which they are familiar, but should understand that the existing components might not be exactly what is needed for a specific step. Not all indications provided are used for a particular operation, and sometimes additional indications could help in controlling the plant. Do not limit your contribution to what is available.

The team should realize that what is said during the task analysis is not final. Although the analysis lists a requirement not now provided on the panels, this does not necessarily mean that it will be provided later. Further study may show that a listed requirement is not needed. On the other hand, not specifying the need for an instrument on a particular operation does not mean that an existing instrument will be removed. This analysis must be a best attempt to specify the CHARACTERISTICS of instruments required for each specific step, based upon the team's combined experience and expertise. This analysis phase must be independent of what already exists.

VERIFICATION

In this phase the team is asked to reverse its previous approach, and think of what exists in the control room. For this phase, the team will have control panel prints and other information and listings for reference. The team may have access to the control room for this phase. The intent in the VERIFICATION phase is to ensure that what does exist in the control room meets all the REQUIREMENTS specified in the first phase of the analysis. By comparing what exists with what is required, we can identify any problems with the control room instrumentation and controls in support of performing the TRIP procedures.

PROCEDURE FOR ANALYSIS

The method to be used in the first phase of the task analysis will consist of reading each step of the TRIP and then specifying what actions must be taken to carry out the step. Where the operator will need information, the team will specify the characteristics of the information needed. For example, each TRIP sequence has initiating cues, all of which must be specified. Each action consists of two parts: taking the action that alters the system, and receiving the feedback indication that lets the operator know that the action was successful. Both parts must be discussed for each action.

Because the TRIP procedures give only general direction, the team must fill in the specific actions to be taken in performing each TRIP step. This will involve recording each valve that must be manipulated, each pump that must be controlled, and each indication that must be read in order to perform the operation specified in the TRIP sequence. Any other procedures referred to in the TRIP will be reviewed to determine if they must also be included in the analysis.

As each step is listed on the form, the team will assume there are only two types of activities for the operator: either he must obtain information, or he must take action. Decision points usually require the operator to obtain information. Also, the word "verify" will be assumed to mean action, since any verification process that reveals a control or parameter not in the correct state, then requires the operator take the action that will put it in the correct state. For an item verified not correct, the action to be taken must be stated.

In general, decision points in the flow diagram will take the NO option. In some cases, there will be a short branch where an action is required under the YES and NO options. In order to be thorough, the team will first assume a YES and take that action, then backtrack and assume a NO to continue the worst case flow path.

When specifying the range required for meters, the team should address only the range of readings expected for that specific step, not the whole range of the meter. The term "resolution" refers to how accurately the operator must be able to read the scale. Generally, if a fairly wide range of readings are acceptable, the scale will not require high resolution. In other cases, a fine resolution may be required. The scale should provide enough resolution to allow the operator to perform the specific step under consideration. The resolution is usually given in + or - numbers. If an absolute limit is involved so that the operator must know when that limit is reached, it must be made clear in our response.

During the verification, the team will determine the availability of specific controls and instruments in the control room that meet defined requirements. In addition, the team will consider the suitability of the component identified. The component must be suitable in location, type, and arrangement. For example, some controls might be separated from the necessary feedback display so that the operator cannot reasonably observe the results of his actions. Or, because of angle of view, it may be difficult to read some displays. In some cases the needed information may be widely dispersed making the operation difficult. To aid the team in recognizing some of these suitability considerations, Task Analysis Guidelines are attached. These guidelines are intended for frequent reference by team members during the verification phase.

After the team considers the availability and suitability of control room components for each requirement established in the first phase, a final judgement will be made. Either the selected component will be marked as satisfactory, or a human engineering discrepancy (HED) will be written. The HED will then be investigated and processed in the same manner as all other HEDs generated during the Control Room Design Review.

Appendix C

Key to Task Analysis Worksheet

KEY TO
TASK ANALYSIS WORK SHEET

TASK

The task being analyzed will be identified at the top left of the worksheet (TASK: ____) using the procedure titles.

The Step Number (STEP NO.), and DESIRED ACTION for each task being analyzed will also be taken from the actual Limerick procedure. The team will first list the step numbers under STEP NO., and the primary actions in the Desired Action column. The team will then fill in any secondary actions, or substeps, that are required to perform the step.

A sample entry for this section, with "a" and "b" indicating substeps is:

STEP NO.	DESIRED ACTION
1	Entry condition for T-101 detected? (No)
2	Verify Scram a. verify control rod insertion b. verify power decreasing

This section might also include such information as:

- Regulate feed flow to reactor
- Obtain level between 12" & 54"
- Stop pump; Start pump
- Initiate flow; Stop flow
- De-energize bus; Energize bus

REQUIREMENTS

CHARACTERISTICS:

This section lists the characteristics of actions or information for each task item. The headings and example entries are listed below:

CODE will be one of the following:

- I - Information the operator must have to determine the need to perform the task step.
- A - Action taken by operator to control the systems.
- F - Feedback information the operator must have to verify the step was performed successfully.

TYPE ACTION or PARAMETER: (select one as appropriate)

Action: Discrete, Continuous, Adjust, Set
Parameter: Level, Flow, Pressure, Temperature,
Position, etc.

STATE or DYNAMIC characteristics of parameters or actions:
(select one as appropriate)

Action State: Closed, Open, Trip, Run, Stop
Parameters: Fast Increase, Slow Decrease, Steady, Long
Term Trend, Monitor

INDICATION of POSITION or RANGE refers to the immediate
action indication or parameter range of readings required:
(select one as appropriate)

Action Indication: Open, Closed, On, Off, etc.
Parameters: Range between which the parameter may vary
for this specific step.

SCALE RESOLUTION (SCALE RESOL.) refers only to the parameter
reading resolution of the scale, usually expressed in +/-
units.

RESPONSE refers to the speed of response required of the
operator in determining the parameter or taking the action:

Rapid - Under time pressure
Deliberate - Considered but timely action or reading required
Analyze - No time constraints to consider reading or action

NOTES: •

Notes will be numbered consecutively for each page and
filled in below.

VERIFICATION

This phase of the task analysis is used to verify that the requirement characteristics defined in the first phase have corresponding instruments in the control room, and that the instruments are suitable for use by the operator. This phase continues the entries on the form under the headings Availability and Suitability. The following entries are made on this form.

AVAILABILITY:

COMPONENT TYPE (COMP. TYPE) will identify the kind of instrument that has been selected from the control room inventory, such as:

- Meter, analog
- Meter, digital
- Control switch
- Control pushbutton
- Annunciator alarm
- Light

INDICATION POSITION or RANGE lists the actual position indication or meter range on the panel.

SCALE RESOLUTION (SCALE RESOL.) indicates the actual resolution available on the existing scale.

ID # will list the component identification number.

PNL # will list the panel on which the instrument is located.

SUITABILITY:

In the Suitability section, the team will record its judgement on the suitability of the instrument for use by the operator. Location and relationship to other instruments and between controls and associated indication. If coordination of control room team members is required, the review will determine if that interaction is consistent with control room organization and mode of operation. (Such information is appropriately noted in the Comments and Note sections.) The attached guidelines will be referred to by the team to aid them in performing the suitability deliberations. The team will reach a conclusion on each item and the last column will be checked either Satisfactory or indicate the need for a HED. If any aspect of suitability is considered not acceptable, a HED must be prepared.

A check in the satisfactory column will also indicate that the availability is considered to be satisfactory. Therefore, this column indicates overall verification for each line entry.

Comments will be entered if appropriate. Numbers in parenthesis will refer to notes below. A note is mandatory for all entries requiring a HED.

Appendix D

Task Analysis Guidelines

TASK ANALYSIS GUIDELINES

The primary purpose of the task analysis is to ensure that all controls and displays needed to perform the Emergency Operating Procedures are present and suitable.

6111ab
6511bc
6512ab

The word "suitable" means:

- They facilitate operator actions by location, arrangement, and identifiability, and design.
- The operators are not overloaded by the requirements of controls and indications in performing the procedures under stressful conditions.

A secondary purpose of the task analysis is to analyze certain minor operational sequences that require operator and engineering judgement to determine their suitability for either normal or emergency operations.

(The numbers in the right hand column are NUREG 0700 references.)

GUIDANCE

The following general guidance is provided for reference by the team during the task analysis.

