SUPPLEMENT NO. 3

HUMAN FACTORS CONTROL ROOM DESIGN REVIEW

OF

COMANCHE PEAK STEAM ELECTRIC STATION

SEPTEMBER 1988

ABSTRACT

Supplement No. 3 to the Comanche Peak Steam Electric Station Human Factors Control Room Design Review provides an update of Detailed Control Room Design Review (DCRDR) program activities performed since the submittal of Supplement No. 2. All elements of the program have been completed except for the environmental surveys and the comparison of the Unit 2 control room with Unit 1 to assess design differences. Procedures have been developed to formalize the ongoing Human Factors Engineering Program.

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1.0 INTRODUCTION

1.1 Purpose

This supplement statuses the remaining activities of the Detailed Control Room Design Review (DCRDR) as defined in Supplement No. 1 of NUREG-0737 [1]. This status is provided to facilitate NRC review and acceptance of the CPSES DCRDR prior to Unit 1 licensing.*

1.2 Background

The Comanche Peak DCRDR plan encompassed the following program elements:

a. Review of the Unit 1 main control boards to assess compliance with NUREG-0700 [1a] guidelines,

b. Review of human factors related Licensee Event Reports (LERs) from other plants for potential CPSES implications,

c. Evaluation of Unit 1 human factors discrepancies and implementation of required design changes,

d. Comparison of Unit 2 main control boards to Unit 1 to assess design differences, and

e. Development and implementation of design change packages such that Unit 2 instruments and controls will be identical to the DCRDR-improved Unit 1 main control boards.

The review of the main control boards included the control room panels with which the operator normally interfaces, and the remote shutdown panels.** The review methods and procedures included data collection, analysis and review, and documentation.

*This report contains references to current versions of CPSES procedures which may be changed in the future. The report will not be updated to reflect such changes unless they are substantive and programmatic, and then, only until the later of (1) NRC staff acceptance of the CPSES Human Factors Engineering (HFE) Program or (2) incorporation in the FSAR of the HFE Program basic criteria.

The basic criteria for the activities to be performed during plant operations, i.e., the HFE Program, will be described in the CPSES FSAR. The FSAR description will be maintained in accordance with the applicable regulations and procedures. Once these criteria are incorporated in the FSAR, they will supersede the criteria for the ongoing HFE Program as described in this Supplement.

**Hereafter, for the purpose of brevity in this report, when the terms main control boards or control room panels are used, they are meant to encompass the remote shutdown panels.

Where design data did not agree with the recommended guideline criteria contained in Section 6 of NUREG-0700, a human engineering discrepancy (HED) was documented. All HEDs were reviewed for validity and safety significance. Corrective action, if required, was implemented.

The Comanche Peak Unit 1 DCRDR Report [2] identified 335 HEDs, of which 240 required corrective action; the remaining 95 did not require any corrective action.

Two supplemental reports to the Comanche Peak DCRDR [3,4] revised 54 of the HEDs submitted in the original DCRDR and added 19 new HEDs, increasing the total to 354 HEDs of which 265 required corrective action. The two supplements to the Comanche Peak DCRDR also reported a schedule for completing the corrective actions for the remaining open HEDs.

Based on a review of these documents, the NRC conducted an on-site audit of the Comanche Peak Unit 1 DCRDR during July and August, 1984. The results of this audit are documented in an NRC letter to Texas Utilities dated August 27, 1984 [5] and in Safety Evaluation Report Supplement No. 6 (SSER-6) [6].

In summary, SSER-6 identified the following activities that remained to be completed for the Comanche Peak Unit 1 full DCRDR:

- Provide a status of HEDs requiring pre-licensing corrections, environmental surveys, and additional assessment,
- Provide a comparison of the task analysis results with the control room inventory,
- Provide verification that the design improvements accomplish the necessary corrections and do not introduce any new HEDs, and
- Provide a description of the ongoing Human Factors Engineering (HFE) Program.

Each of the above activities is addressed in the sections that follow. In addition, a section is included which addresses the new HEDs identified by the ongoing HFE program.

