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6 ENGINEERED SAFETY FEATURES

6.0 Engineered Safety Features

This chapter describes the staff review of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Engineered Safety Features (ESF). Engineered safety features mitigate the consequences of accidents by maintaining the integrity of the fuel cladding, reactor coolant pressure boundary, and primary reactor containment; and thereby limiting releases of radioactive material. The staff's review of the ESF encompasses materials, systems, and inservice inspection of ASME Code Class 2 and 3 components. The staff's materials review includes metallic materials used for ESF fluid systems and organic materials used for coatings. The staff review includes the following CCNPP Unit 3 ESF systems: containment systems, emergency core cooling system, habitability systems, fission product removal and control systems, and extra borating system.

Chapter 6 of the CCNPP Unit 3 Combined License (COL) Final Safety Analysis Report (FSAR) incorporates by reference U.S. EPR FSAR, Tier 2, Chapter 6, with supplementary information provided in COL FSAR Sections 6.1, "Engineered Safety Features Materials"; 6.2, "Containment Systems"; 6.3, "Emergency Core Cooling System"; 6.4, "Habitability Systems"; and 6.6, "Inservice Inspection of Class 2 and 3 Components."

6.1 Engineered Safety Features Materials

This section addresses information related to the materials selection, fabrication, processing, compatibility with engineered safety feature fluids, components and system cleaning, and composition of thermal insulation in ESF systems.

6.1.1 Metallic Materials

6.1.1.1 *Introduction*

Engineered Safety Features must be compatible with the fluids to which they may be exposed during normal operation, maintenance, testing, and postulated accident conditions. In order to maintain the integrity of the reactor coolant pressure boundary (RCPB), ESF components that are part of, or interface with, the RCPB must be fabricated of materials that provide a low probability of significant degradation or rapidly propagating fracture. In addition to using appropriate fabrication materials, processes for welding, non-destructive examination, and cleaning of ESF systems must be controlled to assure initial quality and prevent deterioration.

6.1.1.2 *Summary of Application*

COL FSAR Section 6.1.1 incorporates by reference U.S. EPR FSAR Tier 2, Section 6.1.1.

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

Combined License Information Items:

The COL applicant provided additional information in COL FSAR Section 6.1.1.1, "Materials Selection and Fabrication," to address COL Information Item 6.1-1 from U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items as follows:

A COL applicant that references the U.S. EPR design certification will review the fabrication and welding procedures and other QA methods of ESF component vendors to verify conformance with RGs 1.44 and 1.31.

The COL applicant stated that it would review the fabrication and welding procedures and other Quality Assurance (QA) methods of potential ESF component vendors to verify that they conform to Regulatory Guides (RG) 1.31, "Control of Ferrite Content in Stainless Steel Weld Metal," and RG 1.44, "Control of the Use of Sensitized Stainless Steel," prior to accepting them as ESF component vendors.

6.1.1.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed within the Final Safety Evaluation Report (FSER) related to the U.S. EPR FSAR.

In addition, the relevant requirements of U.S. Nuclear Regulatory Commission (NRC) regulations for the ESF metallic materials, and the associated acceptance criteria, are given in NUREG-0800, Section 6.1.1, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," (hereafter referred to as NUREG-0800 or the SRP).

The applicable regulatory requirements for the information related to COL Information Item 6.1-1 are as follows:

2. General design criterion (GDC) 1, "Quality Standards and Records," and Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a, "Codes and Standards," as they relate to quality standards for design, fabrication, erection, and testing of ESF components and the identification of applicable codes and standards.
3. GDC 4, "Environmental and Dynamic Effects Design Bases," as it relates to compatibility of ESF components with environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss of coolant accidents (LOCAs).
4. GDC 14, "Reactor Coolant Pressure Boundary," as it relates to design, fabrication, erection, and testing of the RCPB so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.
5. GDC 31, "Fracture Prevention of Reactor Coolant Pressure Boundary," as it relates to designing the RCPB such that the boundary behaves in a nonbrittle manner and there is an extremely low probability of rapidly propagating fracture and of gross rupture of the RCPB.

The related acceptance criteria are as follows:

1. Regulatory Guide (RG) 1.44, "Control of the Use of Sensitized Stainless Steel," as it relates to preventing intergranular corrosion of stainless steel components of the ESF.
2. RG 1.31, "Control of Ferrite Content in Stainless Steel Weld Metal," as it relates to assuring the integrity of welds in austenitic stainless steel ESF components.

6.1.1.4 Technical Evaluation

The staff reviewed COL FSAR Section 6.1.1 and checked the referenced design certification FSAR to ensure that the combination of the information in the design certification application and the information in the COL application represent the complete scope of information relating to this review topic. The staff's review confirmed that the information contained in the COL application and incorporated by reference addresses the required information relating to this section. U.S. EPR FSAR Tier 2, Section 6.1.1 is being reviewed by the staff under Docket Number 52-020. The staff's technical evaluation of the information incorporated by reference related to metallic material used in ESF systems and components will be documented in the staff safety-evaluation report on the U.S. EPR design certification application.