GENERAL PANEL PRINCIPLES

- The controls and displays minimize operator movement by appropriate grouping. 6811
6821
6921a
6511d
- No redundancy unless required for backup or to avoid excess movement.
- Controls and displays are in the primary work area if required for continuous monitoring or critical timing. 6111b
- Manning provides timely coverage of controls during emergency operations - no extra personnel needed. 6112
- Procedures terminology should be consistent with panel labels. 6514e
6633c

General dimensions of work station:

- lateral viewing angle 45 deg. 6122e2
- lateral spread no more than 6 ft. 6122f
- Vertical panels - instruments frequently used or require precise reading or setting:
 - Controls - 34-53 inches above floor 6125a2
 - Displays - 50-65 inches above floor 6125b2

CONTROL/DISPLAY RELATIONSHIPS

- The arrangement of controls and related displays is clearly identifiable. 6911c
- Controls and displays that are normally used together are located in close proximity. 6911a
- Control movement should have apparent display feedback in sufficient time under expected dynamic conditions. 6932a
- Controls that have a display response lag should have an immediate feedback of the process and direction of parameter change. 6931c
- Annunciator windows are located above related controls and indications. 6331a

CONTROL PRINCIPLES

- Provides sufficient range of control. 6422a
- Provides sufficient precision (but not excess precision) within limits of dexterity, coordination, and reaction time. 6932ac
- Multiple controls related to the same function grouped together. 6921a
- Controls used in the blind are identifiable visually and tactually and have separation. 6422d
6441c

DISPLAY PRINCIPLES

- Scales consistent with accuracy needed. 6512a
- Operator does not have to convert readings. 6512b
- Scales cover the range needed. 6512d
- Multipliers should be avoided if possible. 6512e
- Multiple displays related to the same general function should be grouped together. 6921a
- Displays to be compared should have compatible numerical progression and organization. 6515d
- Recorders:
 - Generally should show trends or provide information for later reference. 6541g
 - Channels clearly identified. 6542b2
6638a
 - Located in operating area if required. 6541h

Appendix E

Resume of Task Analysis Expert

RALPH E. CHIDLEY - TASK ANALYSIS RESUME

EXPERIENCE: 1954 - Present

Directly involved in human factors and training for twenty-nine years. Broad experience in operating and design of control systems with hands-on application of human factors in systems design. Work has covered workspace design and environmental conditions analysis, panel design, operational computer display concepts and design, procedures development, and training. Thoroughly familiar with commercial nuclear plant systems and operating procedures for both PWRs and BWRs. Extensive experience in nuclear plant operation. Specific experience listed below.

Task Analysis

- Directed the conduct of CRDR task analysis for four power plants, three of which have been audited by the NRC.
- Conducted Position/Activity Analysis for various job categories for a major utility.
- Developed innovative techniques in "top-down" systems analysis and task analysis performed for Navy submarine training.
- Conducted task analysis to define requirements for curriculum and simulators at the U. S. Coast Guard Academy.
- Developed detailed team training task analysis in military and commercial contexts.

Procedures and Training

- Developed procedure writing guidelines for the preparation of normal and emergency operating procedures as part of a DCRDR project.
- Directed the systems analysis design and integration of Navy training simulators into the Trident training facility.
- Directed development of entire Trident training system including curricula for 140 courses representing 22,000 class hours.
- Designed team training curriculum development strategies and techniques.

R.E. Chidley (continued)

- Developed a team training curriculum for submarine sonar crews.
- Member of evaluation team specifying simulator training requirements for Coast Guard Academy cadets in shiphandling.

Panel Design

- Designed control panel improvements as part of CRDRs.
- Designed Trident SSBN control room layout.
- Designed Polaris SSBN ship control ballast control panels.
- Designed an integrated CRT operation concept and display content as part of CRDR.
- Designed and integrated CRT displays for submarine fire control systems and associated training systems.
- Contributed to the design layout for the 680 Class SSN.
- Designed and integrated CRT displays for submarine fire control systems and associated training systems.

Appendix F

Limerick Task Analysis HEDs
(Human Engineering Discrepancies)

HED ASSESSMENT

HED No. TA-01

EP = N/A

TITLE: Isolation Alarm

COMMENT: There is no alarm to indicate a group II isolation.

Item: STEP 2

Ref.: T-100

Source: TA

IDENTIFICATION: Panel: ICC801
Component Name: Annunciator
ID or Number: N/A

DESCRIPTION:

No single, definitive alarm indicating a group II isolation exists. Operators must observe "RHR Out of Service" alarms and system indicating lights to verify an isolation. Response: Rapid.

RESOLUTION: (Code A) (Priority 2) (Sched: When PECO notifies)
the NRC that SPDS is operational.

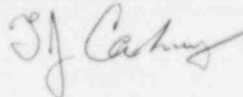
The SPDS system will be used.

TRAINING REQUIREMENTS:

Provide training to operators on SPDS displays.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:



Date: 6-28-85

HED ASSESSMENT

HED No. TA-02

EP = N/A

TITLE: Isolation Indication

COMMENT: No convenient indication of group II trip (isolation).

Item: STEP 2 Ref.: T-100 Source: TA

IDENTIFICATION: Panel: 601, 602
Component Name: Valve position indication
ID or Number: See attached.

DESCRIPTION:

Operators must observe all appropriate valve position indications to verify a group II trip has occurred. No single indication exists. Response: Rapid.

RESOLUTION: (Code A) (Priority 2) (Sched: When PECO notifies the NRC that SPDS is operational.

The SPDS system will be used.

TRAINING REQUIREMENTS:

Provide training to operators on SPDS displays.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

J. C. C. C.

Date: 6-28-85

(1) Additional page(s) attached

ID or Number:

HV-51-1F009

HV-51-1F008

HV-51-1F015A

HV-51-1F015B

HV-51-151A

HV-51-151B

HV-51-1F050A

HV-51-1F022

HV-51-1F023

HV-51-1F079A

HV-51-1F079B

HV-51-1F080A

HV-51-1F080B

HV-51-1F049

HV-51-1F040

HED ASSESSMENT

HED No. TA-03

EP = N/A

TITLE: Reactor Pressure Scale Multipliers

COMMENT: Scales use different multipliers.

Item: STEP 9

Ref.: T-100

Source: TA

IDENTIFICATION: Panel: 603
Component Name: Analog Ind/Recorder
ID or Number: PI42-IR605, XR01-IR609

DESCRIPTION:

These scales measure Reactor Pressure over different ranges (0-1200 PSIG, 850-1050 PSIG), however, they use different multipliers (100, 10). This does not facilitate comparative reading. Response: Rapid.

MITIGATING CONSIDERATIONS:

Most scales use 0-12 or 0-14 PSIG times 100.

RESOLUTION: (Code: B) (Priority 2) (Sched: 2nd Refuel)

Modify the 850-1050 PSIG face to use no multiplier to allow direct reading. Leave 0-12 scale as times 100 to be consistent with other reactor pressure scales.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *Jf Carney*

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-04

EP = N/A

TITLE: Missing Alarm

COMMENT: No alarm to indicate Containment Instrument Gas isolated.

Item: STEP 10

Ref.: T-100

Source: TA

IDENTIFICATION: Panel: 601
Component Name: Ind. Light
ID or Number: HV59-101, HV59-102

DESCRIPTION:

No discrete alarm exists to indicate Containment Instrument Gas Isolated. Operators must look at the system control valve position indications to determine system status. Response: Rapid.

MITIGATING CONSIDERATIONS:

The ERFDS will provide a summary display of this isolation.

RESOLUTION: (Code A) (Priority N/A) (Sched: N/A)

The location of the Instrument Gas Suction Valve controls are side by side in clear view of the operator. He can tell at a glance whether or not the system is isolated. It is a procedural step in the T-100 Scram procedure to check these control indications. The panel has been enhanced to aid the operator in locating these controls. This is not a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *Jf Cahney* Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-05

EP = N/A

TITLE: Viewing Distance

COMMENT: Difficult to view indications from control location.

Item: STEP 11B

Ref.: T-100

Source: TA

IDENTIFICATION: Panel: 653
Component Name: Bypass Control, Rx Pressure Ind.
ID or Number: N/A

DESCRIPTION:

The distance and viewing angle between the Bypass Jack Control and the necessary Reactor Pressure indication make it difficult to monitor pressure while operating the bypass. Response: Rapid.

MITIGATING CONSIDERATIONS:

There is a Steam Line Pressure gauge immediately above the jack control.

RESOLUTION: (Code D) (Priority 4) (Sched: N/A)

The Steam Line Pressure gauge gives the operator immediate feedback on bypass jack operation. The operator has time to check the Reactor Pressure gauge which is approximately 6' away. Human Factors guidelines allow a lateral span of controls up to 6'. This arrangement is considered to be satisfactory since the two consoles meet at an angle that aids the operator in reading the Reactor Pressure gauge.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *Jf Carney*

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-06

EP = N/A

TITLE: Reactor Level Indication

COMMENT: No discrete identification of Reactor Low Level.

Item: CAUTION 5

Ref.: T-100

Source: TA

IDENTIFICATION: Panel: 601

Component Name: Analog Ind/Recorder

ID or Number: LI42-1R610, LR42-1R615

DESCRIPTION:

Procedures require identification of a reactor level of -167". Both indicator and recorder scales have a range of -100" to -300" but there exists no identification of the -167" level. Response: Deliberate.

RESOLUTION: (Code: A) (Priority: 2) (Sched: 1st Refuel)

This scale will be enhanced by the use of specific zone markings to identify safe and unsafe parameters.

TRAINING REQUIREMENTS: Modification Package (MP)

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

J. C. C. C.

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-07

EP = N/A

TITLE: Flow Indication

COMMENT: No Circulating Water Flow indication exists.

Item: STEP 16

Ref.: T-100

Source: TA

IDENTIFICATION: Panel: 652
Component Name: Flow Indication
ID or Number: N/A

DESCRIPTION:

Circulating Water System Flow cannot be determined directly. Operators must observe pump amperes and pump discharge pressure to infer operation status. Response: Deliberate.