2.0 STATUS OF HEDs

Appendix 22-A of SSER-6 listed 3 categories of HEDs requiring corrective action. The 3 categories are statused in the sections that follow.

2.1 Category 1 HEDs Requiring Pre-Licensing Corrective Action

The following HEDs in Category 1 have been closed and verified by the NRC Resident Inspector, as reported in Inspection Report 445/84-45 dated March 21, 1985 [7]:

Control No.	Brief Description
3	Visual Annunciator Priority
58	Procedure Storage
80	J-Handle Pointers
93	Control Discrimination
106	Missing Labels
120	Missing Sound Powered Phone Jacks
122	Incomplete Hierarchical Labeling on HSP
130	Unlabeled Switch Position
214	Direction of Motion Convention
225	Unlabeled Locking Position
226	Set Point Knob Covers Removable
267	Recorder Frosted Glass
321	Annunciator Character Size
345	P-2500 Computer Abbreviations Inconsistent

Inspection Report 445/85-08, dated September 18, 1985 [8], reported the following Category 1 HEDs closed and verified by the NRC Resident Inspector:

Control No.	Brief Description
181	Power Scale Missing
184	Counter Value Conversion Factor

The remaining Category 1 HED, i.e., control number 88, Matching Recorder Chart Paper and Scales, has been closed recently and verified by the NRC Resident Inspector.

2.2 Category 2 HEDs Requiring Environmental Surveys

The environmental surveys are scheduled to be performed and the results evaluated during the preoperational testing phase of the Unit 1 Startup Program. Since the original DCRDR survey, major changes have been made to the control room lighting and ceiling The environmental surveys will be performed when all control room construction and modifications, including carpet installation in the main control board area, are complete.

Since the environmental conditions will be different, it is expected that the lighting and ceiling modifications and the addition of carpeting will invalidate the open Category 2 HEDs. The surveys will be performed and new HEDs will be generated as necessary to reflect as-built conditions. Any new HEDs that are generated will be assessed and resolved as part of the ongoing HFE program.

All of the HEDs in Category 2, as enumerated below, will be evaluated in conjunction with the new surveys:

Control No.	Brief Description
42	Glare on Meters
59	Noise Masks Communications
154	Glare on Recorder Glass
170	Glare on Controllers and Counters
308	Ambient Noise Masks Audible Alarms
310	Alarm Level Above Noise Not Evaluated
311	Alarm Level Not Evaluated
346	Noise Level Disturbs Voice Communications
347	Page Phone Audio Level Masks Alarms
348	Illumination Level Excessive
349	SRO Desk Illumination Inadequate
352	Emergency Lighting Level Inadequate
353	HVAC Comfort Zone Not Maintained

2.3 Status of Category 3 HEDs Requiring Design Improvements and Assessment

The following five Category 3 HEDs have been assessed and the required design changes have been made as part of the ongoing human factors engineering program. HED 354 will be evaluated further.

Control No.	Brief Description
151	Color Coding of Hand Switch Lights
183	Color Coding of Controller Lights
200	Controller Meter Scales
342	HFE Improvements Not Complete on Support Panels
354	Remote Shutdown Area Temperature High

See Appendix A for status details for these Category 3 HEDs. There are no other HEDs in Category 3.

2.4 Safety-Significant HEDs

An independent human factors specialist conducted a control room "walk-talk through" verification to determine if any safety significant HEDs remained or were generated by any of the corrective actions. The results of this verification process revealed that there were no safety significant HEDs, either from the DCRDR or the ongoing HFE Program, which required additional corrective action. This verification was accomplished in conjunction with the Unit 2 survey (see section 6.7.3).

3.0 HEDs IDENTIFIED SUBSEQUENT TO DCRDR SURVEY

The following list of HEDs was identified subsequent to the DCRDR survey reported earlier [2].

Description - Indicator Pointers

It was observed that the black vertical indicator pointers had limited visibility when at the maximum limit of travel at the top or bottom of the scale. Orange pointers were considered to improve visibility.

