

7.0 INSTRUMENTATION AND CONTROLS

Nuclear power plant instrumentation senses various plant parameters and transmits appropriate signals to the control systems during normal operation and to the reactor trip and engineered safety feature systems during abnormal and accident conditions. The information provided in this chapter emphasizes those instruments and associated equipment that constitute the protection and safety systems.

7.1 Introduction

Section 7.1 of the Bellefonte (BLN) combined license (COL) Final Safety Analysis Report (FSAR), Revision 1, incorporates by reference, with no departures or supplements, Section 7.1, "Introduction," of Revision 17 of the AP1000 Design Certification Document (DCD). The Nuclear Regulatory Commission (NRC) staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirmed that there is no outstanding issue related to this subsection.

The Westinghouse application to amend Appendix D to Title 10 of the *Code of Federal Regulations* (CFR), 10 CFR Part 52 includes changes to Section 7.1 of the AP1000 DCD, as stated in Revision 17 of the AP1000 DCD. The staff is reviewing this information on Docket Number 52-006. The results of the NRC staff's technical evaluation of the information related to the introduction incorporated by reference in the BLN COL FSAR, Revision 1, will be documented in a supplement to NUREG-1793. The supplement to NUREG-1793 is not yet complete, and this is being tracked as part of Open Item 1-1. The staff will update Section 7.1 of this safety evaluation report (SER) to reflect the final disposition of the design certification (DC) application.

7.2 Reactor Trip

Section 7.2 of the BLN COL FSAR, Revision 1, incorporates by reference, with no departures or supplements, Section 7.2, "Reactor Trip," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirmed that there is no outstanding issue related to this section.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 7.2 of the AP1000 DCD, as stated in Revision 17 of the AP1000 DCD. The staff is reviewing this information on Docket Number 52-006. The results of the NRC staff's technical evaluation of the information related to the reactor trip system incorporated by reference in the BLN COL FSAR, Revision 1, will be documented in a supplement to NUREG-1793. The amendment supplement to NUREG-1793 is not yet complete, and this is being tracked as part of Open Item 1-1. The staff will update Section 7.2 of this SER to reflect the final disposition of the DC amendment application.

¹ See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included within a COL application that references a DC.

7.3 Engineered Safety Features

Section 7.3 of the BLN COL FSAR, Revision 1, incorporates by reference, with no departures or supplements, Section 7.3, "Engineered Safety Features," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirmed that there is no outstanding issue related to this section.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 7.3 of the AP1000 DCD, as stated in Revision 17 of the AP1000 DCD. The staff is reviewing this information on Docket Number 52-006. The results of the NRC staff's technical evaluation of the information related to the engineered safety features incorporated by reference in the BLN COL FSAR, Revision 1, will be documented in a supplement to NUREG-1793. The supplement to NUREG-1793 is not yet complete, and this is being tracked as part of Open Item 1-1. The staff will update Section 7.3 of this SER to reflect the final disposition of the DC amendment application.

In RAI 1-4 the staff questioned how the COL applicant will verify that the as-built Instrumentation and Controls (I&C) system configuration conforms with schematics. In its response to RAI 1-4, TVA indicated that they or a designee will verify I&C cabinets as-built against the design drawings during manufacturing and will functionally test each system. In addition, TVA's response indicated that the I&C cabinets would be tested during preoperational testing and in accordance with several ITAAC related to the I&C system. The staff notes that vendor qualification testing, which may be done offsite, and preoperational testing fall under TVA's quality assurance program. In accordance with TVA's program any anomalies found during the testing or any problems identified from the time the testing is complete until the components are installed at the site would be identified and corrected in accordance with TVA's quality assurance program. The staff finds the verification of the as-built I&C system configuration against schematics using a combination of vendor testing, which will fall under TVA's quality assurance program, and on-site testing to be acceptable. In addition, the staff believes that adequate program controls exist to ensure that once the testing is complete, it will be maintained as valid throughout the life of the plant. Based on the above, the staff finds TVA's response to RAI 1-4 acceptable.