RESOLUTION: (Code: C) (Priority N/A) (Sched: N/A)

This step requires the operator to maintain Condenser Vacuum. Circulating water flow is necessary to maintain a steady condenser vacuum. The primary indication for maintaining condenser vacuum is the Condenser Vacuum gauge which was found to meet requirements. Circulating Water System operation can be verified by pump breaker position, suction and discharge valve position, and pump discharge header pressure. Indications for these are available and adequate. This is not considered a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

J. C. C. C.

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-08

EP = N/A

TITLE: Rod Drive Flow Increments

COMMENT: Scale increments are missing between some major divisions.

Item: STEP 4

Ref.: T-101 RC/L

Source: TA

IDENTIFICATION: Panel: 602
Component Name: Square Root Analog Indicator
ID or Number: FC46-1R600

DESCRIPTION:

The Control Rod Drive System Flow Indicator uses a 0-100 gpm scale that has no intermediate graduations between 0-20 gpm. This makes it difficult to read accurately. Response: Deliberate.

RESOLUTION: (Code A) (Priority N/A) (Sched: N/A)

This is a square root scale. The reading accuracy is ± 2 gpm between 40 and 100 gpm. The minimum flow is 50 gpm so that the scale meets all operational requirements. Not considered to be a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *Jf Cathey* Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-09

EP = N/A

TITLE: ADS Timer Control Feedback

COMMENT: No feedback involved with ADS Timer Reset.

Item: STEP 7 Ref.: T-101 RC/L Source: TA

IDENTIFICATION: Panel: 626
Component Name: Annunciator Panel 110, Div I (A-4), Div
III (C-4)
ID or Number: B21C-53A,C

DESCRIPTION:

The procedure requires that ADS be defeated by resetting timer logic. When the ADS Timer is reset, the operator receives no direct feedback indicating that the reset has been completed. Response: Rapid.

RESOLUTION: (Code A) (Priority 2) (Sched: Interim: Complete)
Final: 1st Refuel)

Interim Solution: Keep the internal switch on this annunciator alarm in the auto-reset mode. This will cause the annunciator to automatically reset when the pushbutton is depressed and it will annunciate when the button is released.

Final Solution: Revise procedure to use the newly installed auto-inhibit switches that defeat auto-initiation of ADS.

TRAINING REQUIREMENTS:

Train personnel in new procedures.

PROCEDURE REQUIREMENTS:

Revise appropriate procedures for use of auto-inhibit switch.

Team Approval Signature: *Jf Cahoy*

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-10

EP = N/A

TITLE: Drywell Pressure Scale Resolution

COMMENT: Cannot read required discrete value on scale.

Item: NOTE 21

Ref.: T-101 RC/L

Source: TA

IDENTIFICATION: Panel: 601

Component Name: Drywell Pressure Indicator

ID or Number: PI57-121

DESCRIPTION:

The Drywell Pressure Indicator uses a -5 to +5 scale with a ± 1 PSIG level of accuracy. Procedures require the operator to read a pressure of 1.68 PSIG which is too specific for the current scale. Response: Deliberate.

MITIGATING CONSIDERATIONS:

Many annunciator alarms initiate at 1.68 PSIG Drywell Pressure.

RESOLUTION: (Code: A) (Priority: 2) (Sched: 1st Refuel)

This indicator is sufficient for all other tasks. The meter face will be enhanced to allow operators to better identify normal, abnormal, and unsafe parameters.

TRAINING REQUIREMENTS: MP

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *Jf Cahney*

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-11

EP = N/A

TITLE: RPV Pressure Scale Resolution

COMMENT: The indicator scale is not accurate for requirements.

Item: STEP 9

Ref.: T-101 RC/P

Source: TA

IDENTIFICATION: Panel: 603

Component Name: RPV Pressure Indicator

ID or Number: PI42-1R605

DESCRIPTION:

Procedures require a reading of 1115 PSIG. The scale has a range of 0-1200 PSIG, but can only be read to ± 10 PSIG. This is not accurate enough to determine 1115 PSIG. Response: Rapid.

RESOLUTION: (Code: A) (Priority 2) (Sched: 1st Refuel)

The scale will be enhanced by the use of specific zone markings to identify safe and unsafe parameters.

TRAINING REQUIREMENTS: MP

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

Jf Cahoy

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-12

EP = N/A

TITLE: RPV Level Alarm

COMMENT: No Reactor Vessel low level alarm exists.

Item: STEP 0

Ref.: T-101 RC/Q

Source: TA

IDENTIFICATION: Panel: N/A
Component Name: Alarm
ID or Number: N/A

DESCRIPTION:

There is no alarm to alert operators to a low-low level in the reactor vessel. Operators must observe the RPV Level indication to identify a low-low level (less than -38"). Response: Rapid.

RESOLUTION: (Code: A) (Priority N/A) (Sched: N/A)

A reactor low-low level alarm exists (panel 114, window C-2), which alarms at -38 inches. This is not a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

Jf Cushing

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-13

EP = N/A

TITLE: RPV Level Scale Resolution

COMMENT: Operators must interpolate scale to determine low level.

Item: STEP 0

Ref.: T-101 RC/Q

Source: TA

IDENTIFICATION: Panel: 603

Component Name: RPV Level Indication

ID or Number: LI42-1R604

DESCRIPTION:

Procedure requires operator to identify RPV level less than -38" to determine RPV low level. The scale range is 60" to -150" but uses increments of + 2.5 inches. The -38" level cannot be read directly from the indicator and operators must approximate the level. Response: Rapid.

MITIGATING CONSIDERATIONS:

There is an annunciator which alarms at this level.

RESOLUTION: (Code: A) (Priority 2) (Sched: 1st Refuel)

This scale will be enhanced by the use of specific zone markings to identify safe and unsafe parameters.

TRAINING REQUIREMENTS: MP

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *Jf Cahney*

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-14

EP = N/A

TITLE: Reactor Power Scale Resolution

COMMENT: Scale not accurate enough for procedural requirements.

Item: STEP 0

Ref.: T-101 RC/Q

Source: TA

IDENTIFICATION: Panel: 603
Component Name: Reactor Power Indications
ID or Number: C51-R603A,B

DESCRIPTION:

Procedures require a discrete reading of 3% power. The two recorders use a range of 0 to 125% power but can only be read accurately to $\pm 2.5\%$. This is not accurate enough to meet procedural requirements. Response: Rapid.

MITIGATING CONSIDERATIONS: The plant computer displays reactor power within .1% and is available for operator use. IRM's on range 10 can identify 3% power.

RESOLUTION: (Code A) (Priority N/A) (Sched: N/A)

APRM Down Scale lights (6) on Panel 10C603 are energized when less than 3% power. Consequently this is not a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

Jf Cahy

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-15

EP = N/A

TITLE: Isolation Indication

COMMENT: No distinct indication signaling group isolations exist.

Item: STEP 1

Ref.: T-101 RC/Q

Source: TA

IDENTIFICATION: Panel: N/A
Component Name: Isolation Signal
ID or Number: N/A

DESCRIPTION:

Operators have no simple means of identifying group isolations (other than group I). Personnel must observe specific groups of indicating lights to determine if isolation has occurred. Response: Rapid.

RESOLUTION: (Code A) (Priority 2) (Sched: When PECO notifies the NRC that SPDS is operational.)

The SPDS system will be used.

TRAINING REQUIREMENTS:

Provide training to operator or SPDS display.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

Jf Cathey

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-16

EP = N/A

TITLE: Isolation Indication

COMMENT: No summary of isolations exists.

Item: STEP 1

Ref.: T-101 RC/Q

Source: TA

IDENTIFICATION: Panel: N/A
Component Name: Isolation Signal
ID or Number: N/A

DESCRIPTION:

No alarm or summary of group isolations is available for operators to use to identify group isolations. Personnel must scan valve position indications and various annunciators to determine which isolations have taken place. Response: Rapid.

RESOLUTION: (Code A) (Priority 2) (Sched: When PECO notifies the NRC that SPDS is operational.)

The SPDS system will be used.

TRAINING REQUIREMENTS:

Provide training to operators on SPDS displays.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

J. C. C. C.

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-17

EP = N/A

TITLE: Boron Injection Flow Instrumentation

COMMENT: No flow indication exists for Standby Liquid Control.

Item: STEP 1, 15, 19, 30 Ref.: T-101 RC/Q Source: TA

IDENTIFICATION: Panel: 603
Component Name: Flow Indication
ID or Number: LI48-1R601

DESCRIPTION:

Boron injection flow cannot be determined directly. Operators must infer flow by checking Standby Liquid Control tank level indication and pump status lights. Response: Rapid.

RESOLUTION: (Code C) (Priority N/A) (Sched: N/A)

This step requires the operator to inject boron. He can determine that boron is injecting by pump breaker position, squib valve continuity, and pump discharge pressure greater than reactor pressure but less than 1400 PSIG (setpoint for relief valve lift indicating no flow path). Concurrent with this step, the operators are attempting to insert any control rods that have failed to insert. Both of these operations must continue until all rods are in or sufficient boron has injected as determined by boron tank level and appropriate calculations. A flow meter would not add to or alter this process. This is not considered to be a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *Jf Carling* Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-18

EP = N/A

TITLE: Reactor Power Scale Resolution

COMMENT: Reactor power indicator scale not accurate enough.