Resolution:

The existing pointers were evaluated as adequate and in agreement with NUREG-0700. The benefit/cost analysis showed only marginal improvement if replaced. If these meters are replaced for other reasons during the life of the plant, orange pointers may be installed.

Description - Feedwater Bypass Valve Control Switch

The handswitches on CB-09, 1-HS-2162, 2163, 2164, and 2165 were labeled "FW BYP CTRL VLV". These switches also close the main feedwater control valves.

Resolution:

The tags and hierarchical labels were changed to reflect the scope of control of the switches. New nomenclature shows "FW BYP & CTRL VLV".

Description - Unit Designators

The alphanumerics of the nomenclature for the secondary side include a number for the Unit designator. This is not consistent with the remaining control board labels and applied conventions.

Resolution:

The Unit designator numbers have been removed from the labeling and annunciator panels for the secondary side.

Description - Ventilation Chilled Water Alarms

Common alarms are located on Unit 1 and 2 alarm panels 1-ALB-11A and 2-ALB-12A, respectively. These alarms should be on X-ALB-11C since they are common to both Units.

Resolution:

Design Modification Requests-Construction Phase (DMRCs) 87-1-103 and 87-X-104 were issued for relocation of alarms.

Description - Auxiliary Feedwater Isolation Valve (AFWIV) Control Switches

One removable handle was provided for the AFWIV handswitches. This removable handle did not have the valve code symbol utilized for J-handle type switches.

Resolution:

The appropriate valve code symbol has been provided for the removable handle. DMRC 87-1-105 has been issued for installation of fixed handle modules.

Description - Ventilation Panel Layout

The cumulative effects of design modifications which deleted numerous controls made it difficult to perform routine tasks and time sensitive emergency tasks in an efficient manner.

Resolution:

Panels X-CV-01 and X-CV-03 have been substantially rearranged into functional groups with displays and controls located in a systematic manner. This was accomplished by DMRC 87-X-165.

4.0 TASK ANALYSIS AND COMPARISON OF RESULTS WITH CONTROL ROOM INVENTORY

The function and task analysis assures that operator tasks for emergency operations have been identified and that instruments and controls required to perform those tasks are available to the control room operator. This analysis was performed on the Comanche Peak Emergency Response Guidelines (ERGs) in accordance with Operations Procedure No. ODA-204, Revision 4, "Preparation of Emergency Response Guidelines."

The Comanche Peak ERGs were derived from the Generic Technical Guidelines developed by the Westinghouse Owners Group (WOG). These Guidelines included a step-by-step sequence of functions to be performed on a reference plant in response to different events. The sequence included instrument and control requirements for performance of these functions. The WOG Background Documentation explained why each step was necessary and what was required to perform each step.

In performing the Comanche Peak ERG update, the plant design was compared to the reference plant of the Generic Technical Guidelines to identify and justify design differences that would need to be taken into account when writing the Comanche Peak ERGs based on the Generic Guidelines. These differences and the corresponding justifications were documented in the Generic Plant Comparison which is available on site.

An ERG Data Package was developed for each ERG to identify the plant specific data and information incorporated into the ERG. Procedural differences between the Generic Technical Guidelines and the ERGs were identified and the reasons for the differences were documented in the ERG Data Packages.

Using the Generic Technical Guidelines, WOG Background Documentation, and ERG Data Packages, a function and task analysis was performed on each ERG to ensure that the Generic Technical Guidelines were adequately translated into plant specific ERGs. Each step of the ERG was checked using a Task Analysis Worksheet.

