6.0 ENGINEERED SAFETY FEATURES

6.0 Engineered Safety Features

Engineered safety features (ESF) protect the public in the event of an accidental release of radioactive fission products from the reactor coolant system (RCS). The ESF function is to localize, control, mitigate, and terminate such accidents, and to maintain radiation exposure levels to the public below applicable limits and guidelines.

Section 6.0 of the Bellefonte (BLN) combined license (COL) Final Safety Analysis Report (FSAR), Revision 1, incorporates by reference, with no departures or supplements, Section 6.0, "Engineered Safety Features," of Revision 17 of the AP1000 Design Control 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 section.

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 6.0 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 ESF incorporated by reference in the BLN COL FSAR will be documented in a supplement to NUREG-1793, "Final Safety Evaluation Report [FSER] Related to Certification of the AP1000 Standard Design." The supplement to NUREG-1793 is not yet complete, and this is being tracked as Open Item 1-1. The staff will update Section 6.0 of this safety evaluation report (SER) to reflect the final disposition of the design certification (DC) amendment application.

6.1 Engineered Safety Features Materials

This section provides the evaluation of the materials used in the fabrication of ESF components and of the provisions to avoid material interactions that could impair the operation of the ESF. The design information in BLN COL FSAR Section 6.1 is divided into two sections, Section 6.1.1, "Metallic Materials," and Section 6.1.2, "Organic Materials." The NRC staff evaluation of these two FSAR sections is provided below.

6.1.1 Metallic Materials

6.1.1.1 Introduction

In this section, the NRC staff reviews metallic materials used in ESF components to ensure that they are compatible with one another and with ESF fluids. The compatibility of fluids in ESF systems should ensure that there is a low probability of causing abnormal leakage, of rapidly propagating failure, and of gross rupture of reactor coolant pressure boundary (RCPB)

[1] See 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.

components. Metallic materials and fluids should also be compatible with the auxiliary systems that directly support ESF systems.

6.1.1.2 Summary of Application

Section 6.1 of the BLN COL FSAR, Revision 1, incorporates by reference Section 6.1 of the AP1000 DCD, Revision 17. Section 6.1 of the AP1000 DCD includes Section 6.1.1.

In addition, in BLN COL FSAR Section 6.1.1, the applicant provided the following:

AP1000 COL Information Item

- STD COL 6.1-1

The applicant provided additional information in Standard (STD) COL 6.1-1 to resolve COL Information Item 6.1-1. STD COL 6.1-1 describes quality assurance measures for special processes in fabricating austenitic stainless steels. In a letter dated April 7, 2010, the DCD applicant, Westinghouse, proposed to revise Appendix 1A of the AP1000 DCD to remove stated exceptions to conformance with Regulatory Guide (RG) 1.44, "Control of the Use of Sensitized Steel," Revision 0. The NRC staff's review of STD COL 6.1-1 includes the information in the Westinghouse letter. The COL applicant did not submit additional information in response to this proposed DCD revision.

6.1.1.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the metallic materials are given in Section 6.1.1 of NUREG-0800, "Standard Review Plan [SRP] for the Review of Safety Analysis Reports for Nuclear Power Plants."

The regulatory basis of COL information is Appendix B to 10 CFR Part 50 as it relates to the quality assurance requirements for the design, fabrication, and construction of safety-related structures, systems, and components (SSCs). Guidance for COL information is in RG 1.31, "Control of Ferrite Content in Stainless Steel Weld Metal," Revision 3, and RG 1.44, "Control of the Use of Sensitized Steel," Revision 0.

6.1.1.4 Technical Evaluation

The staff reviewed Section 6.1.1 of the BLN COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to metallic materials. The results of the NRC staff's evaluation of the information incorporated by reference in the BLN COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information contained in BLN COL FSAR:

AP1000 COL Information Item

- STD COL 6.1-1

The NRC staff reviewed STD COL 6.1-1 related to COL Information Item 6.1-1 included under Section 6.1.1.2 of the BLN COL FSAR, which addresses the COL information item identified in AP1000 DCD Section 6.1.3.1 related to the fabrication requirements for austenitic stainless steel.

The COL information item identified in AP1000 DCD Section 6.1.3.1 states:

> The Combined License applicants referencing the AP1000 will address review of vendor fabrication and welding procedures or other quality assurance methods to judge conformance of austenitic stainless steels with Regulatory Guides 1.31 and 1.44.

This commitment was also documented as COL Action Item 6.1.1-1 in the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> The COL applicant will review vendor fabrication and welding procedures or other quality assurance methods to ensure that austenitic stainless steels meet the guidelines of RGs 1.31 and 1.44.

The COL information in the FSAR that is to be added to AP1000 DCD Section 6.1.1.2 states:

> In accordance with Appendix B to 10 CFR Part 50, the quality assurance program establishes measures to provide control of special processes. One element of control is the review and acceptance of vendor procedures that pertain to the fabrication, welding, and other quality assurance methods for safety related component [sic] to determine both code and regulatory conformance. Included in this review and acceptance process are those vendor procedures necessary to provide conformance with the requirements of Regulatory Guides 1.31 and 1.44 for engineered safety features components as discussed in DCD Section 6.1 and reactor coolant system components as discussed in DCD Section 5.2.3.

The staff finds the COL information provided by the applicant meets the quality assurance guidelines for austenitic stainless steels specified in RG 1.31 (weld metal ferrite content) and RG 1.44 (the use of sensitized stainless steel). The staff's conclusion is based on the applicant's statement affirming that its Appendix B quality assurance program will address the concerns of these RGs. It is also based on Appendix 1A of the AP1000 DCD, as modified by a letter dated April 7, 2010, from the AP1000 applicant. The modified DCD appendix will be incorporated by reference in a future version of the BLN COL FSAR and will indicate full conformance with these RGs. In addition, the discussions in AP1000 DCD Sections 6.1.1.2 and 5.2.3.4 provide details about how conformance will be accomplished.

6.1.1.5 Post Combined License Activities

There are no COL license conditions related to this section.

6.1.1.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant had addressed the required information relating to metallic materials used in the ESF and that there is no outstanding information expected to be addressed in the BLN COL FSAR related to this section.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 6.1.1 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 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 6.1.1 of this SER to reflect the final disposition of the DC amendment application.

In addition, the staff concludes that the relevant information presented in the BLN COL FSAR is acceptable and meets the requirements of 10 CFR Part 50, Appendix B, with the additional guidance provided in RG 1.31 and RG 1.44. The staff based its conclusion on the following:

- STD COL 6.1-1 is acceptable because the Appendix B quality assurance program proposed by the applicant provides adequate controls over vendor fabrication and welding procedures to ensure that austenitic stainless steels meet the guidelines of RG 1.31 and RG 1.44.

6.1.2 Organic Materials

6.1.2.1 Introduction

Protective coatings are applied for corrosion prevention to the interior and exterior surfaces of the containment vessel, radiologically controlled areas outside containment, and the remainder of the plant. The considerations for protective coatings differ for these four areas and the coatings selection process accounts for these differing considerations. The AP1000 design considers the function of the coatings, their potential failure modes, and their requirements for maintenance.

Other organic materials that may be present in the containment are associated with the specific type of equipment and the supplier selected to provide it. Materials are evaluated for potential interaction with the ESF to provide confidence that the performance of the ESF is not unacceptably affected.

6.1.2.2 Summary of Application

Section 6.1 of the BLN COL FSAR, Revision 1, incorporates by reference Section 6.1 of the AP1000 DCD, Revision 17. Section 6.1 of the AP1000 DCD includes Section 6.1.2.

In addition, in BLN COL FSAR Section 6.1.2, the applicant provided the following:

AP1000 COL Information Item

- STD COL 6.1-2

The applicant provided additional information in STD COL 6.1-2 to resolve COL Information Item 6.1-2. STD COL 6.1-2 discusses a program to control procurement, application, and monitoring of Service Level I and Service Level III coatings.

6.1.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

In addition, the relevant requirements of the Commission regulations for protective coatings, and the associated acceptance criteria, are given in Section 6.1.2 of NUREG-0800.

The applicable regulatory basis for acceptance of the resolution to the COL information item is Appendix B to 10 CFR Part 50 as it relates to the quality assurance requirements for the design, fabrication, and construction of safety-related SSCs. Guidance for the COL item is in RG 1.54, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants," Revision 1.

6.1.2.4 Technical Evaluation

The NRC staff reviewed Section 6.1.2 of the BLN COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to protective coatings and other organic materials inside containment. The results of the NRC staff's evaluation of the information incorporated by reference in the BLN COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the BLN COL FSAR:

AP1000 COL Information Item

- STD COL 6.1-2

The NRC staff reviewed STD COL 6.1-2 included under Section 6.1.2.1.6 of the BLN COL FSAR related to COL Information Item 6.1-2. COL Information Item 6.1-2 states:

> The Combined License applicants referencing the AP1000 will provide a program to control procurement, application, and monitoring of Service Level I and Service Level III coatings. The program for the control of the use of these coatings will be consistent with [DCD] subsection 6.1.2.1.6.

This commitment was also captured as COL Action Item 6.1.2-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> The COL applicant will prepare a program to control procurement, application, and monitoring of Service Level I and Service Level III coatings.