Item: STEP RC/Q 2

Ref.: T-101 RC/Q

Source: TA

IDENTIFICATION: Panel: 603

Component Name: Reactor Power Indication

ID or Number: 651-R603A,B

DESCRIPTION:

Same as HED TA-14. Response: Rapid.

RESOLUTION: (Code A) (Priority N/A) (Sched: N/A)

APRM Down Scale lights (6) on Panel 10C603 are energized when less than 3% power. Consequently this is not a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

Jf Carling

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-19

EP = N/A

TITLE: Boron Injection Instrumentation

COMMENT: Not possible to determine amount of boron injected.

Item: STEP 56

Ref.: T-101 RC/Q

Source: TA

IDENTIFICATION: Panel: 603

Component Name: N/A

ID or Number: N/A

DESCRIPTION:

Operators must observe Standby Liquid Control tank level and ST boron concentration to determine the amount of boron injected. No simple means of determining pounds of boron exists. Response: Analyze.

RESOLUTION: (Code A) (Priority N/A) (Sched: N/A)

Immediate operator action is not required. Time permits the calculation of the pounds of boron injected. Trip procedures provide the calculation format. This is not considered to be a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *J. J. Cahay*

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-20

EP = N/A

TITLE: Suppression Pool Low Level Alarm

COMMENT: No Suppression Pool Low Level Alarm present.

Item: STEP 0 Ref.: T-102 SP/T Source: TA

IDENTIFICATION: Panel: 1AC847
Component Name: Annunciator
ID or Number: A4

DESCRIPTION:

Procedures require operations personnel to quickly determine if Suppression Pool level is outside its normal range. While a Suppression Pool High Level alarm is present, no low level alarm exists. The operator must use the Suppression Pool Level indicator to check level outside normal range. Response: Rapid.

RESOLUTION: (Code A) (Priority 2) (Sched: 2nd Refuel)

Add a "Suppression Pool Low Level" annunciator to the appropriate panel.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS:

Add annunciator response procedure.

Team Approval Signature: *J. C. Carney* Date: 6-20-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-21

EP = N/A

TITLE: Suppression Pool Level Scale Resolution

COMMENT: Scale cannot be read to level of accuracy required by procedures.

Item: STEP 0

Ref.: T-102 SP/T

Source: TA

IDENTIFICATION: Panel: 626
Component Name: Analog Indicator
ID or Number: LI51-140A, B

DESCRIPTION:

The Suppression Pool Level indicator uses a 0-50 feet range and can be read accurately to ± 0.5 feet. Procedures require the operator to identify a discrete level of 24.25 feet. This level cannot be identified on the present scale. Response: Rapid.

RESOLUTION: (Code A) (Priority N/A) (Sched: N/A)

Panel 10C648 LI55-115 has a range of 20-26 feet ± 0.05 ft. Therefore this is not a discrepancy.

TRAINING REQUIREMENTS:

Although not a discrepancy, operators will be trained on the availability of LI55-115. The training will be scheduled during the next annual requalification program.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

J. C. C. C.

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-22

EP = N/A

TITLE: Drywell Temperature Alarm Indication

COMMENT: No Drywell High Temperature alarm exists.

Item: STEP 0

Ref.: T-102 SP/T

Source: TA

IDENTIFICATION: Panel: N/A
Component Name: Alarm
ID or Number: Drywell High Temperature

DESCRIPTION:

Operators must observe the specific Drywell Temperature recorder to determine if Drywell Temperature is above its upper limit. No discrete alarm exists to warn operators of this condition. Response: Rapid.

MITIGATING CONSIDERATIONS:

Computer provides Drywell Cooler Input Temperature alarm (TISH-77-101, A-H).

RESOLUTION: (Code A) (Priority 2) (Sched: 2nd Refuel)

Add an annunciator alarm indicating "Drywell High Temperature" to alarm when Drywell Temperature reaches 145 degrees F.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS:

Add annunciator response procedure.

Team Approval Signature:

J. J. Carney

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-23

EP = N/A

TITLE: Drywell Temperature Scale Resolution

COMMENT: Drywell Temperature recorder scale not accurate enough for procedural requirements.

Item: STEP 0 Ref.: T-102 SP/T Source: TA

IDENTIFICATION: Panel: 601
Component Name: Recorder
ID or Number: TR57-122

DESCRIPTION:

The Drywell Temperature Recorder has a range of 40-440 degrees F, and is readable to +5 degrees F. Procedures require operators to identify a discrete temperature of 145 degrees. While the scale can be read to this level of detail, a discrete mark at the 145 degrees does not exist. Response: Rapid.

RESOLUTION: (Code: A) (Priority N/A) (Sched: N/A)

The scale is readable to + 5 degrees. Therefore it is accurate enough for procedural requirements. This is not a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *Jf Carney* Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-24

EP = N/A

TITLE: Temperature Indication

COMMENT: No discrete indication exists for Steam Dome Coolant to Bottom Head Drain Coolant Temperature.

Item: STEP 11A-3

Ref.: T-99 PSR

Source: TA

IDENTIFICATION: Panel: 602

Component Name: Temperature Indication

ID or Number: TR43-1R650, TI44-1R607

DESCRIPTION:

The procedure requires restart of a recirc. pump during plant recovery. This restart requires operators to observe steam dome to bottom head drain coolant Temperature. In order to accomplish this, operators must observe steam pressure, steam tables, and Bottom Head Drain temperature and then calculate the Steam Dome to Bottom Head Drain Coolant Temperature. No discrete Temperature indication exists. Response: Analyze.

RESOLUTION: (Code: A) (Priority: N/A) (Sched: N/A)

There exists no time constraints on the operator in performing this task. As the information to do the calculation exists in the control room, and procedures do not require an immediate operator response, this is not considered a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *Jf Carling* Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-25

EP = N/A

TITLE: Drywell Temperature Scale Resolution

COMMENT: Drywell Temperature recorder scale not accurate enough for procedural requirements.

Item: STEP 2

Ref.: T-102 DW/T

Source: TA

IDENTIFICATION: Panel: 601
Component Name: Temperature Recorder
ID or Number: TR57-122

DESCRIPTION:

Procedures require a scale range of 100 to 145 degrees F. The recorder has a range of 40 to 440 degrees, but can only be read to ± 10 degrees F. This is not accurate enough to read to the level of detail required by procedures. Response: Deliberate.

RESOLUTION: (Code A) (Priority N/A) (Sched: N/A)

Upon re-examination of the display, the scale was found readable to ± 5 degrees. Therefore it is accurate enough for procedural requirements. This is not a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *Jf Carling* Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-26

EP = N/A

TITLE: Reference Leg Temperature Qualifications

COMMENT: Reference Leg Temperature recorder is not environmentally qualified.

Item: STEP 4

Ref.: T-102 DW/T

Source: TA

IDENTIFICATION: Panel: 601
Component Name: Temperature Recorder
ID or Number: TR57-110 (Red Pen)

DESCRIPTION:

The recorder meets procedural requirements for range and accuracy, but is not a Reg. Guide 1.97 instrument. The recorder next to it (TR57-122) is identical and is a Reg. Guide 1.97 instrument. Response: Deliberate.

RESOLUTION: (Code A) (Priority N/A) (Sched: N/A)

This recorder is specified because the sensor is close to the reference leg, the other is not. The recorder is not required to be a Reg. Guide 1.97 instrument. This is not a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

Jf Cahus

Date: 6-29-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-27

EP = N/A

TITLE: Suppression Scale Resolution

COMMENT: Scale not accurate enough for procedural requirements.

Item: STEP 5, 10, 12, 14 Ref.: T-102 DW/P Source: TA

IDENTIFICATION: Panel: 601
Component Name: Pressure Recorder
ID or Number: PR57-101

DESCRIPTION:

Procedures require discrete readings of 22, 38, 53, and 128 PSIG to determine if Suppression Pool Cooling should continue. The recorder has a range of -5 to 165 PSIG, but can only be read to +2.5 PSIG. This is not accurate enough for procedural requirements. Response: Deliberate.

RESOLUTION: (Code: A) (Priority: 2) (Sched: 1st Refuel)

This scale will be enhanced by the use of specific zone markings to identify safe and unsafe parameters.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

J. Carney

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-28

EP = N/A

TITLE: Suppression Pool Level Resolution

COMMENT: Scale cannot be read to level of accuracy required by procedures.

Item: STEP 2
STEP 16

Ref.: T-102 SP/L

Source: TA

IDENTIFICATION: Panel: 626
Component Name: Level Indication
ID or Number: LI51-140A,B

DESCRIPTION:

See HED TA-21. Response: Deliberate.

RESOLUTION: (Code A) (Priority N/A) (Sched: N/A)

Panel 10C648 LI-55-115 has a range of 20-26 feet \pm .05 feet.
Therefore this is not a discrepancy.

TRAINING REQUIREMENTS:

Although not a discrepancy, operators will be trained on the availability of LI-55-115. The training will be scheduled during the next annual requalification program.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

J. J. Cahy

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-29

EP = N/A

TITLE: Suppression Pool Level Resolution

COMMENT: Scale not accurate enough to be read to level required by procedures.

Item: STEP 9 Ref.: T-102 SP/L Source: TA
STEP 17

IDENTIFICATION: Panel: 626
Component Name: Level Indicator
ID or Number: LI52-140A,B

DESCRIPTION:

Operators must read a discrete suppression pool level of 16.9' and 24.6'. The meter has a range of 0-50', but can only be read to $\pm 0.5'$. This is not accurate enough for procedural requirements. Response: Deliberate.