The Task Analysis Worksheets were divided into two specific areas, i.e., instrumentation needs and control needs. These needs were verified by comparison to the available control room inventory. This verification was accomplished by performing walk-throughs with each ERG. During the walk-throughs, the following information was obtained from the existing control room inventory (at that point in time, the control boards already had been modified by the DCRDR HED corrective actions):

For each required instrument,

- ID number
- Units
- Scale range
- Scale range increments
- Tolerance
- Qualifications (e.g., post-accident)

For each required control,

- ID number
- Control positions available to the operator
- Control indications available to the operator

Utilizing this information, the instruments and controls located on the main control boards were reviewed to determine if they met the required features as specified in the WOG Background Documentation and ERG Data Packages. The following criteria were used in making this determination:

a. Could the indicator display the required parameter indication?

b. Could the indication be read without excessive estimation between increment markings?

c. Could the indicator meet all of the specific requirements listed in the WOG Background Documentation?

d. Can the control perform the required function (e.g., open, close, throttle)?

If the above criteria were not met, then the reviewing engineer would determine if a design modification should be initiated or whether an alternate instrument and/or control replacement could be used.

Each indication and control used in the Comanche Peak ERGs has been subjected to the above function and task analysis process. All revisions to the ERGs undergo the same evaluation process. An example of the above process has been submitted to the NRC for review [9]. Complete documentation is available on site.

Operations Procedure No. ODA-204 also required verification that, after implementation of the DCRDR-related design changes, the ERGs could be followed by the operators on the control boards without confusion, delays or errors. Checklists were provided for the verification of the controls, equipment, indications, designations, units and component operation, as identified in each ERG. The verification was accomplished by operators and operations engineers utilizing simulator exercises, control room walk-through/talk-throughs or desk top reviews, as applicable.

5.0 VERIFICATION OF DESIGN IMPROVEMENTS

The NRC audit performed during July 30 - August 3, 1984 [5] identified concerns which were also documented in SSER-6 [6]. These concerns related, in part, to the ongoing human factors review and continuation of the DCRDR program during plant operation. The verification process, which assures that design improvements provide the necessary corrections and do not introduce new HEDs, was stated to be an informal process at the time of the audit. The NRC found the informal program acceptable but indicated it should be proceduralized to assure that documentation and program requirements were met. In response, TU Electric developed and issued ODA-109, "Human Engineering Review".

ODA-109 also proceduralizes the process used to review design modifications for human factors principles as well as to review concerns and recommendations provided by Operations and other departments. Design Modifications (DMs) are reviewed to assure consistency between existing documentation and the control board layout in order to identify areas which may affect the DCRDR design or NUREG-0700 guidelines. Any deviation from these guidelines requires a HED to be written, evaluated, and resolved.

Logbooks are used to document concerns and recommendations from the Operations, Training, Simulator, and Engineering organizations. These logbooks assign a particular number to each entry. Each entry provides details and documentation to establish a basis for each concern and review. Each entry is tracked on a status list until closure. ODA-109 also provides the forms to be used in documenting the DM/HED Post-Resolution Surveys and Routine Surveys. These surveys are performed in situations which require additional verification data. The surveys can address specific areas or more general topics within Operations.

Examples of the areas of concern for which operators have supplied input include:

- Engraved label changes
- Escutcheon changes
- Mimic changes
- Power supply tag changes
- Annunciator working changes
- Operator aids
- Operations terminology changes
- Programmatic improvement recommendations

The operators are trained, through the operator training programs, in human factors engineering principles as they apply to Comanche Peak.

6.0 DETAILS OF ONGOING HUMAN FACTORS ENGINEERING PROGRAM

The objective of the program is to define and implement a plan of action that will apply human factors principles to maintain and improve the control room design and enhance operator effectiveness throughout the life of the plant. The elements of the DCRDR and NUREG-0700 guidelines are basic to the program, as outlined below.

6.1 Concern Identification

At the present time, Operations Engineering evaluates control room concerns reported by the operators and reviews design modifications to the control boards. Nuclear Engineering and Operations Procedure NEO 5.13, "Human Factors Engineering Program", is in the final review process and will provide a more comprehensive program for identifying human factors concerns from the simulator, control room, and design process. Operators, simulator instructors, and engineers are encouraged to report characteristics of the control room instrumentation, procedures, and physical layouts that may improve the control room interface with the operators.