7.4 Systems Required for Safe Shutdown

Section 7.4 of the BLN COL FSAR, Revision 1, incorporates by reference, with no departures or supplements, Section 7.4, "Systems Required for Safe Shutdown," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirmed that there is no outstanding issue related to this section.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 7.4 of the AP1000 DCD, as stated in Revision 17 of the AP1000 DCD. The staff is reviewing this information on Docket Number 52-006. The results of the NRC staff's technical evaluation of the information related to the systems required for safe shutdown incorporated by reference in the BLN COL FSAR, Revision 1, will be documented in a supplement to NUREG-1793. The supplement to NUREG-1793 is not yet complete, and this is being tracked as part of Open Item 1-1. The staff will update Section 7.4 of this SER to reflect the final disposition of the DC amendment application.

7.5 Safety-Related Display Information (Related to RG 1.206, Section C.III.1, Chapter 7, C.1.7.5, "Information Systems Important to Safety")

7.5.1 Introduction

Safety-related display information includes equipment that processes safety-related information and displays it for use by the operator to monitor and maintain the safety of the AP1000 throughout operating conditions that include anticipated operational occurrences and accident and post-accident conditions.

7.5.2 Summary of Application

Section 7.5 of the BLN COL FSAR, Revision 1, incorporates by reference Section 7.5 of the AP1000 DCD, Revision 17.

In addition, in BLN COL FSAR Section 7.5 the applicant provided the following:

Supplemental Information

- BLN SUP 7.5-1

The applicant provided supplemental (SUP) information in BLN COL FSAR Section 7.5, "Safety-Related Display Information," describing the FSAR Table 7.5-201 supplement to the DCD Table 7.5-1 and provides variable data shown in the DCD Table as "site specific."

7.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," (FSER) related to the DCD, (NUREG-1793).

In addition, the relevant requirements of the Commission regulations for the information systems important to safety, and the associated acceptance criteria, are given in Section 7.5 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (SRP).

The applicable regulatory requirements, guidelines, and related acceptance criteria for the supplemental information items are as follows:

- Criterion 13, "Instrumentation and Control," and Criterion 64, "Monitoring Radioactivity Releases," of Appendix A to 10 CFR Part 50 require, in part, that instrumentation be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to ensure adequate safety. Monitoring should include checking the plant environs for radioactivity that may be released from postulated accidents.
- The site-specific information that applicants are to address in Section 7.5 of their FSARs are specifically instruments for measuring boundary environs radiation and meteorological parameters.

7.5.4 Technical Evaluation

The NRC staff reviewed Section 7.5 of the BLN 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.¹ Section 7.5 of the AP1000 DCD is being reviewed by the staff under Docket Number 52-006. The NRC staff's technical evaluation of the information incorporated by reference related to information systems important to safety will be documented in the staff SER on the DC amendment application for the AP1000 design.

The staff reviewed the information in the BLN COL FSAR:

Supplemental Information

- BLN SUP 7.5-1

The AP1000 DC FSAR references and commits to Regulatory Guide (RG) 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," Revision 3, as the method of complying with the above regulations. Specifically, RG 1.97 states that the variable and range information should be provided for environs radiation and radioactivity, and meteorological instrumentation.

The staff issued RAI 7.5-1 requesting information on boundary environs radiation and meteorological instrumentation. The AP1000 DCD states that this is site-specific information. TVA responded to RAI 7.5-1 with sufficient meteorological range and accuracy information for wind direction and wind speed. For differential temperature, the applicant did not provide range and accuracy information in conformance with the guidance of RG 1.97. For radiation monitoring instrumentation, the applicant stated a commitment to RG 1.97 but did not provide the range of boundary environs radiation instruments. The staff finds that the range of the boundary environs radiation instruments is necessary to ensure that the instruments are adequate for monitoring radioactivity that may be released from a postulated accident. TVA provided supplemental responses to RAI 7.5-1 with sufficient range information for boundary environs radiation instruments and sufficient range and accuracy information for the differential temperature in conformance with the guidance of RG 1.97. The staff will verify that the next update of the BLN COL FSAR adequately incorporates instrumentation information. This is **Confirmatory Item 7.5-1**.

7.5.5 Post Combined License Activities

There are no post-COL activities related to this section.

7.5.6 Conclusion

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 7.5 of the AP1000 DCD, as stated in Revision 17 of the AP1000 DCD. The staff is reviewing this information on Docket Number 52-006. The results of the NRC staff's technical evaluation of the information incorporated by reference in the BLN COL FSAR will be documented in a supplement to NUREG-1793. The supplement to NUREG-1793 is not yet complete, and this is being tracked as part of Open Item 1-1. The staff will update Section 8.1 of this SER to reflect the final disposition of the DC amendment application.