MITIGATING CONSIDERATIONS: The computer provides backup data and can be read $\pm 0.1'$.

RESOLUTION: (Code A) (Priority 2) (Sched: 1st Refuel)

The meter face will be enhanced to allow operators to better identify normal, abnormal, and unsafe parameters.

TRAINING REQUIREMENTS:

Personnel have been trained in meaning of enhancements.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *Jf Carbury*

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-30

EP = N/A

TITLE: RPV Pressure Scale Resolution

COMMENT: Scale not accurate enough for procedural requirements.

Item: STEP 5

Ref.: T-111 LR

Source: TA

IDENTIFICATION: Panel: 601
Component Name: Pressure Recorder
ID or Number: XR42-1R623A,B

DESCRIPTION:

Procedures require a discrete reading of 330 PSIG. While the scale has a range of 0-1400 PSIG and can be read to an accuracy of ± 10 PSIG, there exists no graticule at 330 PSIG. Operators can only approximate 330 PSIG currently. Response: Deliberate.

RESOLUTION: (Code A) (Priority 2) (Sched: 1st Refuel)

The meter face will be enhanced to allow operators to better identify normal, abnormal, and unsafe parameters.

TRAINING REQUIREMENTS:

Personnel have been trained in meaning of enhancements.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *J. Carney* Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-31

EP = N/A

TITLE: RPV Level Scale Resolution

COMMENT: Scale not accurate enough for procedural requirements.

Item: STEP 6

Ref.: T-111 LR

Source: TA

IDENTIFICATION: Panel: 601
Component Name: Level Recorder
ID or Number: XR42-1R623A,B

DESCRIPTION:

Procedures require a discrete reading of -129" level. The recorder has a range of -150" to +60", but can only be read to +2.5". This is not specific enough for procedural requirements. Response: Deliberate.

RESOLUTION: (Code A) (Priority 2) (Sched: 1st Refuel)

This scale will be enhanced by the use of specific zone markings to identify safe and unsafe parameters.

TRAINING REQUIREMENTS: MP

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

J. Carney

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-32

EP = N/A

TITLE: RPV Pressure Scale Range

COMMENT: No narrow range indicator of Reactor Pressure.

Item: STEP 5

Ref.: T-112 EB

Source: TA

IDENTIFICATION: Panel: 603

Component Name: Reactor Pressure Indicator

ID or Number: PI42-1R605

DESCRIPTION:

A narrow range Reactor Pressure indicator is recommended for use in Emergency Blowdown (0-300 PSIG). Current scales have a range of 0-1200 PSIG. Response: Deliberate.

MITIGATING CONSIDERATIONS: The current scale is readable from 0-300 PSIG +10 PSIG.

RESOLUTION: (Code A) (Priority N/A) (Sched: N/A)

The existing scale meets all procedural requirements except for the range, which exceeds that which is suggested. As the scale resolution has not been reduced, this is not considered a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *JJ Carby*

Date: 6-28-85

HED ASSESSMENT

HED No. TA-33

EP = N/A

TITLE: RPV Pressure Scale Resolution

COMMENT: Scale not accurate enough for procedural requirements.

Item: STEP 11 Ref.: T-115 AK Source: TA
STEP 9 T-117 LQ

IDENTIFICATION: Panel: 601
Component Name: Reactor Pressure
ID or Number: LR42-1R623A,B

DESCRIPTION:

Procedures require a discrete reading of less than 154 PSIG and less than 255 PSIG. The scale has a range of 0-1500 PSIG, but can only be read to +10 PSIG. This is not accurate enough for procedural requirements. Response: Deliberate.

MITIGATING CONSIDERATIONS: The computer provides backup and can be read to +1 PSIG.

RESOLUTION: (Code A) (Priority 2) (Sched: Enhancement -
1st Refuel.
SPDS - When PECO notifies
the NRC that SPDS is
operational.)

These scales will be enhanced to clearly identify 154 PSIG and 255 PSIG. The SPDS will provide more convenient identification of these.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *J. C. C. C.*

Date: 6-28-85

HED ASSESSMENT

HED No. TA-34

EP = N/A

TITLE: Drywell Temperature Scale Resolution

COMMENT: Scale not accurate enough for procedural requirements.

Item: STEP 17

Ref.: T-116 RF

Source: TA

IDENTIFICATION: Panel: 601
Component Name: Temperature Recorder
ID or Number: TR57-110

DESCRIPTION:

Drywell reference Leg Temperature is required to be read at a discrete temperature of 212 degrees F. The scale has a range of 40 degrees F to 440 degrees F, but can only be read to +10 degrees F. This is not accurate enough for procedural requirements. Response: Deliberate.

MITIGATING CONSIDERATIONS:

Computer backup provided. Reads to +1 degrees F.

RESOLUTION: (Code A) (Priority 2) (Sched: When PECO notifies the NRC that SPDS is operational.)

The ERFDS will provide an accurate saturation curve and the operation point.

TRAINING REQUIREMENTS: MP

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

Jf Calmy

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. TA-35

EP = N/A

TITLE: Reactor Power Scale Resolution

COMMENT: Scale not accurate enough for procedural requirements.

Item: STEP 1

Ref.: T-117 LQ

Source: TA

IDENTIFICATION: Panel: 603

Component Name: Reactor Power Indication

ID or Number: C51-R603 A,B,C,D

DESCRIPTION:

Procedures require a trend reading accuracy of $\pm 1\%$. The scale has a range of 0-125%, but is only readable to $\pm 2.5\%$. This is not accurate enough for procedural requirements. Response: Deliberate.

MITIGATING CONSIDERATIONS: Computer provides backup and is read $\pm 1\%$.

RESOLUTION: (Code A) (Priority N/A) (Sched: N/A)

Operator actions require a discrete trend indication at 8% power. This is provided by APRM indicator scales which provide a scale resolution of 2.5 percent; and the team determined this to be an adequate scale resolution to determine trends around the 8% power level.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

J. J. Carney

Date: 6-28-85

HED ASSESSMENT

HED No. TA-36

EP = N/A

TITLE: Boron Injection Instrumentation

COMMENT: See HED TA-19.

Item: STEP 56

Ref.: T-101 RC/Q

Source: TA

IDENTIFICATION: Panel: 603

Component Name: See HED TA-19.

ID or Number: See HED TA-19.

DESCRIPTION:

See HED TA-19. Response: Analyze.

RESOLUTION: (Code A) (Priority N/A) (Sched: N/A)

Immediate operator action is not required. Time permits the calculation of the pounds of boron injected. Trip procedures provide the calculation format. This is not considered to be a discrepancy.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

Jf Carney

Date: 6-28-85

() Additional page(s) attached

Appendix G

Modified HED Resolutions

HED ASSESSMENT

HED No. A1-03

EP = 4

TITLE: Annunciator Abbreviations

COMMENT: Inconsistent use of abbreviations

Item: 5.3
5.4

Ref.: C2.1

Source: CRS

IDENTIFICATION: Panel: Various
Component Name Annunciator System
ID or Number: N/A

DESCRIPTION OF PROBLEM:

Annunciator abbreviations were not consistent with each other or with overall control room abbreviation conventions. HTX/HX, REACTOR 20 LEVEL/REACTOR LEVEL 3, D/G versus D-G, CONT used for both "containment" and "control".

RESOLUTION: (Code: A) (Priority: 3) (Sched: Will coordinate with all plant modifications that involve annunciator window tile changes.)

Alarms to be relabeled using terminology consistent with related control panels. (See general discussion of annunciator improvements.)

TRAINING REQUIREMENTS: MP

PROCEDURE REQUIREMENTS: MP

Team Approval Signature: *T.J. Cabrey* Date: 6-6-85

Revised 6/6/85 per telecon. () Additional page(s) attached
Between Interlock (R. Morrison) and PECO (T.J. Cabrey)

HED ASSESSMENT

HED No. A1-06

EP = 6

TITLE: Excessive Annunciator Wording

COMMENT: Many annunciator windows contain excessive wording.

Item: 5.7

Ref.: C2.5

Source: CRS

IDENTIFICATION: Panel: See attached
Component Name: Annunciator System
ID or Number: N/A

DESCRIPTION OF PROBLEM:

Insuccinct wording was found on many annunciator legends. (See attached sheet for examples.)

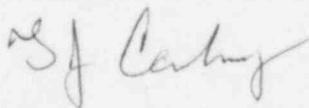
RESOLUTION: (Code: A) (Priority: 2) (Sched: Will coordinate
with all plant modifica-
tions that involve annun-
ciator window tile changes.)

Alarms to be reworded using hierarchal labeling to reduce the number of words on window labels. (See general discussion of annunciator improvements.)