The staff reviewed the information contained in the COL FSAR:

The staff reviewed conformance of COL FSAR Section 6.1.1 using the guidance in RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," Section C.III.1, Chapter 6, C.I.6.1.1, "Engineered Safety Features Materials."

Combined License Information Items:

The staff reviewed COL Information Item 6.1-1 from U.S. EPR FSAR Tier 2, Table 1.8-2 included under COL FSAR Section 6.1.1. COL Information Item 6.1-1 states that a COL applicant that references the U.S. EPR design certification will review the fabrication and welding procedures and other QA methods of ESF component vendors to verify conformance with RG 1.44 and RG 1.31.

In order to address COL Item 6.1-1, COL FSAR Section 6.1.1 states that Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC will select vendors in accordance with requirements in the Quality Assurance Program Description (QAPD) referenced in COL FSAR Section 17.5. QAPD Section 7, "Control of Purchased Material, Equipment, and Services," describes the methods used to control purchased material, equipment, and services. The QAPD establishes measures to provide control of special processes. Special processes that control or verify quality, such as those used in welding, heat treating, and nondestructive examination, must be performed by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements. Ensuring that vendor processes conform to RG 1.31 and RG 1.44 will be accomplished as part of the COL applicant's quality assurance program. The staff notes that COL FSAR Section 17.5.1, "QA Program Responsibilities," states that the QAPD complies with the criteria established in 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

In addition, the COL applicant provided a proposed license condition, in Part 10, Appendix A-2 of the COL application, which states that Calvert Cliffs Unit 3 Nuclear Project, LLC and UniStar

Nuclear Operating Services, LLC shall include, or require its contractors to include, a review of special processes such as fabrication and welding procedures and other QA methods to verify conformance to RG 1.31 and RG 1.44 for ESF components as part of the procurement process. The procurement process will be established prior to purchasing ESF components. The COL applicant further states that this will ensure that conformance to RG 1.31 and RG 1.44 will be established within the appropriate vendor processes prior to initiation of any fabrication activity that would be subject to NRC construction inspection program.

The COL applicant's use of 10 CFR Part 50, Appendix B conforming quality assurance program, to ensure the implementation of RG 1.31 and RG 1.44, is appropriate and acceptable to the staff. In addition, the COL applicant's proposed license condition described above, supports issuance of the COL before complete resolution of COL Information Item 6.1-1, because the COL applicant's proposed license condition meets staff guidance for combined license information that cannot be resolved before the issuance of a license as described in RG 1.206, Section C.III.4.3(3).

6.1.1.5 Post Combined License Activities

CCNPP Unit 3 COL application, Part 10, Appendix A-2 of the COL application, provides a proposed license condition which states that:

Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC shall include, or require its contractors to include, a review of special processes such as fabrication and welding procedures and other QA methods to verify conformance with RGs 1.31 and 1.44 for ESF components as part of the procurement process. The procurement process will be established prior to purchasing ESF components.

6.1.1.6 Conclusions

The staff reviewed the COL application and checked the referenced design certification FSAR. The staff's review confirmed that the COL applicant addressed the required information relating to ESF metallic materials. The staff is reviewing the information in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to the ESF metallic materials incorporated by reference in the COL FSAR will be documented in the staff safety evaluation report on the design certification application for the U.S. EPR. The staff notes that the SER on the U.S. EPR is not yet complete. The staff issued RAI 222, Question 01-5 to track the ongoing review of the U.S. EPR design certification application. **RAI 222, Question 01-5 is being tracked as an open item.** The staff will update Chapter 6 of this report to reflect the final disposition of the design certification application.

Based on the above and with exception to the open item described above, the staff concludes the following:

On the basis of its review of the CCNPP Unit 3 COL application and the referenced U.S. EPR FSAR, the staff finds that U.S. EPR FSAR Tier 2, Section 6.1.1, pertaining to engineered safety features materials, is incorporated by reference in the CCNPP Unit 3 COL application with no departures. The staff's review further confirmed that supplemental information to be provided in the COL application, related to COL Item 6.1-1, has been provided and is acceptable.

Based on the above and with exception to the open item described above, the staff finds that the information provided in the COL application meets:

- GDC 1, as it relates to quality standards for design, fabrication, erection, and testing of ESF components and the identification of applicable codes and standards.
- GDC 4, as it relates to compatibility of ESF components with environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including LOCAs.
- GDC 14, as it relates to design, fabrication, erection, and testing of the RCPB so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.
- GDC 31, as it relates to designing the RCPB such that the boundary behaves in a nonbrittle manner and there is an extremely low probability of rapidly propagating fracture and of gross rupture of the RCPB.

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 U.S. EPR design considers the function of the coatings, their potential failure modes, and their requirements for maintenance.

6.1.2.2 Summary of Application

COL FSAR Section 6.1.2 incorporates by reference U.S. EPR FSAR Tier 2, Revision 0, Section 6.1.2.

