18.0 HUMAN FACTORS ENGINEERING

18.1 Introduction

This chapter describes the staff's evaluation of the Fermi 3 Human Factors Engineering (HFE) design. This includes 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).

18.2 Summary of Application

Chapter 18 of the Fermi 3 combined license (COL) Final Safety Analysis Report (FSAR) Revision 7 incorporates by reference Chapter 18 of the certified ESBWR design control document (DCD), Revision 10, with no departures and one supplement. 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 Implementation.

The COL applicant is responsible for providing a milestone for the implementation of the Human Performance Monitoring (HPM) Program. The applicant commits (COM18.13-001) to implement the HPM Program before the beginning of the first licensed operator training class.

18.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG–1966, "Final Safety Evaluation Report Related to the Certification of the Economic Simplified Boiling-Water Reactor Standard Design," (Agencywide Documents Access and Management System Accession No. ML14100A304). In addition, the relevant requirements of the Commission regulations for the HFE, and the associated acceptance criteria, are in Chapter 18 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)," the Standard Review Plan (SRP).

18.4 Technical Evaluation

As documented in NUREG–1966, 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 ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirms that the information in the application and the information incorporated by reference address the required information related to HFE.

The staff reviewed the information in the Fermi 3 COL FSAR as follows:

[1] 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.

COL Item

- COL STD 18.13-1-A — Milestone for Human Performance Monitoring Implementation.

The applicant commits (COM 18.13-001) to implement an HPM Program before beginning of the first licensed operator training class.

In ESBWR DCD Revision 10, Section 18.13.3, "Elements of Human Performance Monitoring Process" states that the HPM strategy is implemented through the use of a representative training simulator during periodic training exercises.

Senior reactor operator and reactor operator licensing requires the use of a full scope training simulator to develop and demonstrate operating competencies. 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. Accordingly, the staff finds that the applicant has adequately addressed this COL item.

18.5 Post Combined License Activities

The applicant identified the following commitment:

- Commitment (COM 18.13-001) – The HPM program will be implemented 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–1966. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this chapter. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 52.63(a)(5) and 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," Appendix E, "Design Certification Rule for the Economic Simplified Boiling-Water Reactor," Section VI.B.1, all nuclear safety issues relating to HFE that were incorporated by reference are resolved.

In addition, the staff compared the additional COL information in the application to the relevant NRC regulations, the guidance in Chapter 18 of NUREG–0800, and other NRC regulatory guides. The staff's review concludes that the applicant has adequately addressed COL Item COL STD 18.13-1-A.