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:



Date: 6-6-85

Revised 6/6/85 per telecon. (2) Additional page(s) attached
Between Interlock (R. Morrison) and PECO (T.J. Cabrey)

IDENTIFICATION

HED A1-06
attachment
Page 1

GENERATOR HYDROGEN COOLERS H2
OUTLET HI/LO TEMP, panel
1BC870, window 34

EHC EMERGENCY TRIP PRESS LO
PRESS TRIP, panel 1AC870
window 46

CONT ENCL ST FLDNG DMPR
PNL 00C729 TROUBLE, panel
00C881, window 20

A REFUELING FLOOR ISOLATION
SIGNAL INITIATED, panel 10C881
window 23

1A CRD WATER PUMP TRIP
panel 1BC803, window 31

UNIT 1 REAC BLDG EL 352
NORTHWEST AIRLOCK SEAL BROKEN,
panel 10C889, window 1

CIRC WATER PUMP COOLING WATER
BASKET STRAINER FAILURE, panel
10C855, window 43

1 GEN BKRS 452-535/635
POSITION MONITOR CKT CONTROL
PWR FAILURE, panel 1BC854,
window 5

D11 D-G DIESEL OIL STORAGE
TANK HI/LO LEVEL, panel
1AC861, window 19

DIV 1 ADS MANUAL INITIATION
SW ARMED/RELAYS SEALED IN,
panel 10C826, window 2

DIV 2 LO REACTOR PRESSURE
RHR PERMISSIVE TO START, panel
1CC801, window 25

CONTROL RM EMER FRESH AIR
SUPPLY CHARCOAL FILTER A
FIRE, panel 0BC850, window 26

EMER COOLING SUPPLY FROM
CONDENSATE STORAGE TANK
MOV OVLD LOSS OF PWR, panel
10C847, window 21

HED ASSESSMENT

HED No. A1-07

EP = 6

TITLE: Annunciator System Identification

COMMENT: Annunciators do not fully identify systems.

Item: 5.8

Ref.: C2.5

Source: CRS

IDENTIFICATION: Panel: 800,801
Component Name: Annunciator System
ID or Number: N/A

DESCRIPTION OF PROBLEM:

Some annunciator legends were not specific enough to fully identify the system referred to.

- SUPPRESSION ATMOSPHERIC ANALYZER TROUBLE (panel 10C800, window 28)
- TRAIN A PIPING FILL PUMP AP256 LO PMP DISCH (panel 18C801, window 14)

MITIGATING CIRCUMSTANCES:

Annunciator response cards define the meaning of each window.

RESOLUTION: (Code: A) (Priority: 2) (Sched: Will coordinate with all plant modifications that involve annunciator window tile changes.)

Alarms to be reworded using hierarchal labeling and system colors to completely identify the system. (See general discussion of annunciator improvements.)

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *Jf Carney*

Date: 6-6-85

Revised 6/6/85 per telecon. () Additional page(s) attached
Between Interlock (R. Morrison) and PECO (T.J. Cabrey)

HED ASSESSMENT

HED No. A1-08

EP = 6

TITLE: Incomplete & Incorrect Annunciator Legends

COMMENT: Annunciators have incomplete, sometimes incorrect legends.

Item: 5.9
5.10
5.11

Ref.: C2.5

Source: CRS

IDENTIFICATION: Panel: 1AC-870, 1AC-801
Component Name: Annunciator System
ID or Number: N/A

DESCRIPTION OF PROBLEM:

- No process variable specified on windows 43 and 50, panel 1AC870
- DIV 1 SHUTDOWN COOLING & MIN FLOW VALVES OPEN should read RHR A not DIV 1 (1AC801)
- CORE SPRAY LINE INTERNAL BREAK is not literally correct (1AC801)

RESOLUTION: (Code: A) (Priority: 2) (Sched: Will coordinate with all plant modifications that involve annunciator window tile changes.)

Alarms to be relabeled to provide complete and correct labels. (See general discussion of annunciator improvements.)

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

T. J. Cabrey

Date: 6-6-85

Revised 6/6/85 per telecon. () Additional page(s) attached
Between Interlock (R. Morrison) and PECO (T.J. Cabrey)

HED ASSESSMENT

HED No. A1-09

EP = 4

TITLE: Multiple Trip Levels, Clarity

COMMENT: Annunciators legends with multiple trip levels do not differentiate levels.

Item: 5.12

Ref.: C2.6

Source: CRS

IDENTIFICATION: Panel: Various
Component Name: Annunciator System
ID or Number: N/A

DESCRIPTION OF PROBLEM:

Some alarm windows use terminology that does not refer clearly to varying setpoints for parameters with multiple trip levels. An example would be "REACTOR LO LEVEL TRIP" versus REACTOR HI/LO LEVEL and REACTOR HI LEVEL TURBINE/REPT TRIP

RESOLUTION: (Code: A) (Priority: 2) (Sched: Will coordinate with all plant modifications that involve annunciator window tile changes.)

These alarms to be made clear with better terminology. They represent specific set points. (See general discussion of annunciator improvements.)

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

Jf Carney

Date: 6-6-85

Revised 6/6/85 per telecon. () Additional page(s) attached
Between Interlock (R. Morrison) and PECO (T.J. Cabrey)

HED ASSESSMENT

HED No. SA2-02

EP = 6

TITLE: Excessive Annunciator Wording

COMMENT: Annunciator windows contain excessive wording.

Item: N/A

Ref.: C2.5

Source: SCRS

IDENTIFICATION: Panel: 673 (See attached)
Component Name: Annunciator System
ID or Number: N/A

DESCRIPTION:

Insufficient wording was found on many annunciator legends.
(See attached sheet.)

RESOLUTION: (Code A) (Priority: 3) (Sched: Will coordinate
with all plant modifica-
tions that involve annun-
ciator window tile changes.)

Alarms to be reworded using hierarchal labeling to reduce the
number of words on window labels. (See general discussion of
annunciator improvements.)

TRAINING REQUIREMENTS: None

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

T. J. Cabrey

Date: 6-6-85

Revised 6/6/85 per telecon. () Additional page(s) attached
Between Interlock (R. Morrison) and PECO (T.J. Cabrey)

HED ASSESSMENT

HED No. SD4-02

EP = 9

TITLE: Pushbutton Colors

COMMENT: Colors used for pushbuttons are not consistent.

Item: N/A

Ref.: A4.2
TDA

Source: SCRS

IDENTIFICATION: Panel: All
Component Name: Guarded and Unguarded Circular
Pushbuttons
ID or Number: N/A

DESCRIPTION:

Pushbuttons use colors of red, yellow, green and black throughout the control room. The use of color is not consistent with function.

RESOLUTION: (Code: A) (Priority: N/A) (Sched: Fuel Load)

See attached.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Approval Signature: *J. C. Carey*

Date: 6-6-85

(1) Additional page(s) attached

Revised 6/6/85.

RESOLUTION

Pushbutton Color Codes

Pushbuttons throughout the control room will be colored using the following color codes: (NOTE 1)

<u>FUNCTION</u>	<u>COLOR</u>
1. Emergency Trip, Emergency Actuation	RED
2. Reset	LIGHT GRAY
3. Acknowledge Alarm, Bypass, Block	YELLOW
4. Non-Emergency (Start/Stop/Auto, Open/Close, etc.)	GREEN
5. Test	BLACK

NOTE 1 Does not apply to NSSSS isolation logic resets (inboard and outboard) or the North Stack Hi-Rad isolation re-set.

NOTE 2 Does not apply to annunciator reset pushbuttons.
(See HED SD2-04.)

Revised 6/6/85 per telecon.

Between Interlock (R. Morrison) and PECO (T.J. Cabrey)

HED ASSESSMENT

HED No. 12-03

EP = 6

TITLE: Indicator Scales

COMMENT: Indicators are not scaled properly.

Item: 4.2.3

Ref.: B2.3

Source: CRS

IDENTIFICATION: Panel: 647,648,670,602,653,696

Component Name: Indicating devices

ID or Number: See below

DESCRIPTION OF PROBLEM:

Indicating devices are not scaled in units that relate to the operation of the system:

- a. Pump suction pressure indicators (panels 647,648)
- b. Main generator rotor temp (panel 670)
- c. Recirc pump speed and demand speed (panel 602)
- d. Low pressure turbine exit pressure indicators (panel 653)
- e. Turbine speed (panel 653)
- f. Reaction chamber temperature control indicator (Recombiner 696)

RESOLUTION: (Code: See Below) (Priority: N/A) (Sched: Fuel Load)

- a. Scale will be renumbered in standard increments. Correct RCIC indicator to be consistent with HPCI indicator. Code A
- b. Enhancements will emphasize the centigrade scale. System measures degrees Centigrade, therefore indicator is scaled properly. See general discussion of enhancements. Code A
- c. The minimum speed of this pump is 28% and is indicated by a red line. The scale covers the range of 18% to 102% and is considered to be satisfactory. Code B
- d. The engineering units will be positioned across from their designated portion of the scale with clear separation between engineering units. Code B
- e. Turbine speed recorder indicates RPM; it should be percent. Will be changed. Code A
- f. Not included in CRDR.

TRAINING PROCEDURES: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *J. Cabrey*

Date: 6-6-85

() Additional page(s) attached

Team revised 6/6/85 per telecon.

Between Interlock (R. Morrison) and PECO (T.J. Cabrey)

HED ASSESSMENT

HED No. 12-14

EP = 4

TITLE: Scale Differentiation

COMMENT: There is no differentiation between psi and vacuum scales.

Item: 4.2.17

Ref.: B2.18

Source: CRS

IDENTIFICATION: Panel: 647, 648

Component Name: Pump Suction Pressure Indicators

ID or Number: PI-50 - 1R604 and PI-56 - 1R606

DESCRIPTION OF PROBLEM:

There is no clear differentiation between psi and vacuum scales on the pump suction pressure indicators.