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

Combined License Information Items:

The COL applicant provided additional information in COL FSAR Section 6.1.2.3.2, "Service Level 1 Coatings," to address COL Information Item 6.1-2 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

If components cannot be procured with DBA qualified coatings applied by the component manufacturer, a COL applicant that references the U.S. EPR design certification must do one of the following: procure the component as uncoated and apply a DBA-qualified coating system in accordance with 10 CFR 50 Appendix B, Criterion IX; confirm that the DBA-unqualified coating is removed and the component is recoated with DBA-qualified coatings in accordance with 10 CFR 50 Appendix B, Criterion IX; or add the quantity of DBA-unqualified coatings to a list that documents those DBA-unqualified coatings already existing within containment.

The COL applicant stated that if components cannot be procured with design-basis accident (DBA)-qualified coatings applied by the component manufacturer, the COL applicant will satisfy one of the aforementioned three criteria.

6.1.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed within the FSER related to the U.S. EPR FSAR.

In addition, the relevant requirements of NRC regulations for the Service Level 1 Coatings, and the associated acceptance criteria, are given in NUREG-0800, Section 6.1.2.

The applicable regulatory requirements for Service Level 1 Coatings are as follows:

- 10 CFR Part 50, Appendix B, as it relates to the quality assurance requirements for the design, fabrication, and construction of safety-related structures, systems, and components.

6.1.2.4 Technical Evaluation

The staff reviewed COL FSAR Section 6.1.2 and checked the referenced design certification FSAR to ensure that the combination of the U.S. EPR FSAR and the information in the COL FSAR represents the complete scope of information relating to this review topic. The staff's review confirmed that the information contained in the COL application and incorporated by reference addresses the required information relating to this section. U.S. EPR FSAR Tier 2, Section 6.1.2, is being reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the information incorporated by reference related to organic materials will be documented in the staff safety evaluation report on the design certification application for the U.S. EPR.

The staff reviewed the information contained in the COL FSAR:

The staff reviewed conformance of COL FSAR Section 6.1 to the guidance in RG 1.206, Section C.III.1, Chapter C.I.6.1.2, "Organic Materials." Additionally, the staff used SRP Section 6.1.2 as guidance relative to review of the COL information item resolution.

Combined License Information Items:

The staff reviewed COL Information Item 6.1-2 from U.S. EPR FSAR Tier 2, Table 1.8-2 included under COL FSAR Section 6.1.2.3.2.

If components cannot be procured with DBA-qualified coatings applied by the component manufacturer, a COL applicant that references the U.S. EPR design certification must do one of the following:

- Procure the component as uncoated and apply a DBA-qualified coating system in accordance with 10 CFR Part 50, Appendix B, Criterion IX
- Confirm that the DBA-unqualified coating is removed and that the component is recoated with DBA-qualified coatings in accordance with 10 CFR Part 50, Appendix B, Criterion IX

- Add the quantity of DBA-unqualified coatings to a list that documents those DBA-unqualified coatings already existing within containment

COL FSAR Section 6.1.2.3.2 states that this COL Item is addressed as follows:

If components cannot be procured with DBA-qualified coatings applied by the component manufacturer (Constellation Generation Group and UniStar Nuclear Operating Services), shall do one of the following:

- Procure the component as uncoated and apply a DBA-qualified coating system in accordance with 10 CFR Part 50, Appendix B, Criterion IX
- Confirm that the DBA-unqualified coating is removed and that the component is recoated with DBA-qualified coatings in accordance with 10 CFR Part 50, Appendix B, Criterion IX
- Add the quantity of DBA-unqualified coatings to a list that documents those DBA-unqualified coatings already existing within containment

Staff acceptance of the COL information item resolution is based on compliance with 10 CFR Part 50, Appendix B, quality assurance requirements, GDC 38, "Containment Heat Removal," and 10 CFR 50.46(b)(5), as they relate to the functionality of the long-term spray system(s) and emergency core cooling systems (ECCSs). Coatings debris resulting from failure of unqualified coatings during a DBA could prevent compliance with GDC 38 and 10 CFR 50.46(b)(5). SRP Section 6.1.2 provides guidance to the staff on evaluation of coatings system conformance to 10 CFR Part 50, Appendix B. SRP Section 6.1.2 also has an interfacing review with SRP Section 6.2.2, "Containment Heat Removal Systems," which provides guidance with respect to compliance with GDC 38 and 10 CFR 50.46(b)(5). SRP Section 6.2.2 recommends that, to satisfy the requirements of GDC 38 and 10 CFR 50.46(b)(5) regarding the long-term spray system(s) and ECCS(s), the containment emergency sump(s) in pressurized water reactors (PWRs) should be designed to provide a reliable, long-term water source for ECCS and containment spray system (CSS) pumps. One of the design aspects to be considered is the evaluation of potential debris generation and associated effects including debris screen blockage. Debris generation is limited through the use of DBA-qualified coatings. SRP Section 6.2.2 states that acceptable guidance for these debris evaluations may be found in RG 1.82, Revision 3, as modified and supplemented for PWRs by the Nuclear Energy Institute (NEI) Guidance Report (GR) NEI-04-07, "Pressurized Water Reactor Containment Sump Evaluation Methodology," and the NRC safety evaluation (SE) of NEI-04-07, December 6, 2004. These guidance documents recommend that debris created by the containment environment (thermal and chemical) resulting from a loss-of-coolant accident should be considered in the analyses. Examples of this type of debris would be disbondment of coatings in the form of chips and particulates. DBA-qualified coatings are assumed not to disbond unless they are located directly in the zone of influence of the break. The resolution of the information item supports compliance with these recommendations, because it will result in components being coated with DBA-qualified coatings or a quantification of the non-DBA qualified coatings so that the contribution of the non-DBA qualified coatings may be factored into the design evaluation of the debris screen blockage. Additionally, the commitment to quantify and list the DBA-unqualified coatings meets the following recommendation, in part, of RG 1.206 Section C.III.6.1.2, "Organic Materials," to identify and quantify all organic materials that exist within the Containment Building in significant amounts. Such organic materials include wood, plastics, lubricants, paint or coatings, electric insulation, and asphalt. The COL applicant should classify plastics, paints,