In addition, the staff has compared the application to the relevant NRC regulations and other NRC regulatory guides. The applicant has satisfactorily addressed RAI 7.5-1, as discussed above. Pending resolution of Confirmatory Item 7.5-1, the staff concludes that the safety-related display information is acceptable in accordance with the requirements of 10 CFR Part 50, Appendix A, Criteria 13 and 64.

7.6 Interlock Systems Important to Safety

Section 7.6 of the BLN COL FSAR, Revision 1, incorporates by reference, with no departures or supplements, Section 7.6, "Interlock Systems Important to Safety," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirmed that there is no outstanding issue related to this section.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 7.6 of the AP1000 DCD, as stated in Revision 17 of the AP1000 DCD. The staff is reviewing this information on Docket Number 52-006. The results of the NRC staff's technical evaluation of the information related to the interlock systems important to safety incorporated by reference in the BLN COL FSAR, Revision 1, will be documented in a supplement to NUREG-1793. The supplement to NUREG-1793 is not yet complete, and this is being tracked as part of Open Item 1-1. The staff will update Section 7.6 of this SER to reflect the final disposition of the DC amendment application.

7.7 Control and Instrumentation Systems (Related to RG 1.206, Section C.III.1, Chapter 7, C.I.7.7, "Control Systems Not Required for Safety")

Section 7.7 of the BLN COL FSAR, Revision 1, incorporates by reference, with no departures or supplements, Section 7.7, "Control and Instrumentation Systems," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirmed that there is no outstanding issue related to this section.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 7.7 of the AP1000 DCD, as stated in Revision 17 of the AP1000 DCD. The staff is reviewing this information on Docket Number 52-006. The results of the NRC staff's technical evaluation of the information related to the control and instrumentation systems incorporated by reference in the BLN COL FSAR, Revision 1, will be documented in a supplement to NUREG-1793. The supplement to NUREG-1793 is not yet complete, and this is being tracked as part of Open Item 1-1. The staff will update Section 7.7 of this SER to reflect the final disposition of the DC amendment application.

In addition, the staff has compared the application to the relevant NRC regulations and other NRC regulatory guides. The applicant has satisfactorily addressed RAI 7.5-1, as discussed above. Pending resolution of Confirmatory Item 7.5-1, the staff concludes that the safety-related display information is acceptable in accordance with the requirements of 10 CFR Part 50, Appendix A, Criteria 13 and 64.

7.6 Interlock Systems Important to Safety

Section 7.6 of the BLN COL FSAR, Revision 1, incorporates by reference, with no departures or supplements, Section 7.6, "Interlock Systems Important to Safety," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirmed that there is no outstanding issue related to this section.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 7.6 of the AP1000 DCD, as stated in Revision 17 of the AP1000 DCD. The staff is reviewing this information on Docket Number 52-006. The results of the NRC staff's technical evaluation of the information related to the interlock systems important to safety incorporated by reference in the BLN COL FSAR, Revision 1, will be documented in a supplement to NUREG-1793. The supplement to NUREG-1793 is not yet complete, and this is being tracked as part of Open Item 1-1. The staff will update Section 7.6 of this SER to reflect the final disposition of the DC amendment application.

7.7 Control and Instrumentation Systems (Related to RG 1.206, Section C.III.1, Chapter 7, C.I.7.7, "Control Systems Not Required for Safety")

Section 7.7 of the BLN COL FSAR, Revision 1, incorporates by reference, with no departures or supplements, Section 7.7, "Control and Instrumentation Systems," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirmed that there is no outstanding issue related to this section.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 7.7 of the AP1000 DCD, as stated in Revision 17 of the AP1000 DCD. The staff is reviewing this information on Docket Number 52-006. The results of the NRC staff's technical evaluation of the information related to the control and instrumentation systems incorporated by reference in the BLN COL FSAR, Revision 1, will be documented in a supplement to NUREG-1793. The supplement to NUREG-1793 is not yet complete, and this is being tracked as part of Open Item 1-1. The staff will update Section 7.7 of this SER to reflect the final disposition of the DC amendment application.

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