RESOLUTION: (Code: A) (Priority: N/A) (Sched: Fuel Load)

The engineering units will be positioned across from their designated portion of the scale with clear separation between engineering units. (See HED 12-03.)

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *TJ Cabrey* Date: 6-6-85

Revised 6/6/85 per telecon. () Additional page(s) attached
Between Interlock (R. Morrison) and PECO (T.J. Cabrey).

HED ASSESSMENT

HED No. S11-03

EP = 6

TITLE: Scale Units

COMMENT: Process units not specified.

Item: N/A

Ref.: SB1.4

Source: SCRS

IDENTIFICATION: Panel: 602

Component Name: Chart recorder

ID or Number: CRSH23-1R601/1R603

DESCRIPTION OF PROBLEM:

The cleanup inlet and outlet conductivity scales have no process units specified. (These recorders appear not to be installed completely.)

RESOLUTION: (Code: A) (Priority: N/A) (Sched: Fuel Load)

Process units for these recorders have been specified and will be verified.

- o INFLUENT IR601 .05-10 umhos
- o EFFLUENT IR603 .0-1.0 umhos

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

T.J. Cabrey

Date: 6-6-85

Revised 6/6/85 per telecon. () Additional page(s) attached
Between Interlock (R. Morrison) and PECO (T.J. Cabrey)

HED ASSESSMENT

HED No. SIL-06

EP = 12

TITLE: Regulation Guide 1.97 Instruments

COMMENT: Post accident monitoring indication not clearly identified.

Item: N/A Ref.: B6.1 and Source: SCRS
Reg. Guide 1.97

IDENTIFICATION: Panel: 652,670,603,600,602,626,601,647,667,624 & 648
Component Name: Post Accident Monitoring Instrumentation
ID or Number: Ref. FSAR Table 7.5-3 Cat.1 and 2 instruments

DESCRIPTION OF PROBLEM:

Instruments that meet Reg. Guide 1.97 requirements are spread throughout the control room. They should be distinctly marked so that the operator can quickly identify them in post accident conditions.

RESOLUTION: (Code: A) (Priority: N/A) (Sched: Fuel Load)

Reg. Guide 1.97 indicators will be highlighted as part of the overall control panel enhancement effort. (See general discussion of enhancements.)

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *SJ Carney*

Date: 6-6-85

Revised 6/6/85 per telecon. () Additional page(s) attached
Between Interlock (R. Morrison) and PECO (T.J. Cabrey)

HED SI1-06
attachment

Replace pages A-161 through A-164
with this page.

HED ASSESSMENT

HED No. A1-01

EP = 4

TITLE: System Grouping

COMMENT: Annunciators not above related controls and displays

Item: 5.1

Ref.: Cl.2

Source: CRS

IDENTIFICATION: Panel: 661,00C-656,626,ADS,602,668,669,00C-650
Component Name: Annunciator System
ID or Number: N/A

DESCRIPTION OF PROBLEM:

While annunciators are grouped within panels by system, they are not always above the related controls and displays. See attached sheet for examples.

RESOLUTION: (Code: D) (Priority: N/A) (Sched: Fuel Load)

All annunciator panels will be assigned a hierarchal name that relates them to their associated panel or console. Each will be numbered beginning with 101 for identification in procedures. Appropriate demarcation will also be used between annunciator panels. (See general discussion of Annunciator Improvements.)

TRAINING REQUIREMENTS: None

PROCEDURE REQUIREMENTS:

Modify alarm response card numbers to conform to new panel number.

Team Approval Signature: *Jf Carney*

Date: 6-10-85

(1) Additional page(s) attached

Revised 6/10/85

Relating to panel 661, the D11 alarms are above the D13 controls, the D13 alarms are above the D12 controls, and the D12 and D14 alarms are above panel 00C-656.

The location of ADS and MSIV leakage control alarms in alarm panel 10C826 is the reverse of the location of related controls on panel 626.

The reactor isolation system alarms of alarm panel 1AC802 are above the ADS panel.

Excess flow check valve and fuel pool alarms of alarm panel 1BC802 are located with the recirculation and RWCU alarms related to panel 602.

Radiation monitoring alarms in alarm panel 00C824 are above panel 668.

Feedwater alarm panel 1BC868 is located above panel 669.

Fire protection alarm panel 0BC850 is located above the control room entrance, to the left of fire protection panel 00C-650.

HED ASSESSMENT

HED No. D2-13

EP = 12

TITLE: Mimic Flow Path Arrangement

COMMENT: Flow paths and arrangements are not orderly or easily recognized.

Item: 3.2.9

Ref.: A2.7

Source: CRS

IDENTIFICATION: Panel: See attached
Component Name: See attached
ID or Number: See attached

DESCRIPTION OF PROBLEM:

Flow paths are confusing, often appearing to connect where they should not, and sometimes incorrect. See attached.

RESOLUTION: (Code: A) (Priority: N/A) (Sched: Fuel Load)

Resolved through improvement of mimic lines as part of panel enhancements. (See general discussion of enhancements.)

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *J. J. Carling*

Date: 6-10-85

(1) Additional page(s) attached

RHR 1A mimic lines for minimum flow bypass and suppression pool sparger flow appear to connect, but should not - 601.

Some flow arrows are misplaced, such as that to the A containment hydrogen recombiner inlet valve - 601.

RHR servicing water crosstie mimic flow arrow is pointing to an end point labeled "from RHR switch system" - 601.

Core spray B suppression pool return lines for test and minimum flow bypass are very close and congested with the main turbine stop valve and demarcation line. Congestion is also evident in the mimic lines from the pumps to the bypass valve - 601.

Revised 6/10/85

HED ASSESSMENT

HED No. SI5-05

EP = 12

TITLE: Control Manipulation Fatiguing

COMMENT: Pushbuttons induce excessive fatigue.

Item: N/A

Ref.: B5.5

Source: SCRS

IDENTIFICATION: Panel: 603

Component Name: Control rod insert, withdrawal, continuous insert and continuous withdrawal buttons.

ID or Number: N/A

DESCRIPTION:

Pushbuttons require single finger operation for extended periods of time inducing excessive fatigue.

RESOLUTION: (Code: A) (Priority: N/A) (Sched: Fuel Load)

Supply the operators with a portable adapter.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *W. J. Cahoy*

Date: 6-10-85

() Additional page(s) attached

Revised 6/10/85.

HED ASSESSMENT

HED No. 12-11

EP = 3

TITLE: Scale Subdivisions

COMMENT: Indicators are scaled with incorrect decimal multiples.

Item: 4.2.13

Ref.: B2.13

Source: CRS

IDENTIFICATION: Panel: See attached
Component Name: See attached
ID or Number: See attached

DESCRIPTION OF PROBLEM:

The following indicating devices are scaled with subdivisions in decimal multiples other than the recommended 1, 2, or 5. (See attached sheet)

RESOLUTION: (Code: A) Priority: N/A) (Sched: Fuel Load)

A guideline for analog indicator gauge faces has been developed and will be used throughout the control room to correct indicators as appropriate.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

J. C. Carney

Date: 6-10-85

(1) Additional page(s) attached

Revised 6/10/85.

HED ASSESSMENT

HED No. D3-09

EP = 9

TITLE: Coding Consistency

COMMENT: There appears to be no coding convention applied.

Item: 3.3.8

Ref.: A3.5

Source: CRS

IDENTIFICATION: Panel: 651,652

Component Name: N/A

ID or Number: N/A

DESCRIPTION OF PROBLEM:

Coding methods such as demarcation lines, shading, spacing and switch shape are not used consistently between panels; variations in these occur on both panels.

RESOLUTION: (Code A) (Priority: N/A) (Sched: Fuel Load)

Overall enhancement design rectifies these discrepancies. (See general discussion of enhancements. Shape coding; see HED 15-10.)

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

J. C. C. C.

Date: 6-10-85

() Additional page(s) attached

Revised 6/10/85.

HED ASSESSMENT

HED No. SD4-02

EP = 9

TITLE: Pushbutton Colors

COMMENT: Colors used for pushbuttons are not consistent.

Item: N/A

Ref.: A4.2
TDA

Source: SCRS

IDENTIFICATION: Panel: All

Component Name: Guarded and Unguarded Circular
Pushbuttons

ID or Number: N/A

DESCRIPTION:

Pushbuttons use colors of red, yellow, green and black throughout the control room. The use of color is not consistent with function.

RESOLUTION: (Code: A) (Priority: N/A) (Sched: Fuel Load)

See attached.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Approval Signature: *J. C. Carney*

Date: 6-10-85

(1) Additional page(s) attached

Revised 6/10/85.

RESOLUTION

Pushbutton Color Codes

Pushbuttons throughout the control room will be colored using the following color codes:

<u>FUNCTION</u>	<u>COLOR</u>
1. Emergency Trip, Emergency Actuation	RED
2. Reset	LIGHT GRAY
3. Acknowledge Alarm, Bypass, Block	YELLOW
4. Non-Emergency (Start/Stop/Auto, Open/Close, etc.)	GREEN
5. Test	BLACK

NOTE 1: Does not apply to NSSSS isolation logic resets (inboard and outboard) or the North Stack Hi-Rad isolation reset.