and other coatings and list its references. Coatings not intended for 40-year service without overcoating should include total coating thicknesses expected to be accumulated over the service life of the substrate surface.

With respect to quality assurance of coatings, SRP Section 6.1.2 recommends that an acceptable method of complying with 10 CFR Part 50, Appendix B requirements is for the coatings monitoring and maintenance program to conform to the recommendations of RG 1.54, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants." The acceptance criteria of RG 1.54 include verification that coating monitoring and maintenance procedures are capable of ensuring that the coatings will not fail (delaminate from the substrate) and, therefore, become a debris source that could prevent the ECCS from performing its safety-related function. RG 1.54 also recommends American Society for Testing and Materials (ASTM) standards that are acceptable to the staff with respect to qualification of safety-related coatings to withstand DBA conditions. The COL applicant is proposing to apply coatings in accordance with 10 CFR Part 50, Appendix B, Criterion IX, "Control of Special Processes," which states that, "measures shall be established to assure that special processes, including welding, heat treating, and nondestructive testing, are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements." The staff finds that the use of 10 CFR Part 50, Appendix B, Criterion IX is acceptable since it will control DBA-qualified coatings application as a special process, thus assuring a high quality coating. COL FSAR Section 6.1.2.3.5 stated there are no departures or supplements to U.S. EPR FSAR Section 6.1.2.3.5, which describes the protective coatings program. However, the staff is currently evaluating exceptions to the guidance of RG 1.54 in U.S. EPR FSAR Section 6.1.2, mostly relating to the use of different year editions of various ASTM coatings standards than those endorsed by RG 1.54. Also, the resolution of COL Information Item 6.1-2 did not state whether RG 1.54 would be used as guidance with respect to qualification of the coatings to be applied to components procured without DBA-qualified coatings. The coatings program description also did not describe the implementation schedule or the administrative controls that would be applied to the coatings program. Therefore, the staff requested that the COL applicant provide additional information in RAI 43, Questions 06.01.02-1, 06.01.02-2, and 06.01.02-3).

In RAI 43, Question 06.01.02-1, the staff requested that the COL applicant describe the standards to be applied to all coatings program activities including selection, qualification, procurement, application, inspection, monitoring, and maintenance of the protective coatings, and address whether the standards to be applied are consistent with the guidance of RG 1.54. If the standards to be applied are not consistent with the guidance of RG 1.54, the staff requested that the COL applicant provide the basis to conclude that the deviation is acceptable. In a February 3, 2009, response to RAI 43, Question 06.01.02-1, the COL applicant indicated that the COL FSAR Section 6.1.2 incorporates U.S. EPR FSAR Tier 2, Section 6.1.2 by reference, including the exceptions noted to RG 1.54 in U.S. EPR FSAR Tier 2, Section 6.1.2.4, and that additional information with regard to the U.S. EPR FSAR could be obtained through requests made to the U.S. EPR design certification applicant. Since the standards to be applied are consistent with the regulatory guidance in RG 1.54, with the exception of the more recent year edition standards cited in the U.S. EPR FSAR, the staff finds the proposed standards acceptable pending the acceptance of these standards under the review of U.S. EPR FSAR Tier 2, Section 6.1.2.

