

## CHAPTER 18

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## HUMAN FACTORS ENGINEERING

## 18.0 INTRODUCTION

Beaver Valley Power Station Unit 2 (BVPS-2) has performed a Detailed Control Room Design Review (DCRDR) to meet the intent of Task Action Plan I.D.1 of NUREG-0660, as clarified in Supplement 1 to NUREG-0737.

A Safety Parameter Display System (SPDS) had originally been included as part of the control room upgrade to provide operations personnel with a concentrated display of a minimum set of parameters which define the safety status of the plant. Subsequently, the original Safety Parameter Display System was replaced with a new SPDS system.

## 18.1 DETAILED CONTROL ROOM DESIGN REVIEW

Beaver Valley Power Station Unit 2 (BVPS-2) performed a Detailed Control Room Design Review (DCRDR) to meet the intent of Task Action Plan Item I.3.1 of NUREG-0660, as clarified in Supplement 1 of NUREG-0737. The first phase of the review effort was conducted from November 1982 through December 1985, utilizing the guidance contained in NUREGs -0700 and -0801.

Preparation for the conduct of a DCRDR began in November 1982. The results of this planning phase are contained in the Program Plan submitted to the NRC on August 8, 1983, as a separate document. The Program Plan is complemented by the BVPS-2 CRDR Summary Report submitted to the NRC in December 1985, as a separate document. The Summary Report details the methodology and findings of the review and assessment phases, as well as the implementation schedule for resolving the Human Engineering Discrepancies identified within the report. BVPS-1 and BVPS-2 conducted separate efforts; however, information and review findings were exchanged throughout the course of each Unit's DCRDR. This aspect of the review is also discussed in the BVPS-2 Summary Report.

A second phase of the BVPS-2 DCRDR was initiated in July 1986. Additional human factors analyses of the control room computer systems were conducted. Guidelines which were identified as being unable to assess during the initial phase of the DCRDR were reviewed and re-evaluated. Items which were identified by the NRC in the DCRDR Interim Safety Evaluation Report were addressed as requested. The results of this phase of the DCRDR are documented in the BVPS-2 Supplemental Summary Report submitted to the NRC on January 8, 1987.

The BVPS-2 DCRDR succeeded, to the extent possible, in ensuring that the control room and emergency and alternate shutdown panels were designed using accepted human factors principles. Additional human factors analyses will be conducted when the construction of the control room is complete. An on-going human factors review program has been instituted to review changes to the control room, control room equipment, and the emergency and alternate shutdown panels to maintain a human engineered condition.

### 18.1.1 References For Section 18.1

Duquesne Light Company (DLC) 1983. 2NRC-3-060, Program Plan Report, DLC letter dated August 8, 1983.

DLC 1983. 2NRC-5-147, Summary Report, DLC letter dated December 2, 1985.

DLC 1987. 2NRC-7-005, Supplemental Summary Report DLC letter dated January 8, 1987.

DLC 1986. USNRC - DCRDR Interim Safety Evaluation Report.

USNRC 1984. Standard Review Plan for the Review of Safety Analysis Reports; Section 18.1, Revision 0, September 1984.

## 18.2 SAFETY PARAMETER DISPLAY SYSTEM (SPDS)

A Safety Parameter Display System (SPDS) has been included in the Beaver Valley Power Station Unit 2 (BVPS-2) control room upgrade in response to the requirements of Task Action Plan I.D.2 of NUREG-0660 and clarified in Supplement 1 to NUREG-0737. A discussion of the design aspects of the SPDS is provided in Section 7.5.6 of the UFSAR.

The primary function of SPDS in the control room is to aid control room personnel in assessing the plant safety status. Dynamic color-coded status blocks representing six SPDS critical safety functions are located on every user workstation display. The SPDS parameters can be displayed on BVPS-2 plant computer system workstations located in the Control Room, Technical Support Center (TSC) and Emergency Operations Facility (EOF).

The Control Room workstations are used during the initial phase of an emergency until the Technical Support Center located in the ERF Building is staffed and operating.

The SPDS provides a concise display of critical plant variables which aid the operator in determining the status of the following critical safety functions:

1. Sub-criticality Status,
2. Core Cooling Status,
3. Heat Sink Status,
4. Vessel Integrity Status,
5. Containment Integrity Status,
6. Inventory Status.

The original ERF/SPDS computer system has been subjected to a human factors evaluation during the Detailed Control Room Design Review (DCRDR) Computer Survey. The system was evaluated for conformance to the guideline of NUREG-0700. The results of the survey are documented in the DCRDR Supplemental Summary Report which was submitted to the NRC as a separate report (see FSAR Table 1.7-3). The current Unit 2 plant computer system (that includes a SPDS system) was also reviewed for conformance to NUREG 0700 guidelines and human factor considerations.

## 18.2.1 References for Section 18.2

WCAP-10170 ERF Design and V&V Process.

2NRC-7-005 Supplemental Summary Report DLC letter dated  
January, 1987.