NOTE 2: Does not apply to annunciator reset pushbuttons.
(See HED SD2-04.)

NOTE 3: The color code is determined by the color of the pushbutton collar unless collar is silver in which case the color of the pushbutton determines the code.

Revised 6/10/85

HED ASSESSMENT

HED No. D2-10

EP = 8

TITLE: Mimic Quality

COMMENT: Some mimics appear poorly made and installed.

Item: 3.2.7

Ref.: A2.6

Source: CRS

IDENTIFICATION: Panel: 601, 647, 648
Component Name: Mimic lines
ID or Number: N/A

DESCRIPTION OF PROBLEM:

Mimics appear to be of low quality and have been installed without proper care.

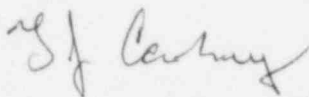
RESOLUTION: (Code: A) (Priority: N/A) (Sched: Fuel Load)

Mimics will be either painted or be of an acceptable adhesive colored taping to ensure proper installation. The mimic has been re-designed and will be checked periodically to ensure proper installation until the 1st refuel outage when the mimic will be replaced with a durable material. (See general discussion of enhancements.)

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:



Date: 6-10-85

() Additional page(s) attached

Revised 6/10/85.

HED ASSESSMENT

HED No. D5-02

EP = 6

TITLE: Label Location

COMMENT: Labels have been switched.

Item: 3.5.2

Ref.: A5.1

Source: CRS

IDENTIFICATION: Panel: 603

Component Name: Recorder Labels

ID or Number: XRM-IR623, XR01-IR609

DESCRIPTION OF PROBLEM:

The labels on these two recorders have been inadvertently reversed.

RESOLUTION: (Code: A) (Priority: N/A) (Sched: Fuel Load)

Resolved through reversing labels associated with hierarchal labeling. (See general discussion of enhancements.)

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

J. Carney

Date: 6-10-85

() Additional page(s) attached

Revised 6/10/85.

HED ASSESSMENT

HED No. SPV-02

EP = N/A

TITLE: SRV Opening Sequence

COMMENT: SRV opening sequence not specified.

Item: Run 7

Ref.: R.E.C./A.C.M.

Source: Val-
idation

IDENTIFICATION: Panel: 626

Component Name: Safety relief valve controls

ID or Number: N/A

DESCRIPTION:

TRIP procedure T-101 Step RC/P-9 and note 24 specify using SRV opening sequence. The proper sequence is not specified in the TRIP procedure or on the panel.

RESOLUTION: (Code: A) (Priority: 2) (Sched: 5% Power)

List appropriate SRV sequence of operation on hierarchal labeling. This is considered to be adequate and is not required in the procedure.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *Wf Cahy*

Date: 6-18-85

() Additional page(s) attached

Revised 6/18/85.

HED ASSESSMENT

HED No. SDV-03

EP = N/A

TITLE: ERFDS Locations

COMMENT: An ERFDS display is not conveniently located for use by the shift supervisor.

Item: Run 2 Ref.: R.E.C. Source: Val-
idation

IDENTIFICATION: Panel: Supervisor Station while using TRIP
procedures
Component Name: ERFDS Display and Control
ID or Number: N/A

DESCRIPTION:

The shift supervisor is responsible for directing the execution of TRIP procedures. This includes determining plant conditions and making decisions. The manual plots required to be used by him are on the TRIP procedures and are also automated on the ERFDS, yet the ERFDS cannot be observed from his station.

MITIGATING CONSIDERATIONS:

TRIP procedures are based upon communications between operators (team) whether it's information from control panel indications or ERFDS display.

RESOLUTION: (Code:) (Priority: 2) (Sched: When PECO notifies the NRC that SPDS is operational.)

The SPDS system will be used.

TRAINING REQUIREMENTS:

Provide training to operator on SPDS display.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *SJ Carney*

Date: 6-24-85

() Additional page(s) attached

Revised 6/24/85.

HED ASSESSMENT

HED No. SPV-06

EP = N/A

TITLE: Procedure/ERFDS Correlation

COMMENT: ERFDS should be appropriately referenced within procedures to indicate display formats as backups.

Item: Run 10

Ref.: A.C.M.

Source: Validation

IDENTIFICATION: Panel: N/A
Component Name: ERFDS
ID or Number: N/A

DESCRIPTION:

The TRIPS provide plots of various parameters to determine "safe & unsafe" regions. The parameter values must be determined from panel instrumentation. ERFDS provides the same plots via CRT displays. These displays are not referenced within the procedure and would be valuable to the ACO to confirm actual readings. Appropriate ERFDS display numbers should be referenced in the TRIPS.

RESOLUTION: (Code: A) (Priority: 2) (Sched: When PECO notifies the NRC that SPDS is operational.)

The SPDS system will be used.

TRAINING REQUIREMENTS:

Provide training to operators on SPDS displays.

PROCEDURE REQUIREMENTS:

Procedures will be revised during the first refuel outage to reference the ERFDS.

Team Approval Signature: *[Signature]*

Date: 6-24-85

() Additional page(s) attached

Revised 6/24/85.

HED ASSESSMENT

HED No. S11-03

EP = 6

TITLE: Scale Units

COMMENT: Process units not specified.

Item: N/A Ref.: SB1.4 Source: SCRS

IDENTIFICATION: Panel: 602
Component Name: Chart recorder
ID or Number: CRSH23-1R601/1R603

DESCRIPTION OF PROBLEM:

The cleanup inlet and outlet conductivity scales have no process units specified. (These recorders appear not to be installed completely.)

RESOLUTION: (Code: A) (Priority: N/A) (Sched: Fuel Load)

Process units for these recorders have been specified and will be verified.

- INFLUENT IR601 umhos
- EFFLUENT IR603 umhos

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature: *J. C. Carney*

Date: 6-10-85

Revised 6/10/85.

() Additional page(s) attached

Appendix H

Assessment of Outstanding HEDs

HED ASSESSMENT

HED No. A1-11

EP = 3

TITLE: Annunciator Tile Color Contrast

COMMENT: Low contrast between amber and white tiles (bulbs)

Item: 5.14

Ref.: C2.8
C3

Source: CRS

IDENTIFICATION: Panel: All

Component Name: Annunciator System

ID or Number: N/A

DESCRIPTION OF PROBLEM:

Alarms have been prioritized through the use of red and amber bulbs. There appears to be little contrast between the amber and white tiles when illuminated.

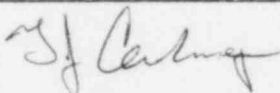
RESOLUTION: (Code: C) (Priority: 4) (Sched: N/A)

The annunciators are being relocated within their panels to enhance the distinction of red, amber, and white windows (see HED A1-02). Amber signifies cautionary alarms only. Since operators will acknowledge these alarms when they occur, and since all cautionary alarms are supported by emergency alarms which will annunciate if a cautionary alarm is ignored, the existing contrast is sufficient.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:



Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. 15-04

EP = 9

TITLE: Emergency Switch Position Markings

COMMENT: Emergency pushbutton switches have no obvious position markings for disarmed/armed position.

Item: 4.5.3

Ref.: B5.2

Source: CRS

IDENTIFICATION: Panel: Various

Component Name: Emergency pushbutton switches

ID or Number: N/A

DESCRIPTION OF PROBLEM:

Emergency pushbutton switches have a small red line on side of collars indicating position; this line is not readily apparent to the operator.

RESOLUTION: (Code: F (Priority: 4) (Sched: N/A)

The red position line is not essential to operation. These pushbutton collars are normally disarmed. They are alarmed so that when they are armed, an annunciator activates to alert the operator. No change necessary.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

J. J. Carling

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. SD3-15

EP = 9

TITLE: Control Location

COMMENT: Manual Initiation pushbutton is not located near signal lock-in control.

Item: N/A

Ref.: A3.1
TDA

Source: SCRS

IDENTIFICATION: Panel: 647,548

Component Name: Manual Initiation, Signal Lock-in

ID or Number: 464,463,(647): 426,459,(648)

DESCRIPTION OF PROBLEM:

These controls appear to be related in the initiation of HPCI and Reactor Core Isolation Cooling, but they are separated and grouped with isolation and turbine trip controls.

RESOLUTION: (Code: D) (Priority: 4) (Sched: N/A)

The panels have been enhanced to demonstrate control/display relationships. These enhancements are adequate.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

Jf Carney

Date: 6-28-85

() Additional page(s) attached

HED ASSESSMENT

HED No. SI2-04

EP = 6

TITLE: Indicator Glare

COMMENT: Glare from ambient lighting exists on higher indicators.

Item: N/A

Ref.: B2.2

Source: SCRS

IDENTIFICATION: Panel: RSP

Component Name: Linear Analog Indicators

ID or Number: See attached print.

DESCRIPTION OF PROBLEM:

See Comment above.

RESOLUTION: (Code: A) (Priority: 4) (Sched: 1st Refuel)

Permanent lighting has been installed since the time of surveying. Light covers will be installed in order to diffuse lighting and reduce glare.

TRAINING REQUIREMENTS: None.

PROCEDURE REQUIREMENTS: None.

Team Approval Signature:

SJ Carney

Date: 6-28-85

() Additional page(s) attached