In RAI 43, Question 06.01.02-3, the staff requested that the COL applicant discuss the standards that will be used specifically for the application of DBA-qualified coatings to

components procured without a qualified coating. In response to RAI 43, Question 06.01.02-3, the COL applicant listed all the standards the program will impose on qualification and application of DBA-qualified coatings performed under the COL holder's program. The standards listed are consistent either with those endorsed by RG 1.54, or the more recent year edition standards listed in the U.S. EPR FSAR Tier 2, Section 6.1.2.4 under the exceptions to RG 1.54. The COL applicant also included a proposed change to COL FSAR Section 6.1.2.3.2 to add the information that the standards to be used to apply DBA-qualified coatings to vendor supplied components will be in accordance with RG 1.54, except as modified by U.S. EPR FSAR Tier 2, Section 6.1.2.4. Therefore, the staff finds the proposed standards acceptable pending the acceptance of these standards under the review of U.S. EPR FSAR Section 6.1.2. **RAI 43, Question 06.01.02-3 is being tracked as a confirmatory item.**

In RAI 43, Question 06.01.02-2 Item 1, the staff requested that the COL applicant provide the schedule for full implementation of the coatings program with respect to major milestones in the construction of the plant. In a February 3, 2009, response to RAI 43, Question 06.01.02-2, the COL applicant indicated that the protective coatings program will be implemented prior to the application of coatings on plant surfaces or equipment or the procurement of components and equipment with vendor applied coatings. This additional information was also included in the proposed revision to COL FSAR Section 6.1.2.3.2. The staff finds this response acceptable, since implementation of the coatings program prior to application of coatings or procurement of coated components will ensure that coatings selection, procurement and application are performed in accordance with appropriate standards. **RAI 43, Question 06.01.02-2, Item 1 is being tracked as a confirmatory item.**

In RAI 43 Question 06.01.02-1 Item 2, the staff requested that the COL applicant provide a description of the administrative controls to be applied to the coatings program. In a February 3, 2009, response to RAI 43, Question 06.01.02-1, Item 2, the COL applicant indicated that the coating program would be controlled by plant administrative procedures which are described in COL FSAR Section 13.5.1. This additional information was also included in the proposed revision to COL FSAR Section 6.1.2.3.2. The staff finds the administrative controls to be applied to the procedures appropriate, because COL FSAR Section 13.5.1.1 states that procedures will be prepared, reviewed, and approved in accordance with the UniStar Nuclear QAPD, thus ensuring conformance to the guidance of RG 1.54 C.1.I that licensees must also meet the commitments and provisions contained in their Quality Assurance Program description (in addition to meeting the quality assurance provisions of the ASTM standards endorsed by RG 1.54). Further, SRP Section 6.1.2 Acceptance Criteria II.1 also requires coatings-related activities to meet the requirements of 10 CFR Part 50, Appendix B. COL FSAR Section 17.5 indicates that the UniStar Nuclear QAPD complies with the criteria of 10 CFR Part 50, Appendix B, and that the topical report establishing the QAPD, UN-TR-06-001-A, "Quality Assurance Program Description," has been approved by the staff. Therefore, control of the coatings program in accordance with administrative procedures will ensure compliance with 10 CFR Part 50, Appendix B. **RAI 43, Question 06.01.02-1 is being tracked as a confirmatory item.**

6.1.2.5 Post Combined Operating License Activities

At the conclusion of the review, this section will identify any applicable COL holder activities.

The staff's inspection of the protective coatings program will be conducted by the NRC construction inspection program when the coatings program is implemented at the plant site.

6.1.2.6 Conclusions

The staff reviewed the COL application and the referenced U.S. EPR FSAR. The staff's review confirmed that the COL applicant addressed the required information relating to organic materials. The staff is reviewing the information in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to organic materials incorporated by reference in the COL FSAR will be documented in the staff safety evaluation report on the design certification application for the U.S. EPR. The staff notes that the SER on the U.S. EPR is not yet complete. The staff will update Section 6.1.2.6 of this report to reflect the final disposition of the design certification application.

In addition, the staff concludes that COL applicant's proposed resolution to the COL information item in COL FSAR Section 6.1.2.3.2 meets the relevant guidelines of SRP Section 6.1.2; RG 1.206, Section C.III.1, Chapter C.I.6.1.2; and Section C.III.4.3, and is thus acceptable. Conformance to the guidelines SRP Section 6.1.2; RG 1.206, Section C.III.1, Chapter C.I.6.1.2, and Section C.III.4.3, provides an acceptable basis for satisfying, in part, the requirements of 10 CFR Part 50, Appendix B. The staff finds that COL Action Item 6.1-2 has been adequately addressed by the COL information item resolution, and is therefore resolved.

6.2 Containment Systems

6.2.1 Containment Functional Design

This section will be delivered at a later date.

6.2.2 Containment Heat Removal Systems

This section will be delivered at a later date.

6.2.3 Secondary Containment Functional Design

COL FSAR Section 6.2.3 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Revision 0, Section 6.2.3. The staff reviewed the COL application and checked the referenced U.S. EPR FSAR to ensure that no issue relating to this section remained for review. The staff is reviewing the information in the U.S. EPR FSAR Tier 2, Section 6.2.3 on Docket No. 52-020. The results of the staff's technical evaluation of the information related to secondary containment functional design incorporated by reference in the COL FSAR will be documented in the staff safety evaluation report on the U.S. EPR design certification application. The staff notes that the SER on the U.S. EPR FSAR is not yet complete. The staff will update Chapter 6 of this report to reflect the final disposition of the design certification application.