The added information in the BLN COL FSAR replaces the third paragraph under the section titled, "Service Level I and Service Level III Coatings," in AP1000 DCD Section 6.1.2.1.6 with the following:

> During the design and construction phase the coatings program associated with selection, procurement and application of safety related coatings is performed to applicable quality standards. Regulatory Guide 1.54 and [American Society for Testing and Materials] ASTM D5144 form the basis for the coating program. During the operations phase, the coatings program is administratively controlled in accordance with the quality assurance program implemented to satisfy 10 CFR Part 50, Appendix B, and 10 CFR Part 52 requirements. The coatings program provides direction for the procurement, application, and monitoring of safety related coating systems. Coating system monitoring requirements for the containment coating systems are based on ASTM D5163, "Establishing Procedures to Monitor the Performance of Coating Service Level I Coating Systems in an Operating Nuclear Power Plant," and ASTM D7167, "Establishing Procedures to Monitor the Performance of Safety-Related Coating Service Level III Lining Systems in an Operating Nuclear Power Plant." Any anomalies identified during coating monitoring are resolved in accordance with applicable quality assurance requirements.

The AP1000 DCD, which the applicant incorporates by reference, includes the following description of the quality assurance program:

> The quality assurance program for Service Level I and Service Level III coatings conforms to the requirements of [American Society of Mechanical Engineers] ASME NQA-1-1983 as endorsed in Regulatory Guide 1.28 ["Quality Assurance

Program Criteria (Design and Construction)"]. Safety related coatings meet the pertinent provisions of 10 CFR Part 50 Appendix B to 10 CFR Part 50. The service level classification of coatings is consistent with the positions given in Revision 1 of Regulatory Guide 1.54, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants." Service Level I and Service Level III coatings used in the AP1000 are tested for radiation tolerance and for performance under design basis accident conditions. Where decontaminability is desired, the coatings are evaluated for decontaminability. The coating applicator submits and follows acceptable procedures to control surface preparation, application of coatings and inspection of coatings. The painters are qualified and certified, and the inspectors are qualified and certified.

The inorganic zinc coating used on the inside surface (Service Level I coatings) and outside surface (Service Level III coatings) of the containment shell is inspected using a non-destructive dry film thickness test and a MEK rub test. These inspections are performed after the initial application and after recoating. Long term surveillance of the coating is provided by visual inspections performed during refueling outages. Other inspections are not required.

Section 6.1.2 of NUREG-0800 references RG 1.54 as providing an acceptable method of complying with the quality assurance requirements in regard to protective coatings applied to ferritic steels, aluminum, stainless steel, zinc-coated (galvanized) steel, concrete, or masonry surfaces of nuclear facilities. RG 1.54 lists a number of ASTM standards that provide guidance on practices and programs that are acceptable to the NRC staff for the selection, application, qualification, inspection, and maintenance of protective coatings applied in nuclear power plants. Section 6.1.2 of NUREG-0800 also states that a coating system to be applied inside the containment vessel is acceptable if it meets the regulatory positions of RG 1.54 and the standards of ASTM D5144-00 and ASTM D3911-03. By contrast, the AP1000 DCD references RG 1.54, but only with respect to classification of coating service level as I, II, or III.

The AP1000 DCD text to be replaced with the COL information item stated that the procurement, application, and monitoring of Service Level I and Service Level III coatings are controlled by a program prepared by the COL applicant The information provided clarified that the applicant's coatings program, with respect to procurement, application, inspection, and monitoring, will be consistent with the recommendations of RG 1.54, which is endorsed in Section 6.1.2 of NUREG-0800 as an acceptable method of meeting the quality assurance requirements of 10 CFR Part 50, Appendix B for safety-related and nonsafety-related coatings. However, the information provided by the applicant to resolve the COL information item merely states that the protective coatings program complies with RG 1.54, when, in fact, the program was not yet developed. Therefore, the COL applicant had not provided a coatings program as committed in COL Information Item 6.1-2.

To resolve this issue, in request for additional information (RAI) 6.1.2-1, the staff requested the following information:

1. The applicant should describe the standards to be applied to maintenance of the protective coatings in the program description. The description of the proposed coatings program should also describe the standards to be applied to selection and qualification

of coatings, if the applicant intends to use coatings systems different than those described in the AP1000 DCD, either during construction or after plant operation commences.

2. The program description should describe the administrative controls that will be applied to the coatings program.

3. Provide the schedule for full implementation of the coatings program with respect to major milestones in the construction of the plant; for example, prior to application of coatings, prior to preparation of surfaces to be coated, or prior to procurement of coatings materials.

In a letter dated May 23, 2008, the applicant provided the following response:

Item 1) The coating program will be based on Revision 1 of RG 1.54 and the referenced ASTM standards in ASTM D5144. Also, the guidance provided in ASTM D5163, "Establishing Procedures to Monitor the Performance of Coating Service Level I Coating Systems in an Operating Nuclear Power Plant," and in ASTM D7167, "Establishing Procedures to Monitor the Performance of Coating Service Level III Coating Systems in an Operating Nuclear Power Plant," will be used to specify monitoring (maintenance) requirements for the safety-related coating systems pertaining to containment. While a change in coating systems (from those described in the AP1000 DCD) is not anticipated, if a different safety-related coating system is needed, it will be evaluated in accordance with the appropriate change process, i.e., 10 CFR 50.59 or 10 CFR Part 52, Appendix D, Section VIII.

Item 2) FSAR Section 6.1.3.2, Coating Program, will be revised to indicate compliance with 10 CFR Part 50, Appendix B, and 10 CFR Part 52 requirements implemented by the quality assurance program for the plant (see FSAR Chapter 17 and Part 11 of the COL application) for design, construction, and operation of the units.

Item 3) During the design and construction phase, the requirements for the coating program will be contained in certified drawings and/or standards and specifications controlling the coating processes of the designer (Westinghouse); these design documents will be available prior to the procurement and application of the coating material by the constructor of the plant. Prior to initial fuel loading, a consolidated plant coating program will be in place to address procurement, application, and monitoring (maintenance) of those coating system(s) for the life of the plant.

The staff finds the applicant's response to Item 1 acceptable because, pursuant to RG 1.54, ASTM D5163 provides guidelines that are acceptable to the NRC staff for establishing an in-service coatings monitoring program for Service Level I coating systems in operating nuclear power plants and for Service Level II and other areas outside containment (as applicable). The applicant also specified ASTM D7167 for monitoring (maintenance) requirements for the safety-related coating systems pertaining to containment. Although ASTM D7167 is not listed in RG 1.54 or ASTM D5144, the staff finds it an appropriate standard because it addresses maintenance of Service Level III coatings. Additionally, ASTM D7167 references ASTM D4541 and ASTM D3359, which are listed in RG 1.54 as acceptable standards for maintenance of

protective coatings in nuclear power plants. Further, if a change in any of the originally specified coatings systems is necessary, the applicant will use an appropriate process, either the 10 CFR 50.59 or 10 CFR Part 52, Appendix D, Section VIII process, to evaluate the change. The staff finds the application of these regulations an appropriate alternative to control of the selection of coatings by the consolidated coatings program.

The BLN application references later versions of ASTM D5144 and ASTM D5163 than those referenced in RG 1.54, Revision 1. The use of the 2008 revision of ASTM D5144 is acceptable because it provides detailed requirements through reference to other coatings standards applicable to BLN. In this regard, it is not changed with respect to the 2000 revision referenced in the RG 1.54, Revision 1. Similarly, the 2005 revision of ASTM D5163 is referenced in the BLN COL application rather than the 1996 revision referenced in RG 1.54, Revision 1. The staff finds this acceptable because the NRC staff has accepted the 2005 revision of ASTM D5163 as the basis for the Aging Management Program XI.S8 in NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," Volume 2, Revision 2 (license renewal). With respect to simulated design-basis accident qualification testing for coatings, the staff notes that the applicable version of ASTM D3911 is the 1995 revision, as indicated in Appendix 1A of the AP1000 DCD.

In response to Item 2, the applicant stated that the administrative controls spelled out in its Quality Assurance Program Document (QAPD) will be applied to the coatings program. The staff finds that this will ensure compliance with the requirements of 10 CFR Part 50, Appendix B, which is a regulatory acceptance criterion of Section 6.1.2 of NUREG-0800. However, the staff notes that the QAPD references ASME NQA-1-1994 as an acceptable means to implement the requirements of 10 CFR Part 50, Appendix B, rather than ASME NQA-1-1983 as referenced by AP1000 DCD Section 6.1.2.1.6. ASME NQA-1-1994 is used as the basis for NUREG-0800 Section 17.5, "Quality Assurance Program Description - Design Certification, Early Site Permit and New License Applicants," which is applicable to the quality assurance program for a COL. Therefore, the staff finds the use of ASME NQA-1-1994 acceptable with respect to quality assurance requirements for coatings.

The staff finds the response to Item 3 acceptable because the applicant indicated the consolidated plant coating program will be in place to address procurement, application, and monitoring (maintenance) of those coating system(s) for the life of the plant, prior to initial fuel loading. During the construction phase, the requirements for the coating program will be contained in certified drawings and/or standards and specifications controlling the coating processes, which meets the requirements of 10 CFR Part 50, Appendix B, Criterion III with respect to design control and instructions, Criterion IV with respect to procurement document control, and Criterion V with respect to procedures and drawings.

