

## **18.0 HUMAN FACTORS ENGINEERING**

### **18.1 Introduction**

Human Factors Engineering (HFE) describes the human system interface (HSI) design development, the HSI design goals and bases, the standard HSI design features and the detailed HSI design and implementation process, with embedded design acceptance criteria, for the Economic Simplified Boiling-Water Reactor (ESBWR). The incorporation of HFE principles into all phases of the design of these interfaces is also discussed.

### **18.2 Summary of Application**

Chapter 18 of the Fermi 3 Combined License (COL) Final Safety Analysis Report (FSAR) Revision 3 incorporates by reference, with no departures and one supplement, Chapter 18 of the ESBWR Design Control Document (DCD), Revision 9.

In addition, in FSAR Section 18.13, "Human Performance Monitoring," the applicant provides the following:

#### **COL Item**

- STD COL 18.13-1-A Milestone for Human Performance Monitoring (HPM) Implementation.

The COL applicant is responsible to provide a milestone for the implementation of the HPM program. The applicant indicated that an HPM program will be implemented prior to the beginning of the first licensed operator training class.

### **18.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference and the supplemental information presented in this application is addressed in Chapter 18 of the Final Safety Evaluation Report (FSER) related to the ESBWR DCD.

### **18.4 Technical Evaluation**

As documented in NUREG-XXXX, the U.S. Nuclear Regulatory Commission (NRC) staff reviewed and approved Chapter 18 of the certified ESBWR DCD. The staff reviewed Chapter 18 of the Fermi 3 COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the information in the COL represent the complete scope of information relating to this review topic.<sup>1</sup> The NRC staff's review confirmed that the information contained in the application and incorporated by reference addresses the required information related to HFE.

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.2.2, for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

The staff reviewed the following information contained in the COL FSAR:

COL Item

- COL STD 18.13-1-A Milestone for HPM Implementation.

The applicant stated that an HPM program will be implemented prior to the beginning of the first licensed operator training class.

The ESBWR DCD Revision 9, Section 18.13.3 states the strategy for this COL Item is implemented through the use of a representative training simulator during periodic training exercises.

By implementing the monitoring program at the beginning of the first licensing class, the COL applicant has selected the earliest opportunity subsequent to the completion of the HFE design verification and validation to begin collecting performance information. Senior reactor operator/reactor operator licensing requires the use of a full scope simulator to develop and demonstrate operating competencies. This implements the DCD methodology and ensures simulated design conditions are used to evaluate human performance. Timely initiation of the HPM program using a plant reference simulator provides reasonable assurance that any degradation in performance will be detected and corrected before plant safety is compromised.

**18.5      Post Combined License Activities**

- COM 18.13-001 Human Performance Monitoring (HPM) Program

The applicant is committed to implement the HPM program prior to the beginning of the first licensed operator training class.

**18.6      Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-XXXX. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix [x], Section VI.B.1, all nuclear safety issues relating to "Human Factors Engineering" that were incorporated by reference have been resolved. The staff's review concluded that the applicant has adequately addressed COL Item COL STD 18.13-1-A.