6.2.4 Containment Isolation System

COL FSAR Section 6.2.4 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Revision 0, Section 6.2.4. The staff reviewed the COL application and checked the referenced U.S. EPR FSAR to ensure that no issue relating to this section remained for review. The staff is reviewing the information in the U.S. EPR FSAR Tier 2, Section 6.2.4 on Docket No. 52-020. The results of the staff's technical evaluation of the

information related to the containment isolation system incorporated by reference in the COL FSAR will be documented in the staff safety evaluation report on the U.S. EPR design certification application. The staff notes that the SER on the U.S. EPR FSAR is not yet complete. The staff will update Chapter 6 of this report to reflect the final disposition of the design certification application.

6.2.5 Combustible Gas Control in Containment

COL FSAR Section 6.2.5 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Revision 0, Section 6.2.5. The staff reviewed the COL application and checked the referenced U.S. EPR FSAR to ensure that no issue relating to this section remained for review. The staff is reviewing the information in the U.S. EPR FSAR Tier 2, Section 6.2.5 on Docket No. 52-020. The results of the staff's technical evaluation of the information related to the control of combustible gas in containment incorporated by reference in the COL FSAR will be documented in the staff safety evaluation report on the U.S. EPR design certification application. The staff notes that the SER on the U.S. EPR FSAR is not yet complete. The staff will update Chapter 6 of this report to reflect the final disposition of the design certification application.

6.2.6 Containment Leakage Testing

6.2.6.1 Introduction

Containment leakage testing assures that (1) leakage through the primary reactor containment and systems and components penetrating primary containment shall not exceed allowable leakage rate values as specified in the technical specifications or associated bases; and (2) periodic surveillances of reactor containment penetrations and isolation valves are performed so that proper maintenance and repairs are made during the service life of the containment and the penetrating systems and components. In the COL FSAR Section 6.2.6, the COL applicant states that the containment leakage testing program complies with 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," Option B, "Performance-Based Requirements," and follows the guidance of RG 1.163, "Performance-based Containment Leak-Test Program," September 1995.

6.2.6.2 Summary of Application

COL FSAR Section 6.2.6 incorporates by reference U.S. EPR FSAR Tier 2, Section 6.2.6, "Containment Leakage Testing."

In addition, in COL FSAR Section 6.2.6, "Containment Leakage Testing," the COL applicant provided the following:

Combined License Information Items

The COL applicant provided additional information in COL FSAR Section 6.2.6 to address COL Information Item No. 6.2-1 from U.S. EPR FSAR Tier 2, Table 1.8-2, "U.S. EPR Combined License Information Items," As follows:

Combined License Information Item No. 6.2-1 states that:

A COL applicant that references the U.S. EPR design certification will identify the implementation milestones for the CLRT program described under 10 CFR 50, Appendix J.

COL FSAR Table 13.4-1, "Operational Programs Required by NRC Regulations and Program Implementation," provides milestones related to 10 CFR Part 50, Appendix J containment leak rate testing (CLRT).

6.2.6.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed within the FSER related to the U.S. EPR FSAR.

In addition, the relevant requirements of NRC regulations for the containment leakage testing, and the associated acceptance criteria, are specified in NUREG-0800, Section 6.2.6, "Containment Leakage Testing."

The applicable regulatory requirements for containment leakage testing are as follows:

1. 10 CFR Part 50, Appendix J as it relates to primary reactor containment leakage testing.
2. 10 CFR 100.10, "Factors to be considered when evaluating sites," and 10 CFR 100.11, "Determination of exclusion area, low population zone, and population center distance," as they relate to reactor site criteria.
3. GDC 52, "Capability for Containment Leakage Rate Testing," as it relates to the capability for containment leakage rate testing.
4. GDC 53, "Provisions for Containment Testing and Inspection," as it relates to provisions for containment testing and inspection.
5. GDC 54, "Systems Penetrating Containment," as it relates to piping systems penetrating containment.

For COL applicants who select Option B of 10 CFR Part 50, Appendix J, the following related acceptance criteria apply:

RG 1.163 endorses NEI 94-01, "Nuclear Energy Institute Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," Revision 0 (with certain exceptions), which provides guidance in Sections 8.0 and 9.0 that no repairs or adjustments be made to the containment prior to the performance of the containment integrated leak rate test (CILRT) so that the containment is tested as close to the "as-is" condition as practical. Instrument lines that penetrate containment, however, are sometimes isolated for the CILRT. Leakage rate testing of instrument lines may be done in conjunction with the CILRT or local leak rate tests (LLRTs). Instrument lines that are not locally leak rate tested should not be isolated from containment atmosphere during performance of the CILRT. Measured leakage rates from the LLRTs that are isolated from the CILRT should be added to CILRT results, and provisions should be made to assure that the lines are restored to operable following the tests.

RG 1.163 endorses NEI 94-01, Revision 0 (with certain exceptions), which provides guidance in Sections 8.0 and 10.0 relative to containment isolation valve leak rate tests. At the design

certification stage, the COL applicant should identify all containment isolation valves that will be locally (Type C) leak rate tested with the test pressure applied in a direction opposite to that occurring under accident conditions. In this case, the COL applicant should commit to justify at the COL stage that such testing will result in equivalent or more conservative results.