6.2 Assessment

Procedure NEO 5.13 directs Comanche Peak Engineering (CPE) to administer a multidiscipline team for the assessment of the reported HFE concerns. The following factors are evaluated in the assessment process for all concerns before selection of the design improvements for those which require corrective action:

- Safety significance
- History of associated error
- Potential for error
- Likelihood of recovery from error
- Consequence of error
- Technical Specification impact
- Operator performance
- Interactions/cumulative effects
- Economics

6.3 Function and Task Analysis

Procedure NEO 5.13, requires the multidiscipline team to review design changes to determine if a function and task analysis would be beneficial. A function and task analysis will be performed for modifications which affect emergency operating procedures to assure that information and control requirements are satisfied as described in section 4.0 of this Supplement.

6.4 Implementation and Verification

Priorities for the improvements will be proposed to management by the HFE multidiscipline team. Enhancements such as paint, labels, and tape improvements will be implemented expeditiously in the simulator and control room. Feedback from use of the simulator and from the control room operators will supplement the results of surveys performed by the team to verify that design modifications provide the necessary corrections and do not introduce new HEDs.

6.5 Design

In accordance with procedure ECE 5.09-01, "Design Verification and Interdiscipline Review," design changes that affect the electrical operation, mechanical layout or environment of the main control boards are reviewed by the Human Factors Engineer. The Human Factors Engineer assures that the conceptual layout, labels, scales, coding, display and control selection conform to accepted human factors principles.

Qualification requirements for the position of Human Factors Engineer will be developed after review of Section 2.1.2.1 of Appendix A to Standard Review Plan 18.1 [10], and will be available on site.

6.6 Documentation

6.6.1 Guidelines

Technical procedure EEE 5.01-11, "Human Factors Engineering Guidelines," provides conceptual and detailed design criteria for modifications to assure that main control board changes are consistent with the human factors principles established by the DCRDR.

6.6.2 Drawings

At the present time, Computer Aided Design (CAD) detail drawings are being developed to show "as-built" hierarchical labeling, demarcation, mimic, layout, coding and instrument types. These detailed drawings will aid in the verification of improvements, design concepts, training, simulation, and configuration management.

6.6.3 Labels

The controlled listing, ECE-E1-2975, "Unit 1 Main Control Board Engraving List," identifies component labels, nameplates and electrical bus tags for main control board devices. This document aids in assuring the consistent use of acronyms and abbreviations in procedures, controls, displays, and alarms. The unique designation of Regulatory Guide 1.97, Rev. 2 instrumentation is also identified.

6.6.4 Standards

Attachment 8.B of Procedure No. ODA-207, "The Dictionary of Abbreviations and Acronyms," will be maintained and updated, as applicable, for use in the preparation of procedures, labels and annunciators.

6.7 Ongoing HFE Activities

6.7.1 Safety Parameter Display System (SPDS) Survey

The SPDS was installed in the control room subsequent to the original DCRDR. As part of the ongoing HFE Program, a review of the SPDS was performed.

A checklist developed from review of Section 18.2 of NUREG-0800 [11], as well as from NUREG-0835 [12], and NUREG-0700 was used by an independent human factors specialist to survey the human factors suitability of the SPDS for Comanche Peak Unit 1. A total of 30 human engineering concerns (HECs) were identified and documented.

These HECs were reviewed and assessed by a HFE multidiscipline team comprised of a Human Factors Engineer, Operations Engineer, Computer Systems Engineer, and Training Specialist. HECs that were assessed to have a safety, operational or technical impact on plant performance were classified as human engineering discrepancies (HEDs) and incorporated into design changes for implementation. Verification will be accomplished as part of the ongoing HFE program.

Documented results of this survey are available on site.

6.7.2 Control Room Work Center Review

A human factors review of the Comanche Peak Units 1 and 2 control room work center mock-up was conducted during the week of January 18, 1988 by an independent human factors specialist. The objective of the review was to evaluate the work center for the following:

- o General layout
- o Anthropometric dimensions
- o Document organization and accessibility
- o Traffic flow

The resulting eight recommendations were incorporated into the final design to improve the control room interface with the operators.