The applicant also provided proposed changes to BLN COL FSAR Section 6.1.2.1.6 to incorporate the information included in the response to RAI 6.1.2-1. The staff confirmed that FSAR Section 6.1.2.1.6 has been revised to include information on the quality assurance program. However, since the information proposed to be added does not include the detailed information on control of coatings during the design and construction phase, the staff identified **Open Item 6.1.2-1** to ensure that BLN COL FSAR Section 6.1.2.1.6 is revised to include the information from the response to RAI 6.1.2-1, Item 3, related to control of the coating program during the design and construction phase and the schedule for full implementation of the consolidated coatings program.

6.1.2.5 Post Combined License Activities

There are no COL license conditions related to this section.

6.1.2.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to protective coatings and other organic materials inside containment, and there is no outstanding information expected to be addressed in the BLN COL FSAR related to this section.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 6.1.2 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 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 6.1.2 of this SER to reflect the final disposition of the DC amendment application.

However, as a result of Open Item 6.1.2-1, the staff is unable to finalize its conclusions related to the coatings program.

6.2 Containment Systems

6.2.1 Introduction

The containment systems (CSs), which include the primary containment, passive cooling system (heat removal system), isolation system, containment atmosphere cleanup systems, hydrogen control system, and leak rate test system, are discussed in this section. The containment encloses the reactor system and is the final barrier against the release of significant amounts of radioactive fission products in the event of an accident. The containment structure must be capable of withstanding, without loss of function, the pressure and temperature conditions resulting from postulated loss-of-coolant, steam line, or feed water line break accidents. The containment structure must also maintain functional integrity in the long term following a postulated accident; i.e., it must remain a low leakage barrier against the release of fission products for as long as postulated accident conditions require.

6.2.2 Summary of Application

Section 6.2 of the BLN COL FSAR, Revision 1, incorporates by reference Section 6.2 of the AP1000 DCD, Revision 17. Section 6.2 of the DCD includes Sections 6.2.1, "Containment Functional Design"; 6.2.2, "Passive Containment Cooling System"; 6.2.3, "Containment Isolation System"; 6.2.4, "Containment Hydrogen Control System"; and 6.2.5, "Containment Leak Rate Test System." DCD Section 6.2.5 is evaluated by the NRC staff in Section 6.2.6 of NUREG-1793. NUREG-1793 also includes the staff's evaluation of the following issues:

- Fracture prevention of the containment pressure boundary in accordance with SRP section 6.2.7.

- In-containment Refueling Water Storage Tank (IRWST) hydrodynamic loads

There are no COL information items associated with the review of either of these issues. The staff's evaluation of the incorporated by reference sections of the application that address fracture prevention of the containment pressure boundary is found in Section 3.8 of this report. With respect to the hydrodynamic loads, the staff's evaluation may be found in Section 6.2.8 of NUREG-1793.

The staff's evaluation of the containment cleanliness program associated with GSI-191, "Assessment of Debris Accumulation on PWR [Pressurized Water Reactor] Sump Performance," is evaluated in Section 6.3 of this SER.

In addition, in BLN COL FSAR Section 6.2.5, the applicant provided the following:

AP1000 COL Information Item

- STD COL 6.2-1

The applicant provided additional information in STD COL 6.2-1 to address COL Information Item 6.2-1 and COL Action Item 6.2.6-1, which addresses the containment leak rate test program. In addition, Table 1.9-203 of the BLN COL FSAR includes a line item for Task Action Plan Item A-23, "Containment Leak Testing." This item is addressed in BLN COL FSAR Section 6.2.5.1, STD COL 6.2-1.

License Conditions

- Part 10, License Condition 3, Item G.8

This license condition states that the COL holder shall implement the containment leakage rate testing program prior to initial fuel load, as stated in BLN FSAR Table 13.4-201.

- Part 10, License Condition 6

This license condition states that the COL holder shall provide an operational program schedule to support NRC inspections.

Tier 2 Departure and Exemption Request

The applicant proposed the following Tier 2 departure (DEP) from the AP1000 DCD:

- BLN DEP 2.3-1

In a supplemental response to RAI 15.00.03-1, dated February 2, 2009, the applicant requested a departure and an exemption from the AP1000 DCD because the BLN site cannot meet the exclusion area boundary (EAB) atmospheric dispersion (χ/Q) values in the AP1000 DCD. To support the departure and exemption request, the applicant completed a site-specific calculation to demonstrate that the NRC dose requirements were met at the EAB. This site-specific calculation took credit for a reduction in the fission product source term by applying the following two assumptions:

1. Reduction in the containment leak rate used in the loss-of-coolant accident (LOCA) analysis from 0.10 wt. percent/day to 0.09 wt. percent/day (exemption from the AP1000 Generic Technical Specification (TS)).

2. Reduction of the calorimetric power uncertainty to 1 percent (from 2 percent previously used in the dose analysis) and removal of the excess conservatism for fuel cycle variations, resulting in an approximate 4 percent reduction in the core source term.

The exemption request related to the AP1000 DCD EAB χ/Q site parameter involves exemptions to the following requirements:

1. Containment leak rate TS.

   Tennessee Valley Authority (TVA) requested an exemption from the requirement of 10 CFR Part 52, Appendix D, Subsection III.B to comply with the requirements of the Generic TS. Specifically, TVA requested an exemption from Generic TS 5.5.8.c and proposed a more stringent containment leakage rate TS of 0.09 wt. percent/day as opposed to the Generic TS limit of 0.10 wt. percent/day.

2. AP1000 DCD Tier 1 EAB χ/Q site parameter

   TVA requested an exemption from the requirement of 10 CFR Part 52, Appendix D, Subsection III.B to comply with the requirements in Tier 1 of the AP1000 DCD. Specifically, TVA requested an exemption from AP1000 DCD Tier 1, Table 5.0-1, “Site Parameters” for the site EAB (0-2 hour) atmospheric dispersion factor. In its exemption request, TVA proposed a site-specific dose consequence analysis using a site-specific EAB χ/Q.

This SER section evaluates the applicant’s exemption request to use the more stringent containment leakage rate TS of 0.09 wt. percent/day. The NRC staff’s evaluation of the applicant’s request to reduce the calorimetric power uncertainty to 1 percent is in Section 15.0 of this SER. The NRC staff’s evaluation of the applicant’s exemption request to use a

site-specific EAB χ/Q in the site-specific dose consequence analysis is in Section 15.9 of this SER.

Supplemental Information

- STD SUP 14.3-1

The applicant provided supplemental (SUP) information in STD SUP 14.3-1 to describe the ITAAC for each site-specific system described in the FSAR that meets the selection criteria, and that is not included in the certified design.

- BLN SUP 14.3-2

The applicant provided information in BLN SUP 14.3-2 to describe the AP1000 SSCs considered for selection to supplement the AP1000 DCD ITAAC Screening Summary Table (Table 14.3-1).

6.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

In addition, the associated acceptance criteria for relevant requirements of the Commission regulations for containment leak rate testing, are given in Section 6.2.6 of NUREG-0800.

The regulatory requirements related to this section are established in General Design Criteria (GDC) 52, "Capability for Containment Leakage Rate Testing"; GDC 53, "Provisions for Containment Testing and Inspection"; and GDC 54, "Piping System Penetrating Containment"; and Appendix J to 10 CFR Part 50, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors." In addition, the staff used guidance found in Nuclear Energy Institute (NEI) 94-01, as endorsed and modified by RG 1.163, "Performance-Based Containment Leak-Test Program."

The staff used the guidelines of NuStart Technical Report, AP-TR-NS01-A, Revision 2, "Containment Leak Rate Test Program," dated April 4, 2007 to review the operational program, Containment Leakage Rate Testing Program.

The regulatory requirements associated with the Tier 2 departure and exemption request are as follows:

> 10 CFR Part 52, Appendix D, Design Certification Rule for the AP1000 Design, Subsection III.B
>
> An applicant or licensee referencing this appendix …shall incorporate by reference…the generic Technical Specifications. The generic Technical Specifications for Programs and Manuals, Section 5.5.8 (c), Containment Leakage Rate Testing Program, state: The maximum allowable primary

> containment leakage rate, La, at post accident pressure, Pa, shall be 0.10 percent of primary containment air weight per day.
>
> 10 CFR 52.7 – Specific Exemptions
>
> The Commission may grant exemptions from the requirements of the regulations of this part, governed by 10 CFR 50.12 of this chapter.
>
> 10 CFR 50.12(a) – Specific Exemptions
>
> (a) The Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of the regulations of this part, which are authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security. The Commission will not consider granting an exemption unless special circumstances are present.

Regarding ITAAC, the related acceptance criteria are addressed in 10 CFR 52.80(a), which requires that a COL application contain proposed ITAAC and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the ITAAC are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity with the COL, the provisions of the Atomic Energy Act, and the NRC's regulations.