All leakage rate tests, performed by either pneumatic or hydraulic means, should have the capability to quantify leakage rates either explicitly or by a conservative bounding method to satisfy test acceptance criteria in 10 CFR Part 50, Appendix J and the technical specifications.

NEI 94-01, Revision 0 (Section 6.0) and American National Standards Institute/ American Nuclear Society (ANSI/ANS) 56.8-1994, "Containment System Leakage Testing Requirements," (Section 3.3.1) states that Type B and Type C tests are not required for the following cases:

1. Containment boundaries that do not constitute potential containment atmospheric leakage pathways during and following a design-basis loss-of-coolant accident (DBA-LOCA)
2. Containment boundaries sealed with qualified seal systems, as further defined in ANSI/ANS 56.8-1994
3. Test connection, vents, and drains between containment isolation valves which:
 - Are 1 inch or less in size
 - Administratively secured closed
 - Consist of a double barrier (e.g., two valves in series, one valve with a nipple and cap, one valve and a blind flange)

6.2.6.4 Technical Evaluation

The staff reviewed COL FSAR Section 6.2.6 and checked the referenced design certification FSAR to ensure that the combination of the information in the U.S. EPR FSAR and the information in the COL FSAR represents the complete scope of required information relating to this review topic. The review confirmed that the information contained in the COL application and incorporated by reference addresses the required information relating to this section. U.S. EPR FSAR Tier 2, Section 6.2.6 has been reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the information incorporated by reference related to containment leakage testing has been documented in the staff safety evaluation report on the design certification application for the U.S. EPR.

The staff's review of the information contained in the COL FSAR is discussed as follows:

Combined License Information Items

The staff reviewed COL Information Item No. 6.2-1 from U.S. EPR FSAR Tier 2, Table 1.8-2 included under COL FSAR Section 6.2.6.

In the COL FSAR Section 6.2.6, the COL applicant states that the milestone for implementing the containment leak rate testing program is given in COL FSAR Table 13.4-1. The staff

reviewed COL FSAR Table 13.4-1 and found that Item 7, Containment Leak Rate Testing Program, committed to a milestone date for implementation as prior to initial fuel load.

The staff found this milestone date acceptable, as it is in accordance with 10 CFR Part 50, Appendix J, and the guidance of NUREG-0800, SRP Section 13.4, "Operational Programs."

6.2.6.5 Post Combined License Activities

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

6.2.6.6 Conclusions

The staff reviewed the COL application and checked the referenced U.S. EPR FSAR. The staff's review confirmed that the COL applicant addressed the required information relating to containment leakage testing. The staff reviewed the information in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to containment leakage testing incorporated by reference in the COL FSAR have been documented in the staff's SER on the design certification application for the U.S. EPR. The staff notes that the SER on the U.S. EPR is not yet complete. The staff will update Chapter 6 of this report to reflect the final disposition of the U.S. EPR design certification application.

6.2.7 Fracture Prevention of Containment Pressure Vessel

COL FSAR Section 6.2.7 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Revision 0, Section 6.2.7. The staff reviewed the COL application and checked the referenced U.S. EPR FSAR to ensure that no issue relating to this section remained for review. The staff is reviewing the information in the U.S. EPR FSAR Tier 2, Section 6.2.7 on Docket No. 52-020. The results of the staff's technical evaluation of the information related to the fracture prevention of the primary containment pressure vessel incorporated by reference in COL FSAR will be documented in the staff safety evaluation report on the U.S. EPR design certification application. The staff notes that the SER on the U.S. EPR FSAR is not yet complete. The staff will update Chapter 6 of this report to reflect the final disposition of the design certification application.

6.3 Emergency Core Cooling System

This section will be delivered at a later date.

6.4 Habitability Systems

6.4.1 Introduction

The CCNPP Unit 3 main control room (MCR) habitability systems are designed to protect plant operators from the effects of accidental releases of radioactive and toxic gases. Additionally, habitability systems provide the necessary support for the technical support center (TSC) personnel. The major review interfaces are the control room ventilation system and its associated filtration trains. The review of the control room ventilation system is performed under the control room air conditioning system (CRACS) and its subsystem control room emergency filtration system (CREF) in Section 9.4.1 of this report. The review of the emergency standby

atmosphere filtration system and iodine removal efficiencies of the control room atmosphere filtration system is performed in Section 6.5.1 of this report.

6.4.2 Summary of Application

COL FSAR Section 6.4 incorporates by reference U.S. EPR FSAR Tier 2, Section 6.4, "Habitability Systems."

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

Combined License Information Items:

The COL applicant provided additional information in COL FSAR Section 6.4 to address COL Information Item Nos. 6.4-1 through 6.4-4 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

COL Information Item No. 6.4-1

A COL applicant that references the U.S. EPR design certification will identify the type(s) of Seismic Category I Class IE toxic gas sensors (i.e., the toxic chemical(s) of concern) necessary for control room operator protection.