Documented results of this survey are available on site.

6.7.3 Unit 2 Control Room Survey

The original DCRDR identified the methodology for conducting the Unit 2 DCRDR as:

> "Compare Unit 2 with Unit 1 to assess the design differences".

In conjunction with performing this comparison, a survey of Unit 2 was conducted by an independent human factors specialist. The purpose of this survey was to identify any HEDs that developed either as a result of implementing improvements or from the experience gained by operators on watch or while undergoing simulator training.

All 265 HEDs which required corrective action in Unit 1 were surveyed in Unit 2. A total of 153 of these HEDs have been corrected in Unit 2 as of the date of preparation of this Supplement; the remaining 112 HEDs require additional corrective action. By combining HEDs of similar nature, the number of HEDs in Unit 2 which require corrective action to resolve design differences has been reduced to 38.

In addicion, based on a series of unstructured operator interviews, 19 new HEDs were identified. These 19 HEDs will be reviewed and assessed on the basis of safety significance, as well as operational and technical impact on plant performance. Any of these new Unit 2 HEDs that also apply to Unit 1 will be documented and required improvements will be implemented as part of the ongoing Unit 1 HFE program.

The results of this survey have been documented and are available on site.

LIST OF REFERENCES

1. D.G. Eisenhut (NRC), "Supplement 1 to NUREG-0737 Requirements for Emergency Response Capability," Generic Letter 82-33, dated December 17, 1982.

1a. US NRC, "Guidelines for Control Room Design Reviews," NUREG-0700, dated September, 1981.

2. R.J. Gary, "Transmittal of the Human Factors Control Room Design Review Final Report of Comanche Peak Steam Electric Station," letter (TXX-3588) dated December 15, 1982.

3. R.J. Gary, "Transmittal of Supplement 1 to the Human Factors Control Room Design Review Final Report," letter (TXX-4129) dated March 8, 1984.

4. H.C. Schmidt, "Transmittal of Supplement 2 to the Human Factors Control Room Design Review Final Report," letter (TXX-4207) dated June 24, 1984.

5. B.J. Youngblood (NRC), "Results of NRC Staff Pre-Licensing Audit of Control Room Design for Comanche Peak Steam Station Electric Station (Units 1 and 2)," letter to M.D. Spence, dated August 27, 1984.

6. US NRC, "Safety Evaluation Report related to the operation of Comanche Peak Steam Electric Station, Units 1 and 2," NUREG-0737, Supplement No. 6, dated November, 1984.

7. D.R. Hunter (NRC), Inspection Report 445/84-45, dated March 21, 1985.

8. R.P. Denise (NRC), Inspection Report 445/85-08, dated September 18, 1985.

9. W.G. Counsil, "TMI Action Items I.C.1 and I.D.1, Emergency Response Guideline Task Analysis," letter (TXX-4641) dated December 16, 1985.

10. US NRC, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," NUREG-0800, dated July, 1981; Appendix A to SRP 18.1, dated September, 1984.

11. US NRC, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," NUREG-0800, dated July, 1981; SRP 18.2, dated November, 1984.

12. US NRC, "Human Factors Acceptance Criteria for Safety Parameter Display System," NUREG-0835, dated October, 1981.

APPENDIX A

STATUS OF CATEGORY 3

HUMAN ENGINEERING DISCREPANCIES

HED CONTROL NO. 151

A. HED DESCRIPTION

Control switch indicating lights, for controls with three indicating lights, are not labeled.

B. GUIDELINE REFERENCE

NUREG-0700: 6.6.1.1.

C. LOCATION

CB-01

D. POTENTIAL SAFETY CONSEQUENCES

1. Loss of instrument air.

2. Unit shutdown.

E. ASSESSMENT PROCESS

1. The functional meaning of indicator lights was determined.

2. Potential for error.

F. BACKFIT

None.

JUSTIFICATION:

1. Control switch indicating lights, for control with three indicating lights, conform to the following standard convention used throughout the main control boards:

   Red: pump running, breaker closed
   Green: pump stopped, breaker open
   Amber: mismatch
   White: trip

   This standard is well known to the operators, thus making labeling unnecessary.