6.2.4 Technical Evaluation

The NRC staff reviewed Section 6.2 of the BLN COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the containment systems. The results of the NRC staff's evaluation of the information incorporated by reference in the BLN COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the BLN COL FSAR:

AP1000 COL Information Item

- STD COL 6.2-1

The NRC staff reviewed STD COL 6.2-1 related to COL Information Item 6.2-1 included under Section 6.2.5 of the BLN COL FSAR regarding the text added to Section 6.2.6 of the COL application. The added text references the program, which was reviewed and approved by the NRC in a letter from Stephanie Coffin, NRC, to Marilyn Kray, NuStart, "Final Safety Evaluation for AP1000 Technical Report No. AP-TR-NS01, Containment Leak Rate Test Program (TAC No. MD5136)," dated October 25, 2007.

License Conditions

- Part 10, License Condition 3, Item G.8
- Part 10, License Condition 6

The portion of License Conditions 3 and 6 relevant to this SER section is the containment leakage rate testing program listed in BLN COL FSAR Table 13.4-201. As noted in Section 13.4 of this SER, the containment leakage rate testing program meets the criteria for an operational program as specified in SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria." Therefore, the NRC staff finds License Conditions 3 and 6 acceptable, with respect to the inclusion of the containment leakage rate testing program in Table 13.4-201.

Due to discrepancies in the implementation milestones provided in various locations in the BLN COL application, RAI 6.2.6-1 was forwarded to the applicant. The applicant's response was that the milestones were meant to reflect the implementation of an approved testing program and when the tests were actually to be performed. However, the applicant agreed that this was not consistently reflected. The discrepancies have been addressed in BLN COL FSAR, Table 13.4-201, sheet 2 of 7, and Part 10, License Conditions and ITAAC. The changes indicate that the containment leak rate testing program will be implemented prior to initial fuel load. This RAI is closed.

Tier 2 Departure and Exemption Request

- BLN DEP 2.3-1

The portion of BLN DEP 2.3-1 evaluated in this SER section is the applicant's request for an exemption from the requirement of 10 CFR Part 52, Appendix D, Subsection III.B to comply with the requirements of the Generic TS. Specifically, TVA requested an exemption from Generic TS 5.5.8.c and proposed a containment leakage rate TS of 0.09 wt. percent/day as opposed to the Generic TS limit of 0.10 wt. percent/day. This plant-specific exemption request, to be included in a future amendment to the BLN COL FSAR, changes the containment leakage rate assumed in STD COL 6.2-1.

NUREG-0800 Section 6.2.6, "Containment Leakage Testing," acceptance criterion establishes the minimum acceptable leak rate of 0.10 percent per day. This limit supports 10 CFR 100.11, "Determination of the Exclusion Area," which requires that an applicant assume the expected demonstrable leakage rate from the containment. Nuclear power plant leakage rate testing experience shows that a design leakage rate of 0.10 percent per day provides adequate margin above typically measured containment leakage rates and is compatible with current leakage rate test methods and test acceptance criteria.

As stated in Section 15.9 of this report, the staff is currently evaluating whether or not the special circumstances required for an exemption are present. This is identified as part of Open Item 15.9-2. In addition, the staff is also evaluating whether or not reducing the maximum

allowable containment leakage rate would achieve the underlying purpose of TS 5.5.8 (c). **This is being tracked as Open Item 6.2-1.**

Supplemental Information

- STD SUP 14.3-1
- BLN SUP 14.3-2

The NRC staff reviewed STD SUP 14.3-1 and BLN SUP 14.3-2 related to the screening methodology used to develop the specific ITAAC included under Section 14.3 of the BLN COL FSAR. This evaluation is provided in Section 14.3 of this report.

The BLN COL FSAR incorporates the AP1000 ITAAC by reference, and includes no new information related to the containment design beyond what is addressed in the AP1000 DCD. None of the site-specific information and interface requirements related to the containment design involves a change in the plant design. Consequently, no site-specific ITAAC are required in this area. However, as noted in Open Item 6.2-1 above, the staff has not completed its review of the containment leak rate exemption request. If the staff's interaction with the applicant on this issue results in additional design features, the applicant will need to consider plant-specific ITAAC. This is **Open Item 6.2-2**.

6.2.5 Post Combined License Activities

The following items were identified as the responsibility of the COL holder:

- Part 10, License Condition 3, "Operational Program Implementation," Item G.8, regarding implementation of the containment leakage rate testing program prior to initial fuel load.

- Part 10, License Condition 6, "Operational Program Readiness," will require the licensee to develop a schedule that supports planning for and conduct of NRC inspections of the operational programs (specifically, the containment leakage rate testing program) listed in BLN COL FSAR Table 13.4-201, "Operational Programs Required by NRC Regulations." This schedule must be available to the NRC staff no later than 12 months after issuance of the COL. The condition will also require that the schedule be updated every 6 months until 12 months before scheduled fuel load, and every month thereafter until either the operational programs listed in the BLN COL FSAR Table 13.4-201 table have been fully implemented or the plant has been placed in commercial service, whichever comes first.

6.2.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant had addressed the required information relating to the containment systems and there is no outstanding information expected to be addressed in the BLN COL FSAR related to this section.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 6.2 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 containment systems 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 6.2 of this SER to reflect the final disposition of the DC amendment application.

In addition, the staff concludes that the relevant information presented in the BLN COL FSAR is acceptable and complies with the guidance and staff positions contained in RG 1.163. The staff based its conclusion on the following:

- STD COL 6.2-1, as related to the containment leak rate testing program, is acceptable because the NRC staff has determined that the requirements of 10 CFR Part 50, Appendix J, have been met.

- Part 10, License Condition 3, Item G.8 as it relates to the implementation of the containment leakage rate testing program, is acceptable because it complies with the regulatory guidance addressed in SECY-05-0197.

- Part 10, License Condition 6, as it relates to the timing of information related to the containment leakage rate testing program details to support NRC inspection activities, is acceptable because it complies with the regulatory guidance addressed in SECY-05-0197.

However, as a result of **Open Items 6.2-1 and 6.2-2** related to BLN DEP 2.3-1 noted above, the staff is unable to finalize its conclusions related to containment leak rate systems and leakage rate testing programs.

6.3 Passive Core Cooling System (Related to RG 1.206, Section C.III.1, Chapter 6, C.I.6.3, "Emergency Core Cooling System")

6.3.1 Introduction

The passive core cooling system is designed to provide emergency core cooling to mitigate design-basis events that involve a decrease in the RCS inventory, such as a LOCA, a decrease in heat removal by the secondary system, such as a feedwater system piping failure, or an increase in heat removal by the secondary system, such as a steam system piping failure. It also provides core cooling for shutdown events, such as a loss of normal residual heat removal system during a shutdown operation. The passive core cooling system is designed to perform the following safety-related functions:

- emergency core decay heat removal
- RCS emergency makeup and boration

- safety injection
- containment sump pH control

During long-term operation, the AP1000 passive core cooling system must withstand the effects of debris loading on the containment recirculation screens, IRWST screens and the fuel assemblies. The concern that debris may lead to unacceptable head loss for the recirculating flow was raised in GSI-191 and it is the topic of Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," and Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors." Section 6.3 of the AP1000 DCD contains an evaluation of this issue and Section 6.2.1.8 of NUREG-1793 contains the staff's review, which was performed in accordance with the NRC-approved evaluation methodology.

6.3.2 Summary of Application

Section 6.3 of the BLN COL FSAR, Revision 1, incorporates by reference Section 6.3 of the AP1000 DCD, Revision 17. Section 6.3 of the DCD includes Section 6.3.2.2.7, "IRWST and Containment Recirculation Screens;" Section 6.3.8.1, "Containment Cleanliness Program;" and Section 6.3.8.2, "Verification of Water Sources for Long-Term Recirculation Cooling Following a LOCA."

In addition, in BLN COL FSAR Section 6.3.8.1, the applicant provided the following:

AP1000 COL Information Items

- STD COL 6.3-1

The applicant provided additional information in STD COL 6.3-1 to address COL Information Item 6.3-1 identified in AP1000 DCD Table 1.8-2, "Summary of AP1000 Standard Plant Combined License Information Items." STD COL 6.3-1 requires the applicant to develop a containment cleanliness program to limit the amount of debris that might be left in the containment following refueling and maintenance outages.

Section 1.9 of the BLN COL FSAR, Revision 1, incorporates by reference Section 1.9, "Compliance With Regulatory Criteria," of the AP1000 DCD, Revision 17. Section 1.9 of the DCD includes Section 1.9.4.2.3, "New Generic Issues," and Section 1.9.5.5, "Operational Experience."

In addition, in BLN COL FSAR Section 1.9, the applicant provided the following information related to the effect of debris accumulation on long term cooling:

- STD COL 1.9-3

The applicant provided additional information in STD COL 1.9-3 to address the review of GSI-191.

- STD COL 1.9-2

The applicant provided additional information in STD COL 1.9-2 to address the review of Bulletin 03-01 and GL 04-02.

6.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

In conducting its review of STD COL 6.3-1, the NRC staff used the guidance and staff positions of RG 1.82, Revision 3, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors," and NEI 04-07, "Pressurized Water Reactor Sump Performance Evaluation Methodology," Revision 0, Volume 1, as supplemented by the NRC in the "Safety Evaluation by The Office of Nuclear Reactor Regulation Related to NRC Generic Letter 2004-02," contained in NEI 04-07, Revision 0, Volume 2.

6.3.4 Technical Evaluation

The NRC staff reviewed Section 6.3 of the BLN COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the passive core cooling system. The results of the NRC staff's evaluation of the information incorporated by reference in the BLN COL application are documented in NUREG-1793 and its supplements.

