

SUPPLEMENT NO. 5  
HUMAN FACTORS CONTROL ROOM DESIGN REVIEW  
OF  
COMANCHE PEAK STEAM ELECTRIC STATION  
SEPTEMBER 1, 1992

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## 1.0 INTRODUCTION

A comprehensive review has been accomplished utilizing detailed color photographs of Unit 1 Main Control Boards as the basis for comparison. These photographs show the configuration of Unit 1 after the first refueling outage and were compared component by component to the current Unit 1 detail Computer Aided Design (CAD) control board layout drawings. These drawings show all surface enhancements such as labels, mimic, demarcation, legends, and component layout. The Unit 1 drawings were then compared to Unit 2 drawings with emphasis on the Human Engineering attributes outlined in the original Unit 1 DCRDR. These NUREG-0700 attributes have been captured as CPSES specific by Technical Procedure, EEE 5.13, "Human Factors Engineering Guidelines". Consistency between units was further maintained by having engineering personnel who had worked on the original Unit 1 DCRDR conduct the Unit 2 DCRDR.

The Unit 2 drawings were reviewed and compared component by component to the Unit 2 control boards to identify all unit differences, discrepancies, and work remaining. This comprehensive information was then recorded in a PC database for tracking and reporting.

Some definitive information must be established to clarify what is classified as a unit difference. The following are not considered design unit differences:

- o All common controls and indicators are installed solely in the Unit 1 control boards; e.g., boric acid storage tank level indicators are not installed in Unit 2. The annunciators for these common tanks are repeated in Unit 2 as are all alarms for common equipment.
- o Design Modifications - This category of differences is very dynamic and changes day-to-day during the Unit 2 construction phase. Unit 2 has been the lead unit for many design changes and Unit 1 for others; e.g., all Hagan recorders (28 units) have been replaced in Unit 2, and the balance of 23 units is scheduled to be installed in Unit 1. Another major change of this nature is the new Plant Process Computer System which is being installed in Unit 2. This system integrates the Westinghouse P2500 computer and Emergency Response Facilities (ERF) functions and other minor computer systems. The features of the ERF system retain the Safety Parameter Display System (SPDS) displays and format. The 19-inch monitor in the control board has been replaced with a 25-inch monitor and is controlled by a new board mounted touchpad. All these changes have been reviewed and comply with NUREG-0700 guidelines.
- o Electrical Switchyard - The tag numbers for the electrical switchyard equipment have no unit designators. On the electrical panel in both units, the layout is the same but the tag numbers for similar switchyard breakers and buses are different.

A programmatic review is conducted by both system and design engineers on each design change for either unit, and all unit differences are identified and evaluated in accordance with procedure, STA-820, "Reporting and Evaluation Unit Difference," and tracked by a PC database. All unit differences must have Station Operations Review Committee (SORC) approval.

For the Annunciators and Monitor Light Box engravings, the Unit 1 photographs and drawings have been compared with the Unit 2 design drawings. No significant unit differences have been noted. Minor symbols, format and abbreviations are being corrected during the final testing and turnover process for Unit 2 systems. A recent review of all annunciators was conducted to resolve "nuisance" alarms which detract from the "dark board" concept for Unit 1. All associated design changes were reviewed for applicability to Unit 2 during their initial development for Unit 1.

## 2.0 DIFFERENCES IN DESIGN

### 2.1 Color Coded Operating Bands

Main Control Board indicator color coded operating bands have been reviewed and unit differences evaluated. The following systems have different operating bands:

- o The Steam Generator level bands differ due to the difference in the Steam Generator models. A Westinghouse Model D4 is used in Unit 1, and a Model D5 is used in Unit 2.
- o The Steam Generator Feedwater flow split between nozzles have different restriction orifices and corresponding different bypass flow.
- o The Overtemperature N-16 trip setpoints are higher in Unit 2. This is due to updated parameter values being used in the analysis for determining the Unit 2 setpoints.

It should be noted that these operating bands are based on engineering data and operating experience and are subject to change as operating experience is gained. The bands are controlled by OWI-109, "Operations Human Factor Controls."

### 2.2 Mirror Image Unit Difference

This difference developed from different techniques in system configuration; "mirror image" philosophy of the steam system, "slide along" principle for the turbine equipment and "180° rotation" of some auxiliary skids. A major effort to resolve the interfacing of these systems has been accomplished to minimize the main control board configuration and tagging differences without making actual equipment moves in the Plant.

- o The final Unit 2 design which affects the control boards is the "mirror image" configuration of the two Moisture Separators and the four Main Steam Lines. These differences affect twelve valve position indicator descriptive labels. No controls, tag numbers, or component layout differences exist. A control board graphic operator aid has been developed to depict the actual configuration of each unit to assist in recognition of the differences.

### 2.3 Handswitch Module Deletion

During the design validation of Unit 2, it was determined that the control of four isolation dampers was not needed. The corresponding two handswitch modules were deleted from the design of Unit 2. These modules were on a back panel which is not constantly manned by an operator. Removal of the Unit 1 switches has been determined to be a low risk potential for operator error.

### 3.0 CONCLUSION

CPSES remains committed to the DCRDR program and continues to evaluate Human Engineering Discrepancies. In addition, the Unit 2 DCRDR environmental surveys will be conducted when all control room and remote shutdown systems are operational. The results of the surveys, together with any proposed corrective action plan, will be transmitted to the NRC prior to issuance of the Unit 2 operating license. The Human Engineering Discrepancies identified as a result of this comparison have been resolved and the related documentation is available on site.