

7.0 INSTRUMENTATION AND CONTROL SYSTEMS

This chapter of the U.S. Nuclear Regulatory Commission's (NRC's) safety evaluation report (SER) provides the NRC staff evaluation of the North Anna 3 Combined License (COL) specific detailed design and performance information for the instrumentation and control (I&C) systems for the Economic Simplified Boiling-Water Reactor (ESBWR). These systems help ensure 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. They are 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 features systems during abnormal and accident conditions. The I&C system for the ESBWR design is a distributed control and information system (DCIS). DCIS is designated as either 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 consequence 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 (deluge system).

Chapter 7 of the North Anna 3, COL Final Safety Analysis Report (FSAR), Revision 8, incorporates by reference, with no departures or supplements, Chapter 7, "Instrumentation and Control Systems," of Revision 10 of the Design Control Document (DCD) for the ESBWR, referenced in Appendix E to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remains for review. The staff's review confirmed that the COL application addressed the required information relating to the I&C systems, and there is no outstanding information expected to be addressed in the North Anna 3 COL FSAR related to this chapter. The NRC staff documented the results of its technical evaluation of the information incorporated by reference in the North Anna COLA in NUREG-1966, "Final Safety Evaluation Report Related to the Certification of the Economic Simplified Boiling-Water Reactor Standard Design," issued April 2014.