Westinghouse modified Section 6.3 of the referenced AP1000 DCD, Revision 17, in APP-GW-GLE-002, Revision 5. The incorporation of these modifications into the DCD referenced by the BLN COL FSAR will be tracked under **Open Item 1-1**.
The staff reviewed the information in the BLN COL FSAR:

AP1000 COL Information Items

- STD COL 6.3-1

The applicant provided additional information in STD COL 6.3-1 to address COL Action Item 6.2.1.8.1-1 identified in NUREG-1793 and COL Information Item 6.3-1 identified in Table 1.8-2 of the AP1000 DCD. The applicant added information to BLN COL FSAR Section 6.3.8.1, "Containment Cleanliness Program," providing details of the program and procedures to minimize the amount of debris that might be left in containment following refueling and maintenance outages, including requirements for cleanliness inspections and limits on materials introduced into containment. TVA states that the cleanliness program will be consistent with the evaluation discussed in the AP1000 DCD.

In its June 9, 2009, response to RAI 6.2.2-1, the applicant addressed the changes made to Revision 17 of the AP1000 DCD in APP-GW-GLE-002 and staff questions on cleanliness measurements with a modification to STD COL 6.3-1. This included adding that the cleanliness program will meet the DCD limits on latent debris, that housekeeping procedures will be implemented to return work areas to original conditions upon completion of work, and that a sampling program will be used to quantify the amount of latent debris. The sampling program is stated to be consistent with NEI 04-07 Volumes 1 (guidance report) and 2 (NRC safety evaluation). The sampling will be done after containment exit cleanliness inspections, prior to start up, and the results will be evaluated post-start up. Any non-conforming results will be addressed in the Corrective Action Program.

The resulting cleanliness program is consistent with the RG 1.82 recommendation that procedures be in place to regularly clean the containment and to control and remove foreign materials from containment. The sampling program included in STD COL 6.3-1 is required to demonstrate that the latent debris found in containment is within the AP1000 DCD specified limits of 130 pounds of which up to 6.6 pounds may be fibrous material. The DCD specified limits were demonstrated to be acceptable through scale testing and analysis. Thus, STD COL 6.3-1 is consistent with the RG 1.82 recommendation that the cleanliness program be correlated to the amount of debris used in the long term cooling analysis. It is appropriate that the sampling program be in accordance with NEI 04-07, Volumes 1 and 2, because these documents contain the most recent NRC-approved evaluation methodology for cleanliness programs. The response to RAI 6.2.2-1 is acceptable and incorporation of the changes to STD COL 6.3-1 in the BLN FSAR will be tracked as **Confirmatory Item 6.3-1**.

The staff reviewed the following information in the BLN COL FSAR as it relates to the effect of debris accumulation on long term cooling:

- STD COL 1.9-3

The applicant added information to Section 1.9.4.2.3, “New Generic Issues,” regarding Issue 191. The applicant states that the design aspects are addressed by the AP1000 DCD and the COL applicant portions are the protective coatings program discussed in BLN COL FSAR Section 6.1.2.1.6 and the containment cleanliness program discussed in BLN COL FSAR Section 6.3.8.1. The staff agrees that these are the only two COL items identified in the staff’s review of GSI-191 from Section 6.2.1.8 of NUREG-1793.

- STD COL 1.9-2

The applicant added line items for Bulletin 03-01 and GL 04-02 in Table 1.9-204, “Generic Communications Assessment.” The new information states that the design aspects are addressed in the AP1000 DCD and that the COL applicant aspects are addressed in BLN COL FSAR Section 6.3 for Bulletin 03-01 and BLN COL FSAR Section 6.3.8.1 for GL 04-02. The staff agrees that the design aspects of these generic communications are addressed in the staff’s review of GSI-191 from Section 6.2.1.8 of NUREG-1793. The COL applicant aspects are addressed in the staff’s review of BLN COL FSAR Section 6.1.2.1.6 and BLN COL FSAR Section 6.3.8.1.

6.3.5 Post Combined License Activities

There are no COL license conditions related to this section.

6.3.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the passive containment cleanliness program and there is no outstanding information expected to be addressed in the BLN COL FSAR related to this section.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 6.3 of the AP1000 DCD, as stated in Revision 17 of the AP1000 DCD and in APP-GW-GLE-002, Revision 5. 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 passive core cooling system 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 6.3 of this SER to reflect the final disposition of the DC amendment application.

As a result of **Open Item 1-1** and **Confirmatory Item 6.3-1**, the staff is unable to finalize its conclusions related to the containment cleanliness program.

6.4 Habitability Systems

6.4.1 Introduction

The design and operation of a set of systems provide habitability functions for the AP1000 design. These systems include the nuclear island non-radioactive ventilation system (VBS), the main control room (MCR) emergency habitability system (VES), the radiation monitoring system (RMS), the plant lighting system (ELS), and the fire protection system (FPS).

6.4.2 Summary of Application

Section 6.4 of the BLN COL FSAR, Revision 1, incorporates by reference Section 6.4 of the AP1000 DCD, Revision 17. STD SUP 6.4-2 and STD COL 6.4-1 were reviewed using BLN COL FSAR Revision 2.

In addition, in BLN COL FSAR Section 6.4, the applicant provided the following:

Supplemental Information

- STD SUP 6.4-1

The applicant provided supplemental information in STD SUP 6.4-1 to address control room (CR) doses for accident analyses in the downwind unit of a dual unit site.

- STD SUP 6.4-2

In BLN FSAR, Revision 2, the applicant provided a list of onsite chemicals in BLN COL FSAR Table 6.4-202 to supplement the list of chemicals identified in Table 6.4-1 of the DCD. The chemicals in Table 6.4-202 associated with STD COL 6.4-1 (as annotated in the left margin) include: hydrogen (both in a gas and liquid form), hydrazine, morpholine, sulfuric acid, sodium hydroxide, fuel oil, sodium molybdate (molybdic acid, disodium salt), sodium hexametaphosphate, and sodium hypochlorite.

AP1000 COL Information Items

- STD COL 6.4-1

In BLN FSAR, Revision 2, the applicant provided a list of onsite chemicals in BLN COL FSAR Table 6.4-202 to supplement the list of chemicals identified in Table 6.4-1 of the AP1000 DCD. The chemicals in Table 6.4-202 having this left margin annotation include: nitrogen, carbon dioxide, and ammonium comp polyethoxylate.

- STD COL 6.4-2

The applicant provided additional information in STD COL 6.4-2 to address COL Information Item 6.4-2 regarding the procedures and training for CR habitability pursuant to the resolution of GSI-83, “Control Room Habitability.”

- BLN COL 6.4-1

The applicant provided plant-specific information BLN COL 6.4-1 to address COL Information Item 6.4-1. The local toxic gas services are evaluated to determine the need for monitoring for CR habitability.

Supplemental Information

- STD SUP 14.3-1

The applicant provided supplemental information in STD SUP 14.3-1 to describe the ITAAC for each site-specific system described in the FSAR that meet the selection criteria, and that are not included in the certified design.

- BLN SUP 14.3-2

The applicant provided information in BLN SUP 14.3-2 to describe the AP1000 SSCs considered for selection to supplement the AP1000 DCD ITAAC Screening Summary Table (Table 14.3-1).

6.4.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for habitability systems are given in Section 6.4 of NUREG-0800.

CR habitability is addressed is the following regulations and guidance:

- GDC 4, “Environmental and Dynamic Effects Design Bases,” as it relates to SSCs important to safety being designed to accommodate the effects of and to be compatible with the environmental conditions associated with postulated accidents.

- GDC 5, “Sharing of Structures, Systems and Components,” as it relates to ensuring that sharing among nuclear power units of SSCs important to safety will not significantly impair the ability to perform safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining unit(s).

- GDC 19, “Control Room,” as it relates to maintaining the nuclear power unit in a safe condition under accident conditions and providing adequate radiation protection.

- 10 CFR 50.34(f)(2)(xxviii), as it relates to evaluations and design provisions to preclude certain CR habitability problems.

- 10 CFR 52.80(a), which requires that a COL application address the proposed inspections, tests, and analyses, including those applicable to emergency planning, that the licensee shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity with the COL, the provisions of the Atomic Energy Act, and the NRC's regulations.

- Three Mile Island (TMI) Action Plan, Item III.D.3.4, “Control Room Habitability.”

- RG 1.78, “Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release,” Revision 1.

- RG 1.52, “Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post Accident Engineered Safety Feature Atmosphere Cleanup Systems in Light Water Cooled Nuclear Power Plants,” Revision 3, June 2001.

- RG 1.196, “Control Room Habitability at Light Water Nuclear Power Reactors,” May 2003.

6.4.4 Technical Evaluation

The NRC staff reviewed Section 6.4 of the BLN COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to habitability systems. The results of the NRC staff's evaluation of the information incorporated by reference in the BLN COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the BLN COL FSAR:

Supplemental Information

- STD SUP 6.4-1

The NRC staff reviewed STD SUP 6.4-1 related to the evaluation of CR doses in the other unit of a dual unit plant included under Section 6.4.4 of the BLN COL FSAR. The staff concludes that STD SUP 6.4-1 is acceptable because the dose to the CR operators at an adjacent AP1000 due to a radiological release from another unit is bounded by the dose to CR operators on the affected unit. Further, simultaneous accidents at multiple units at a common site are not considered to be a credible event, unless there is a reliance on shared systems between the two units. This is not the case for the AP1000 design. STD SUP 6.4-1 is also evaluated by the NRC staff in SER Section 15.9, "Radiological Consequences of Accidents."

