

HUMAN FACTORS ENGINEERING BRANCH
CONTROL ROOM DESIGN REVIEW
SAFETY EVALUATION REPORT, SUPPLEMENT NO. 5
FOR
COMANCHE PEAK STEAM ELECTRIC STATION

BACKGROUND

Human factors engineering in nuclear power plants is addressed by Chapter 18 of the NRC's "Standard Review Plan" (NUREG-0800, July 1981). Evaluation of the control room design review at Comanche Peak Steam Electric Station (CPSES), Unit 1 has been consistent with Sections 18.4 and 18.5 of that chapter. The Section 18.5 review was limited to the remote shutdown and transfer panels.

Results of the staff evaluation, through November 1983, were provided in Supplement 4 to the Safety Evaluation Report (SER). Subsequent to issuance of SER Supplement 4, Texas Utilities Generating Company (TUGCO) submitted Supplements 1 and 2 to its "Human Factors Control Room Design Review of Comanche Peak Steam Electric Station," report. Based on staff review of those documents, an audit of the CPSES control room design review for Unit 1 was conducted from July 30 through August 3, 1984. The purpose of the audit was to obtain information about the CPSES detailed control room design review (DCRDR) and to determine whether human engineering discrepancies (HEDs) identified by the review had been acceptably corrected. Results of the audit were provided in a report forwarded to the Division of Licensing on

August 23, 1984 for transmittal to TUGCO. Per agreement with the staff, TUGCO provided a letter report updating the status of HED corrections on August 24, 1984. The indication that several HEDs were closed was confirmed in an August 29, 1984 telephone conversation with the NRC's Senior Resident Inspector for CPSES (to be documented in Inspection Report 84-31). The current SER Supplement is based on the events described above and updates the staff evaluation provided in SER Supplement 4.

DISCUSSION

The implementation status of corrective actions for all HEDs which remained after the staff's April 1983 audit was audited during July and August 1984. Approximately 90 percent of the HEDs identified in the CPSES Unit 1 control room and at the remote shutdown and transfer panels are acceptably corrected and have been closed by the staff reviewer or NRC's Senior Resident Inspector. HEDs which remain require one of the following actions:

1. Implementation of correction and NRC audit prior to licensing or, if covered by a license condition, prior to exceeding 5 percent power
2. Post-licensing submission of environmental surveys
3. Post-licensing assessment and selection of design improvement as part of the ongoing DCRDR

The NRC's Senior Resident Inspector has been requested and has agreed to assist in confirming correction of those HEDs which must be corrected before licensing (documentation will be by Inspection Report). TUGCO has agreed to coordinate an audit of those corrections with the Senior Resident Inspector. A list which identifies HEDs to be corrected prior to licensing as well as the actions required to close those HEDs is attached. The attached list also identifies those HEDs which require post-licensing environmental surveys or have been deferred until the DCRDR.

DCRDR Program Plan information in TUGCO's "Human Factors Control Room Design Review of Comanche Peak Steam Electric Station" report and Supplement 1 to that report was reviewed against the DCRDR requirements of Supplement 1 to NUREG-0737. Staff concerns were identified in a status report forwarded to TUGCO. Several of those concerns were resolved during the July 30 through August 3, 1984 audit. Concerns which have not been completely resolved are discussed below.

Two essential elements of the DCRDR requirement in Supplement 1 to NUREG-0737 are:

1. Function and task analyses to identify control room operator tasks and information and control requirements during emergency operations

2. A comparison of display and control requirements with a control room inventory

TUGCO is currently addressing those elements as part of the upgrade of CPSES emergency operating procedures (EOPs). With respect to the DCRDR, the actions necessary to satisfy requirements in Supplement 1 to NUREG-C737 were described in the staff's report on the July 30 through August 3, 1984 audit. The function and task analyses and comparison of display and control requirements with a control room inventory are part of the full DCRDR but are not expected nor required to be completed prior to licensing.

Two other essential elements of the DCRDR are:

1. Verification that selected design improvements will provide the necessary correction
2. Verification that improvements will not introduce new HEDs

The staff typically expects formal verification processes involving engineers, operators, and human factors specialists. Techniques might include partial re-surveys, walkthrough/talkthroughs on improved panels, environmental surveys, and operator interviews. Discussions during the July 30 through August 3, 1984 audit indicated that formal verification processes were not a part of the CPSES DCRDR. TUGCO did state that an informal process of verification had occurred. The staff's report on the

July 30 through August 3, 1984 audit indicated the need for TUGCO to document that process for staff review of the full DCRDR.