2. CONSISTENT DESIGN

   Standard color coding guidelines are contained in CPE Technical Procedure EEE 5.01-11.

HED CONTROL NO. 183

A. HED DESCRIPTION

The color coding of pushbuttons on the miniature turbine control panel and on the process controllers is indiscriminant.

B. GUIDELINE REFERENCE

NUREG-0700: 6.4.2.2.f.

C. LOCATION

CB-01, CB-04, CB-05, CB-06, CB-08, CB-09, CB-10, CV-01, and CV-03.

D. POTENTIAL SAFETY CONSEQUENCES

1. Delay in identification of proper control function.

2. Incorrect control function.

E. ASSESSMENT PROCESS

The applicability of various types of visual enhancements was evaluated.

F. BACKFIT

1. Process controller pushbuttons have been color coded:

   Amber: Manual
   White: Auto
   Red: Increase Output
   Green: Decrease Output

2. This serves to reduce the number of distracting red indications that are not warnings.

3. The pushbutton color coding on the unique miniature turbine control panel is clear and unambiguous.

A. HED DESCRIPTION

Absence of engineering units on process controller meter labels.

B. GUIDELINE REFERENCE

NUREG-0700: 6.5.1.1.b.

C. LOCATION

CB-09 and CB-10.

D. POTENTIAL SAFETY CONSEQUENCES

None.

E. ASSESSMENT PROCESS

1. Analyze feasibility of providing engineering units.

2. Analyze backfit alternatives.

F. BACKFIT

None.

JUSTIFICATION:

Process controllers do not utilize quantitative units on output meter scales. The output meter indications have no direct correlation to their process parameters. The display indicator for each process loop is calibrated in suitable engineering units. The output meter scales indicate 0-100% of controller output. All process controllers have corresponding display indicators with engineering units for process feedback. No additional labels are needed.

HED CONTROL NO. 342

A. HED DESCRIPTION

Human factors improvements have not been made to the NIS Panel, the Meteorological Panel, the In Core Instrumentation Panel, or Recorder Panel.

B. GUIDELINE REFERENCE

NUREG-0700: 6.1.2.5.

C. LOCATION

NIS Panel, Meteorological Panel, In Core Instrumentation Panel, Recorder Panel.

D. POTENTIAL SAFETY CONSEQUENCES

1. Inability to operate controls.

2. Failure to read displays properly.

3. Failure to locate components.

E. ASSESSMENT PROCESS

Determine operator interface requirements at these panels.

F. BACKFIT

None, other than enhancements.

JUSTIFICATION:

Generic enhancements such as labeling, coding and demarcation have been implemented for the recorder and meteorological panels. Only minor HFE changes were made on the NIS and In Core Instrumentation Panels due to the very limited operator interfaces. Major design changes are being made to the meteorological panel and will be reviewed for HFE concerns by the Human Factors Engineer during the normal design process. In light of both the previous and ongoing activities, no additional major HFE backfit is needed.

HED CONTROL NO. 354

A. HED DESCRIPTION

The effective temperature at the Hot Shutdown Panel (HSP) was not maintained within the comfort range.

B. GUIDELINE REFERENCE

NUREG-0700: 6.1.5.1.a

C. LOCATION

Hot Shutdown Panel

D. POTENTIAL SAFETY CONSEQUENCES

Operator Stress.

E. ASSESSMENT PROCESS

Environmental survey

F. BACKFIT

None

JUSTIFICATION:

1. The Hot Shutdown Panel is an emergency operating station which is not normally manned. As such, it is not necessary to maintain the environment of the Hot Shutdown Panel within the comfort zone required for the control room. Testing performed thus far indicates that the ambient temperature should be maintained at a level that will allow the operator to adequately perform his remote shutdown tasks.

2. No new surveys have been made. Additional monitoring of the Hot Shutdown Panel environmental area will be performed under operating conditions and evaluated at that time.