- STD SUP 6.4-2

STD SUP 6.4-2 provides the chemical names, state of the chemical, quantity and location of the chemicals. The chemicals include: hydrogen (both in a gas and liquid form), hydrazine, morpholine, sulfuric acid, sodium hydroxide, fuel oil, sodium molybdate (molybdic acid, disodium salt), sodium hexametaphosphate, and sodium hypochlorite.

Subsequent to the issuance of Section 2.2.3 of this report, the staff reviewed the applicant's inventory of chemicals contained in STD SUP 6.4-2 for threats to CR habitability. The staff has determined, with the exception of hydrazine, that the STD SUP 6.4-2 chemicals do not warrant additional analysis for CR habitability because they do not exceed the immediate danger to life and health (IDLH) limit at ground level at the location of the CR.

Regarding hydrazine, a further analysis with the HABIT computer code (RG 1.78) confirms that the hydrazine may exceed the IDLH limit at ground level. However, additional analysis shows that the hydrazine concentrations at the CR intake and inside the CR will not exceed the IDLH limit when crediting the design of the CR ventilation intake located at the auxiliary building (57 ft. above ground), calculations show concentrations much less than the IDLH limit. These results are based on a temperature of 25 °C and a wind speed of 1 m/sec, with meteorology F class, which are the conditions used by the applicant and RG 1.78. Hence, it is determined that the hydrazine listed in STD SUP 6.4-2 will not pose a threat to CR habitability.

AP1000 COL Information Items

- STD COL 6.4-1

STD COL 6.4-1 information also provides the chemical names, state of the chemical, quantity and location of the chemicals. The chemicals include: nitrogen, carbon dioxide, and ammonium comp polyethoxylate.

Subsequent to the issuance of Section 2.2.3 of this report, the staff reviewed the applicant's inventory of chemicals listed in STD COL 6.4-1, and screened out the toxic chemicals that do not pose a threat to CR habitability. The staff has determined that with the exception of carbon dioxide the STD COL 6.4-1 chemicals do not warrant additional analysis because they do not exceed the IDLH limit at ground level at the location of the CR.

Regarding carbon dioxide, analysis with the HABIT computer code (RG 1.78) finds that carbon dioxide will not exceed the IDLH limit at ground level. This analysis is based on a temperature of 25 °C and a wind speed of 1 m/sec, with meteorology F class, which are the conditions used by the applicant and RG 1.78. Hence, it is determined that the carbon dioxide contained in STD COL 6.4-1 will not pose a threat to CR habitability.

The staff notes that the chemical analysis relied on by the COL applicant includes assumptions associated with design features, such as the intake location for the CR ventilation system. In RAI 6.4-8, the staff asked if any of the analyses of the chemicals in Table 6.4-202 credit design features, such as an elevated CR intake, to keep the chemical concentration in the CR below the IDLH levels, in which case a description of the design features credited in the safety analyses should be provided in the FSAR. This is **Open Item 6.4-1**.

- STD COL 6.4-2

The NRC staff reviewed STD COL 6.4-2, related to COL Information Item 6.4-2 and COL Action Item 6.4-1, included under Section 6.4.3 of the BLN COL FSAR. The applicant stated that procedures and training for CR habitability are written in accordance with Section 13.5 for CR operating procedures, and Section 13.2 for operator training. In Section 6.4.3 of the FSAR, the applicant states that the procedures and training will be verified to be consistent with the intent of GSI-83.

However, the level of detail provided in the standard portion of BLN COL FSAR Section 6.4.3 is not adequate to determine if the regulatory requirements are met. As a result, the staff issued RAI 6.4-7, which asked the applicant to provide in the FSAR the essential elements of the training and procedures necessary to demonstrate that the regulatory requirements are met. The staff questioned what the operators would be directed and trained to do to meet the recommendations in RG 1.196. Specifically, in RAI 6.4-7, the staff requested information addressing the following:

- RG 1.78, Regulatory Position C.5, "Emergency Planning"

- RG 1.196, Regulatory Position 2.5, "Hazardous Chemicals"

- RG 1.196, Regulatory Position 2.2.1, “Comparison of System Design, Configuration, and Operation with the Licensing Basis”

- RG 1.196, Regulatory Position 2.7.1, “Periodic Evaluations and Maintenance”

The resolution of RAI 6.4-7 is identified as **Open Item 6.4-2**.

- BLN COL 6.4-1

The NRC staff reviewed BLN COL 6.4-1, related to COL Information Item 6.4-1 included under Section 6.4.4.2 of the BLN COL FSAR. BLN COL FSAR Section 2.2.3.1.3.3 identifies a pressurized liquid chlorine tanker accident as a potential threat to the control room. TVA performed an analysis for a chlorine release event and concluded that chlorine monitors would not be needed, as permitted by RG 1.78, because there would be sufficient time for the operators to detect the odor of chlorine, actuate the VES, and don a respirator and protective clothing. Section 6.4.4.2 of the BLN COL FSAR states that a chlorine spill from a tanker 2.5 miles away would result in approximately four minutes for the chlorine level to start being elevated, eight additional minutes until humans could detect the chlorine (3.5 parts per million [ppm]) and RG 1.78 states that the NRC expects the operators to don a respirator and protective clothing (or take other mitigating actions) within the next two minutes (at 14 minutes).

TVA justified its decision to rely on the operators’ sense of smell and added a requirement to actuate the VES in order to isolate the CR envelope and prevent additional chlorine gas from entering it.

- BLN COL 6.4-1

In a letter dated May 4, 2009, Westinghouse responded to RAI-SRP6.4-SPCV-01 through RAI-SRP6.4-SPCV-06, with proposed changes to the MCR design in Sections 6.4 and 9.4 of the AP1000 DCD. In particular, Westinghouse changed the in-leakage rate from 0.0023 m^3/s (about 5 cubic feet per minute [cfm]) to 15 cfm (5 cfm is attributed to in-leakage from ingress/egress activities, and the other 10 cfm is attributed to in-leakage from sources other than the vestibule).

In a letter dated June 29, 2009, TVA responded to RAI 6.4-6, which articulated staff concerns regarding the applicant’s toxic chemical habitability analysis. The applicant’s response indicated that the CR personnel would actuate the VES within 2 minutes once the human detection odor threshold was reached. The scenario provides a new measure of allowable operator action time for site vicinity chlorine release. The results of the applicant’s analysis support the conclusion that more than 2 minutes would be available for operator action to activate the VES, and support the conclusion that the BLN location satisfies RG 1.78 guidance for protecting the CR operators from toxic gas releases.

The NRC staff performed an independent analysis using the computer code HABIT 1.1. The sequence of events is illustrated as follows:

Time (min)	Event	Unfiltered	Note
0	chlorine spill	670 cfm	
10	plumes arrive CR intake	670 cfm	
15.8	CR concentration, 3.5 ppm	670 cfm	odor threshold
16.8	CR intake peak, 105 ppm	670 cfm	
17.8	VBS manual switch to VES CR concentration, 7.15 ppm	15 cfm	
20.8	CR concentration, 7.2 ppm	15 cfm	peak concentration

The CR interior chlorine concentration peak is less than the chemical immediately dangerous to life (IDLH) limit of 10 ppm for chlorine.

The results of the staff's independent analysis of chlorine release support TVA's conclusion that more than 2 minutes would be available for operator action to activate the VES.

- BLN COL 6.4-1

With respect to hydrogen fluoride, in its letter dated June 29, 2009, TVA responded to RAI 6.4-6 by stating that the CR personnel would actuate the VES within 2 minutes once the human detection odor threshold was reached. The scenario provides a measure of allowable operator action time for site vicinity hydrogen fluoride release. The results of the applicant's analysis support the conclusion that more than 2 minutes would be available for operator action to activate the VES, and support the conclusion that the BLN location satisfies RG 1.78 guidance for protecting the CR operator from toxic gas releases.

The NRC staff performed an independent analysis using the computer code HABIT 1.1 and the same quantity of chemicals and distance from the CR as the applicant. The sequence of events is illustrated as follows:

Time (min)	Event	Unfiltered	Note
0	hydrogen fluoride spill	670 cfm	
10.25	plumes arrive CR intake	670 cfm	
11.77	CR concentration, 0.04 ppm	670 cfm	odor threshold
13.77	VBS manual switch to VES CR concentration, 0.98 ppm	15 cfm	
17.25	CR intake peak, 161 ppm	15 cfm	
20.75	CR concentration, 1.37 ppm	15 cfm	peak concentration

The CR interior hydrogen fluoride concentration peak is less than the chemical immediately dangerous to life (IDLH) limit of 30 ppm for hydrogen fluoride.

The results of the staff's independent analysis of hydrogen fluoride release supports TVA's conclusion that more than 2 minutes would be available for operator action to activate the VES.