CONCLUSION

Based on its current evaluation, the staff expects that CPSES Unit 1 will be licensed on the basis of a control room preliminary design assessment rather than on the full DCRDR. Pre- and post-licensing actions related to specific HEDs are summarized in the preceding discussion and detailed in an attachment. A license condition, to be satisfied prior to CPSES Unit 1 exceeding 5 percent power, is recommended for HEDs the applicant has committed to correct prior to licensing but which are not corrected by that date. Delaying correction of those HEDs until that date should not adversely affect plant safety. A report, providing the results of the post-licensing environmental surveys, should also be covered by that license condition.

A supplement to TUGCO's "Human Factors Control Room Design Review of Comanche Peak Steam Electric Station" report should be provided to complete the Unit 1 DCRDR. That report should address:

1. HEDs deferred to the DCRDR (identified in the attachment)
2. HEDs identified in the post-licensing environmental surveys
3. Comparison of task analysis results with a control room inventory

4. Verification that selected design improvements will provide necessary corrections and not introduce new HEDs

An additional supplement should be provided at the completion of the CPSES Unit 2 DCRDR. That supplement should specifically address results associated with any differences between the CPSES Unit 1 and 2 control rooms and remote shutdown panels. Both supplements should provide as appropriate:

1. An outline of proposed control room changes
2. An outline of proposed schedules for implementation
3. Summary justification for HEDs with safety significance to be left uncorrected or partially corrected

Dates for submission of the supplements to the "Human Factors Control Room Design Review of Comanche Peak Steam Electric Station" report should be negotiated with the NRC Project Manager. A license condition documenting the negotiated date for the supplement completing the Unit 1 DCRDR is recommended. The supplement indicating completion of the Unit 2 DCRDR should be provided at least six months prior to expected licensing of that unit.

REFERENCES

NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1980; Supplement 1, December 1982.

NUREG-0797, "Safety Evaluation Report Related to the Operation of Comanche Peak Steam Electric Station, Units 1 and 2," July 1981.

NUREG-0797, Supplement No. 4, "Safety Evaluation Report Related to the Operation of Comanche Peak Steam Electric Station, Units 1 and 2," November 1983.

Letter from R. J. Gary (TUGCO) to H. R. Denton (NRC); subject, "Transmittal of the Human Factors Control Room Design Review Final Report," December 15, 1982.

Letter from R. J. Gary to Director of Nuclear Reactor Regulation, subject, "Transmittal of Supplement 1 to Human Factors Control Room Design Review Final Report," March 8, 1984.

Letter from H. C. Schmidt to Director of Nuclear Reactor Regulation, subject, "Transmittal of Supplement 2 to Human Factors Control Room Design Review Final Report," June 29, 1984.

Memorandum from V. A. Moore (HFEB) to B. J. Youngblood (LB1), subject, "Results of the Pre-Licensing Audit of the Comanche Peak Steam Electric Station Control Room Design Review," August 23, 1984.

Letter from H. C. Schmidt to Nuclear Reactor Regulation, subject, "Response to Human Factors Control Room Design Review Implementation Audit," August 24, 1984.

COMANCHE PEAK STEAM ELECTRIC STATION
OPEN HUMAN ENGINEERING DISCREPANCIES (HEDs)
AS OF AUGUST 31, 1984

A. Summary

1. Control numbers (from Texas Utilities Generating Company's "Human Factors Control Room Design Review of Comanche Peak Steam Electric Station" report and supplements 1 and 2) of HEDs which require correction and NRC audit prior to licensing

3	106	184	321
68	120	214	345
80	122	225	
88	130	226	
93	181	267	

2. Control numbers of HEDs which will be addressed by post-licensing submission of environmental surveys

42	310	349
59	311	352
154	346	353
170	347	
308	348	

3. Control numbers of HEDs which require post-licensing assessment and selection of design improvements as part of the ongoing DCRDR

151	342
183	354
200	

B. PRE-LICENSING ACTIONS

1. Introduction

2. Workspace

68. HED DESCRIPTION

No storage space has been allocated for essential material.

