

7.0 INSTRUMENTATION AND CONTROL SYSTEMS

This chapter presents specific detailed design and performance information for the instrumentation and control (I&C) systems. These systems help assure the integrity of the reactor coolant pressure boundary, the capability to shut down the reactor and maintain it in a safe shutdown condition, and the capability to prevent or mitigate the consequences of anticipated operational occurrences and postulated accidents. These systems are also significant for plant operation and are used throughout the plant. This chapter provides information on the systems and components that sense various reactor parameters and transmit signals to the control systems during normal operations and to the reactor trip and engineered safety feature systems during abnormal and accident conditions. The I&C system for the Economic Simplified Boiling-Water Reactor (ESBWR) design is an I&C distributed control and information system (DCIS). The DCIS is designated as either a safety-related DCIS (Q-DCIS) or nonsafety-related DCIS (N-DCIS). The Q-DCIS and N-DCIS functions include diverse power and sensors and diverse hardware and software architectures to significantly reduce the consequences of a potential software common cause failure in the primary I&C protection system.

The Q-DCIS includes the reactor protection system, the neutron monitoring system, the independent control platform, and the safety system logic and control for the emergency safety feature actuation system. The N-DCIS includes the diverse protection system, the balance of plant systems, the plant investment protection systems, the plant computer functions and workstations, and the severe accident mitigation system (the deluge system).

Chapter 7 of the Fermi 3 combined license (COL) Final Safety Analysis Report (FSAR), Revision 7 incorporates by reference Chapter 7, "Instrumentation and Control Systems," of the certified ESBWR design control document (DCD) Revision 10, referenced in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, Appendix E, "Design Certification Rule for the Economic Simplified Boiling-Water Reactor," with no departures or supplements. U.S. Nuclear Regulatory Commission (NRC) staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this chapter remains for review.¹ The staff's review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this chapter. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the I&C system are resolved.

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.