- BLN COL 6.4-1

In a letter dated February 20, 2009, TVA responded to staff concerns related to site hazards in RAI 2.2.3-10 by providing a chemical screening for onsite chemicals. The applicant's chemical screening identified no impact related to control room habitability except for sodium hypochlorite. Therefore, TVA performed further evaluation of sodium hypochlorite. Results indicate IDLH values would not exceed the 10 ppm threshold and no protective actions would be required to protect the CR operator in the event of a worst case scenario involving a tank rupture.

The NRC staff performed an independent analysis using the computer code HABIT 1.1. Sodium hypochlorite can be considered immobile in air because it has a boiling point of 101°C, which is greater than standard atmospheric conditions. The concern is that sodium hypochlorite, at above 40°C, may decompose. The decomposition products venting into atmosphere is mainly oxygen. Therefore, oxygen concentration is calculated during a scenario involving a sodium hypochlorite spill event. The sequence of events is illustrated as follows:

Time (min)	Event	Unfiltered	Note
0	oxygen venting	670 cfm	
1.4	plumes arrive CR intake	670 cfm	
2.2	CR intake peak, 1680 ppm	670 cfm	
4.2	CR concentration, 31.8 ppm	670 cfm	peak concentration
8.9	CR intake, 0.3 ppm	670 cfm	
8.9	CR concentration, 31.3 ppm	670 cfm	

The results show that no VBS switch to VES operator action would be required. The exterior oxygen concentration at the CR heating, ventilation, and air conditioning (HVAC) intake peaks at 1680 ppm after 2.2 minutes into the sodium hypochlorite spill event. A concentration of 1680 ppm is equivalent to 0.168 percent and the normal atmospheric chemistry is 20.95 percent O_2 by volume. The peak atmospheric oxygen at the CR intake is 21.12 percent. This neither constitutes a combustion hazard, nor reaches a toxic level.

The results of this analysis support the conclusion that the BLN location satisfies RG 1.78 guidance for protecting the CR operators from toxic gas releases. However, as stated in Section 2.2.3 of this report, there are three open items (i.e., Open Items 2.2.3-2, 2.2.3-3, and 2.2.3-4) associated with the toxic chemicals provided in FSAR Section 2.2.3 of the BLN COL application. The resolution of these issues has the potential to affect the list of chemicals that must be addressed in the CR habitability analysis. Until Open Items 2.2.3-2 through 2.2.3-4 are

resolved, the staff cannot come to a conclusion on the CR habitability toxic gas analysis. This is **Open Item 6.4-3**.

Supplemental Information

- STD SUP 14.3-1
- BLN SUP 14.3-2

The NRC staff reviewed STD SUP 14.3-1 and BLN SUP 14.3-2 related to the screening methodology used to develop the specific ITAAC included under Section 14.3 of the BLN COL FSAR. This evaluation is provided in Section 14.3 of this report.

The BLN COL FSAR and RCOL application incorporates the AP1000 ITAAC by reference, and contains no new information related to the design of the containment and ventilation systems beyond what is addressed in the AP1000 DCD. None of the site-specific information and interface requirements related to the containment and ventilation systems involves a change in the plant design. Consequently, no site-specific ITAAC are required in this area. However, the staff notes that Section 6.4 includes three open items related to toxic gas and the need for toxic gas monitors. If the staff's interaction with the applicant on the resolution of these issues results in the addition of toxic gas monitors or other features to the plant design, the applicant will need to consider plant-specific ITAAC for those monitors. This is **Open Item 6.4-4**.

6.4.5 Post Combined License Activities

The following item was identified as the responsibility of the COL holder:

- STD COL 6.4-2, involving operator training associated with CR habitability . As discussed in the technical evaluation above aspects of the control room habitability training program will be contained in the operator training program (Section 13.2 of the application). The post COL activities associated with the operator training program are as follows:

  - Part 10, License Condition 3, "Operational Program Implementation," Item B.1, regarding implementation of the operator training program 18 months prior to scheduled date of initial fuel load.

  - Part 10, License Condition 6, "Operational Program Readiness," will require the licensee to develop a schedule that supports planning for and conduct of NRC inspections of the operational programs (specifically, the operator training program) listed in BLN COL FSAR Table 13.4-201, "Operational Programs Required by NRC Regulations." This schedule must be available to the NRC staff no later than 12 months after issuance of the COL. The condition will also require that the schedule be updated every 6 months until 12 months before scheduled fuel load, and every month thereafter until either the operational programs listed in the BLN COL FSAR Table 13.4-201 table have been fully implemented or the plant has been placed in commercial service, whichever comes first.

6.4.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant had addressed the required information relating to CR habitability, and there is no outstanding information expected to be addressed in the BLN COL FSAR related to this section.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 6.4 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 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 6.4 of this SER to reflect the final disposition of the DC amendment application.

However, as a result of Open Items 6.4-1, 6.4-2, 6.4-3, and 6.4-4, the staff is unable to finalize its conclusions related to CR habitability.

6.5 Fission Product Removal and Control Systems

In the event of a design basis LOCA there is an assumed core degradation that results in a significant release of radioactivity to the containment atmosphere. This activity would consist of noble gases, particulates, and a small amount of elemental and organic iodine. Fission product removal and control systems are considered to be those systems for which credit is taken in reducing accidental release of fission products. The AP1000 design has no active system to control fission products in the containment following a postulated accident. The fission product control system is the primary containment. AP1000 DCD Appendix 15B discusses satisfactory removal of airborne activity (elemental iodine and particulates) from the containment atmosphere by natural removal processes (e.g., deposition and sedimentation) without the use of containment spray.

Section 6.5 of the BLN COL FSAR, Revision 1, incorporates by reference, with no departures or supplements, Section 6.5, "Fission Product Removal and Control Systems," of Revision 17 of the AP1000 DCD. In addition, Appendix 6A of the BLN COL FSAR, Revision 1, incorporates by reference, with no departures or supplements, Appendix 6A, "Fission Product Distribution in the AP1000 Post-Design Basis Accident Containment Atmosphere," 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 these sections remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to section 6.5 and Appendix 6A.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 6.5 and Appendix 6A 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 fission product removal and control systems 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 Open Item 1-1. The staff will update Section 6.5 of this SER to reflect the final disposition of the DC amendment application.

6.6 Inservice Inspection of Class 2, 3, and MC Components (Related to RG 1.206, Section C.III.1, Chapter 6, C.I.6.6, "Inservice Inspection of Class 2 and 3 Components")

6.6.1 Introduction

Inservice inspection (ISI) programs must meet requirements of 10 CFR 50.55a, "Codes and Standards," in which Section XI of the ASME Boiler and Pressure Vessel Code (ASME Code) is incorporated by reference. This section addresses the ISI of ASME Code Class 2 and 3 components. ASME Code Class 2 and 3 components must meet the applicable inspection requirements set forth in Subsections IWC and IWD of Section XI of the ASME Code, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components." Subsection IWC and IWD also include requirements for preservice examinations prior to initial plant startup as provided in Subarticles IWC-2200 and IWD-2200.

6.6.2 Summary of Application

Section 6.6 of the BLN COL FSAR, Revision 1, incorporates by reference Section 6.6 of the AP1000 DCD, Revision 17. In addition, in BLN COL FSAR Section 6.6, the applicant provided the following:

AP1000 COL Information Items

- STD COL 6.6-1

The applicant provided additional information in STD COL 6.6-1 to address COL Information Item 6.6-1. The information relates to plant-specific preservice inspection (PSI) and ISI programs.

- STD COL 6.6-2

The applicant provided additional information in STD COL 6.6-2 to address COL Information Item 6.6-2. The information relates to preservation of component accessibility design considerations during the construction phase.

Supplemental Information

- STD SUP 6.6-1

The applicant provided supplemental information to add additional text to AP1000 DCD Section 6.6.1. The information relates to the design stage consideration of component accessibility to enable the performance of ISI examinations.

License Condition

- Part 10, License Condition 6

This license condition states that the COL holder shall provide an operational program schedule to support NRC inspections.

6.6.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

The acceptance criteria associated with the relevant requirements of the Commission regulations for ISI of Class 2 and 3 components are identified in Section 6.6 of NUREG-0800.

The applicable regulatory requirements for acceptance of the resolution of COL information items and supplementary information on ISI and testing of Class 2 and 3 components are established in GDC 45, "Inspection of Cooling Water System," found in Appendix A to 10 CFR Part 50, as it relates to periodic inspection of important components, such as heat exchangers and piping to assure the integrity and capability of the system.

The applicable policy for acceptance of COL information items, as it relates to fully describing an operational program, is found in SECY-05-0197.