ACTION

Confirmatory after installation of portable storage unit and storage of equipment at the remote shutdown panel

122. HED DESCRIPTION

The Hot Shutdown Panel is in the process of complete redesign.

ACTION

Confirmatory on completion of hierarchical labeling at Hot Shutdown Panel and Transfer Panels, labeling of light box, proper paper in recorders, and sound powered headsets at Hot Shutdown Panel (68 above) and Transfer Panel.

3. Communications

120. HED DESCRIPTION

Sound powered jack communications are incomplete.

ACTION

Confirmatory on storage of sound powered headset at the Hot Shutdown Panel (68 above).

4. Annunciators

3. HED DESCRIPTION

Annunciator alarms are not visually prioritized.

ACTION

Confirmatory on completion of annunciator prioritization.

321. HED DESCRIPTION

Annunciator character sizes are inconsistent.

ACTION

Confirmatory on re-engraving of annunciator tiles

1-ALB-2:	3.7
1-ALB-3B:	2.6
1-ALB-4A:	4.4
1-ALB-4B:	1.5, 2.6, 3.6
1-ALB-5B:	2.1, 3.4
1-ALB-5C:	3.1, 4.2
1-ALB-6C:	1.2, 1.3, 2.1, 2.2, 2.7, 3.2, 3.3, 3.7, 4.2

1-ALB-6D: 1.4, 1.10, 1.14, 2.4, 2.13, 2.14, 3.13,
3.14, 4.13
1-ALB-8: 1.14, 2.13, 2.14, 3.14, 4.14
1-ALB-9: 1.4, 1.8, 1.11, 5.12, 7.6

5. Controls

93. HED DESCRIPTION

No control coding is currently being used for:

- a. Mechanical valves, pumps, breakers, motors, etc.
- b. Throttle valves
- c. Emergency or critical controls.

ACTION

Confirmatory on installation of "T" handles on transfer switches at HSP (14 handles)

214. HED DESCRIPTION

A rotary control with clockwise-counter clockwise movement is used to control a "lower" and "raise" function.

ACTION

Confirmatory on permanent escutcheon plates on CB-11 (90-1EG2 and 65-1EG2)

226. HED DESCRIPTION

Setpoint knob covers on process controllers can be easily removed.

ACTION

Confirmatory on more secure attachment of setpoint knob covers on controllers.

6. Visual Displays

80. HED DESCRIPTION

Pointers on J-handle/Star-handle switches contrast poorly with handle color.

ACTION

Confirmatory on "J" handle/star handle pointers being painted white.

88. HED DESCRIPTION

Trend recorder scale differs from chart paper scale.

ACTION

Confirmatory on recorders having paper matching recorder scales (all recorders should have paper).

181. HED DESCRIPTION

The Nuclear Instrumentation System recorder lacks a scale for differential power.

ACTION

Confirmatory on addition of Δ flux scale.

184. HED DESCRIPTION

Counters require calculations by operator when displayed values run past 60 minutes. Other counters require the operator to convert displayed values by multiplication factors other than multiples of ten.

ACTION

Confirmatory on full scale counters replacing .5 scale counters on CPS-01.

267. HED DESCRIPTION

Trend recorders use frosted glass.

ACTION

Confirmatory on replacement of frosted glass on recorders on CB-10.

7. Labels and Location Aids

106. HED DESCRIPTION

Labels are missing.

ACTION

Confirmatory on labels on recorders on CV-04, incore panel, and for lights on CV-03.

130. HED DESCRIPTION

Controls have unlabeled switch positions.

ACTION

Confirmatory on new escutcheon plates for 1-HS-2491 through 1-HS-2494 on CB-09.

225. HED DESCRIPTION

The locking position or function of the vernier controllers is not clearly indicated.

ACTION

Confirmatory on "LOCK" position labels on Hagan controllers.

8. Process Computers

345. HED DESCRIPTION

Abbreviations in computer displays do not conform to those in the Comanche Peak Steam Electric Station "Dictionary of Acronyms and Abbreviations."

ACTION

Confirmatory on revision of point descriptions in P2500 to use CPSES abbreviations.

9. Panel Layout

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10. Control/Display Integration

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