6.6.4 Technical Evaluation

The NRC staff reviewed Section 6.6 of the BLN COL FSAR and the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information contained in the application and incorporated by reference addresses the required information relating to the ISI of Class 2 and 3 components. The results of the NRC staff's evaluation of the information incorporated by reference in the BLN COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the BLN COL FSAR:

AP1000 COL Information Items

- STD COL 6.6-1

In Section 6.6 of the NRC staff FSER (NUREG-1793, dated September 2004), the staff concluded that the AP1000 ISI program for ASME Code Class 2 and 3 components is acceptable and meets the requirements of 10 CFR 50.55a with regard to the preservice and inservice inspectability of these components. The specific version of the ASME Code, Section XI used as the baseline Code in the AP1000 certified design, is the 1998 Edition up to and including the 2000 Addenda. It should be noted that the staff did not identify any portions of the AP1000 ISI program for Class 1, 2 and 3 components that were excluded from the scope of

the staff's review of the AP1000 DC (as the staff did for inservice testing of valves in AP1000 FSER Section 3.9.6.4). Therefore, the staff's conclusions regarding the acceptability of the AP1000 ISI program based on the 1998 Edition up to and including the 2000 Addenda of the ASME Code, Section XI with regard to preservice and inservice inspectability of Class 2 and 3 components remains unchanged. The staff's evaluation of the operational program aspects of the ASME Code Class 2 and 3 ISI program is addressed with Class 1 ISI in Section 5.2.4 of this SER. The review of the COL applicant's supplemental information also includes the adequacy of the ISI program for reactor containment (Class MC). In Revision 17 of the AP1000 DCD, Class MC components were added to the DCD, Section 6.6, as being within the scope of the ISI Program. The COL applicant incorporated DCD Section 6.6 in its entirety under Revision 1 of its FSAR. Accordingly, the staff's evaluation of this section focused on the acceptability of the COL applicant's supplemental information and responses to AP1000 COL information items and action items as they relate to ISI of ASME Code Class 2, 3, and MC components.

As part of STD COL 6.6-1, the COL applicant added to the end of DCD Section 6.6.2 words to state that the initial ISI program will incorporate the latest Edition and Addenda of the ASME Code (Section XI) approved in 10 CFR 50.55a(b) on the date 12 months before initial fuel load. The COL applicant stated that successive 120-month inspection intervals must comply with the requirements of the latest Edition and Addenda of the Code incorporated by reference in 10 CFR 50.55a(b) 12 months before the start of the 120-month interval, subject to the limitations and modifications listed in 10 CFR 50.55a(b). The requirements in 10 CFR 50.55a(g) state that inservice examinations of components and system pressure tests conducted during the initial 120-month inspection interval must comply with the requirements in the latest Edition and Addenda of the Code incorporated by reference in paragraph (b) of 10 CFR 50.55a on the date 12 months before the date scheduled for initial loading of fuel under a COL under 10 CFR Part 52. The staff concludes that the supplemental information provided by the COL applicant meets the NRC's regulations and is, therefore, acceptable.

As part of STD COL 6.6-1, the COL applicant added to the end of DCD Section 6.6.1 words to state that Class 2 and 3 components are included in the equipment designation list contained in the ISI program. The requirements in 10 CFR 50.55a(g)(3)(ii) state, in part, that Class 2 and 3 components be designed and provided with access to enable the performance of ISI examinations. In addition, the inclusion of Class 2 and 3 components is consistent with the requirements of an ISI program as defined under ASME Section XI, and is, therefore, acceptable. The staff concludes that the supplemental information provided by the COL applicant meets the NRC's regulations and is, therefore, acceptable.

In Section 6.6 of the FSER (NUREG-1793), the staff identified COL Action Item 6.6-1 in which the COL applicant will prepare a PSI program and an ISI program for ASME Code, Class 2 and 3 systems, components and supports. The PSI and ISI programs will address the equipment and techniques used. As part of STD COL 6.6-1, the COL applicant describes the use of visual, surface, ultrasonic, alternative examination techniques, and the use of automated equipment to perform the examinations. The COL applicant referenced the relevant portions of the ASME Code, Section XI to describe the nondestructive examination techniques and alternative examinations. The COL applicant also added information to describe the 120-month inspection interval as defined by IWB-2400 for Inspection Program B and the evaluation of examination results as defined by the ASME Code, Section XI, paragraphs IWC-, IWD-, IWE-, or IWF-3400 acceptance criteria. In addition, the COL applicant appropriately referenced

10 CFR 50.55a(b)(2)(xix) and IWA-2240 as described in the 1997 Addenda of the ASME Code, Section XI when applying alternative examination provisions. The supplemental information provided by the COL applicant meets the requirements in 10 CFR 50.55a, the ASME Code, Section XI, and the guidelines in RG 1.206, Section C.III.1, Chapter 6, C.I.6.6.3, and is, therefore, acceptable. Based on the discussion above, the staff concludes that the supplemental information under STD COL 6.6-1 is acceptable.

- STD COL 6.6-2

As part of STD COL 6.6-2, the COL applicant states that during the construction phase of the project, anomalies and construction issues are addressed using change control procedures. Modifications reviewed following DC will adhere to the same level of review as the certified design, thus, control of accessibility is maintained during post-DC activities. Control of accessibility for inspectability and testing during post-DC activities is provided via procedures for design control and plant modifications. In the NRC staff's FSER (NUREG-1793), the staff identified COL Action Item 6.6-2, which recommends COL applicants referencing the AP1000 certified design address the controls to preserve accessibility and inspectability for ASME Code, Section III, Class 2 and 3 components and piping during construction or other post-DC activities. The NRC staff reviewed the applicant's proposed resolution of COL Action Item 6.6-2 using NUREG-0800, Section 6.6. The staff finds that the accessibility needed to perform PSI/ISI examinations is maintained during the design, construction and operational phases, which satisfies NUREG-0800, Section 6.6 recommendations for accessibility. In addition, the supplemental information meets the regulations under 10 CFR 50.55a(g)(3)(ii), which requires that Class 1, 2, and 3 components be designed and provided with access that enables the performance of ISI examinations, and the requirements under ASME Code, Section XI, IWA-1500. Based on the discussion above, the staff concludes that STD COL 6.6-2 is acceptable.

Supplemental Information

- STD SUP 6.6-1

As part of STD SUP 6.6-1, the COL applicant added supplemental information to the AP1000 DCD, Section 6.6.2, to address accessibility of Class 2, 3, and Class MC pressure retaining components to permit preservice and inservice examinations. Factors considered, such as examination requirements, techniques, accessibility, geometry, and material selections, are used in establishing the designs with the goals being to eliminate uninspectable components, reduce occupational radiation exposure, reduce inspection times, allow state-of-the-art inspection systems, and enhance detection and the reliability of flaw characterization.

The requirements in 10 CFR 50.55a(g)(3)(ii) state, in part, that Class 2 and 3 components be designed and provided with access to enable the performance of ISI examinations. ASME Code, Section XI, IWA-1500 requires that access be provided to enable the performance of ISI examinations, along with design considerations to render ISI practical. The staff finds that the supplemental information under STD SUP 6.6-1 meets the requirements of 10 CFR 50.55a and ASME Code, Section XI, and is, therefore, acceptable.

License Condition

- Part 10, License Condition 6

The COL applicant proposed a license condition for BLN for all operational programs requiring that the licensee shall submit to the appropriate Director of the NRC a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of NRC inspections of operational programs. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the operational program has been implemented or the plant has been placed into commercial service. A separate license condition for PSI and ISI program implementation requirements is not necessary in the BLN COL FSAR since it is a requirement under 10 CFR 50.55a. However, submittal of the schedule for the PSI and ISI program development is necessary to plan for and conduct NRC inspections during construction. The staff finds that this schedule will enable the staff to adequately plan and schedule inspections of the PSI and ISI programs during the construction phase. This proposed license condition is consistent with the policy established in SECY-05-0197, and is acceptable.

6.6.5 Post Combined License Activities

The following item was identified as the responsibility of the COL holder:

- Part 10, License Condition 6, “Operational Program Readiness,” will require the licensee to develop a schedule that supports planning for and conduct of NRC inspections of the operational programs (specifically, the PSI and ISI programs) listed in BLN COL FSAR Table 13.4-201, "Operational Programs Required by NRC Regulations." This schedule must be available to the NRC staff no later than 12 months after issuance of the COL. The condition will also require that the schedule be updated every 6 months until 12 months before scheduled fuel load, and every month thereafter until either the operational programs listed in the BLN COL FSAR Table 13.4-201 table have been fully implemented or the plant has been placed in commercial service, whichever comes first.

6.6.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff’s review confirmed that the applicant addressed the required information relating to ISI of ASME Code Class 2 and 3 components, and there is no outstanding information expected to be addressed in the BLN COL FSAR related to this section.

The Westinghouse application to amend Appendix D to 10 CFR Part 52 includes changes to Section 6.6 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 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 6.6 of this SER to reflect the final disposition of the DC amendment application.

In addition, the staff concludes that the relevant information presented in the BLN COL FSAR is acceptable and meets the requirements of GDC 45 and 10 CFR 50.55a. The staff based its conclusion on the following:

- STD COL 6.6-1 is acceptable because the staff concluded that the applicant's AP1000 ISI program for ASME Code Class 2, 3, and MC components is acceptable and meets the requirements of 10 CFR 50.55a with regard to the preservice and inservice inspectability of these components.

- STD COL 6.6-2 is acceptable because the staff concluded that the accessibility needed to perform PSI/ISI examinations is maintained during the design, construction and operational phases, and satisfies NUREG-0800 Section 6.6 acceptance criteria for accessibility.

- STD SUP 6.6-1 is acceptable because the staff concluded that accessibility to perform ISI examinations would be incorporated into the design, and satisfies the regulations under 10 CFR 50.55a(g)(3)(ii).

- Part 10, License Condition 6, as it relates to the timing of information related to the PSI and ISI program details to support NRC inspection activities, is acceptable because it complies with the regulatory guidance addressed in SECY-05-0197.