COL Information Item No. 6.4-2

A COL applicant that references the U.S. EPR design certification will provide written emergency planning and procedures in the event of a radiological or a hazardous chemical release within or near the plant, and will provide training of control room personnel.

COL Information Item No. 6.4-3

A COL applicant that references the U.S. EPR design certification will evaluate the results of the toxic chemical accidents from Section 2.2.3 and address their impact on control room habitability in accordance with RG 1.78.

COL Information Item No. 6.4-4

A COL applicant that references the U.S. EPR design certification will confirm that the radiation exposure of main control room occupants resulting from a design basis accident at a nearby unit on a multi-unit site is bounded by the radiation exposure from the postulated design basis accidents analyzed for the U.S. EPR or confirm that the limits of GDC 19 are met.

COL Information Item Nos. 6.4-1, 6.4-2, 6.4-3, and 6.4-4 from U.S. EPR FSAR Tier 2, Table 1.8-2 are addressed in COL FSAR Section 6.4 as follows:

The COL applicant stated that prior to receipt of fuel onsite at CCNPP Unit 3, it will prepare written emergency planning procedures for use during radiological or hazardous chemical releases at or near the plant. Training on these procedures will be provided to control room personnel.

The COL applicant indicated that MCR dose to CCNPP Units 1 or 2 from a CCNPP Unit 3 LOCA is less than 0.02 Sv (2.0 rem) total effective dose equivalent (TEDE). This dose is well below the regulatory dose acceptance criterion of 0.05 Sv (5 rem) TEDE. The COL applicant also stated that the CCNPP Unit 3 MCR dose from a LOCA in CCNPP Unit 1 or 2 will be less than CCNPP Units 1 and 2 dose from a CCNPP Unit 3 LOCA. This also meets the regulatory dose acceptance criteria of 0.05 Sv (5 rem) TEDE.

The CCNPP Unit 3 MCR is equipped with safety-related radiation monitors in the heating, ventilation, and air conditioning (HVAC) intake ducts which would isolate the MCR in a timely manner. Therefore, a LOCA in CCNPP Unit 1 or 2, which already meets the regulatory acceptance criteria for their control rooms, will also meet the acceptance criteria for the CCNPP Unit 3 MCR. The design basis for the CCNPP Unit 3 MCR HVAC emergency filtration system is described in U.S. EPR FSAR Tier 2, Section 15.0.3, "Radiological Consequences of Design Basis Accidents."

Departures and Exemption Request

In CCNPP Unit 3 COL Application, Part 7, "Departures and Exemption Requests," Section 1.1.5, "Toxic Gas Detection and Isolation," and Section 1.2.7, "Toxic Gas Detection and Isolation," the COL applicant proposed the following U.S. EPR FSAR departures and exemption request:

U.S. EPR FSAR Tier 1, Section 2.6.1, "Main Control Room Air Conditioning System," requires that the main control room air conditioning system maintain habitability of the control room envelope and ambient temperature conditions inside the control room envelope during toxic gas contamination events. As a result, the U.S. EPR design provides a toxic gas alarm signal with automatically closing air intake dampers.

The results of the COL applicant's toxic chemicals evaluation in COL FSAR Section 2.2.3, "Evaluation of Potential Accidents," did not identify any credible toxic chemical accidents that exceed the limits established in RG 1.78, "Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release." As a result, toxic gas detectors and automatic control room envelope (CRE) isolation are not required for CCNPP Unit 3. The COL applicant's analysis showed that no specific provisions are required to protect the operators from an event involving the release of toxic gas, and protection from toxic gas contamination events is not part of the site-specific design basis for CCNPP Unit 3. Therefore, in COL application Part 7, Section 1.2.4, "Toxic Gas Detection and Isolation," the COL applicant "requests an exemption from compliance with the U.S. EPR FSAR Tier 1 and Tier 2 requirements associated with control room envelope isolation as a result of the toxic gas detection and alarm signal." The COL FSAR departs from the following U.S. EPR FSAR sections: Tier 1, Section 2.6.1; Tier 2, Section 1.8, "Interfaces with Standard Designs and Early Site Permits"; Tier 2, Section 3.11, "Environmental Qualification of Mechanical and Environmental Conditions"; Tier 2, Section 6.4; Tier 2, Section 9.4.1, "Main Control Room Air Conditioning System"; Tier 2, Section 14.2.12.8.10, "Main Control room Air Conditioning System (Test No. 082)"; and Tier 2, Chapter 16, "Technical Specifications."

6.4.3 Regulatory Basis

The regulatory basis for the information incorporated by reference is addressed within the final FSER related to the U.S. EPR FSAR.

In addition, the relevant requirements of NRC regulations for the MCR habitability systems, and the associated acceptance criteria, are specified in NUREG-0800, Section 6.4, "Control Room Habitability System."

The applicable regulatory requirements for the habitability systems are as follows:

1. GDC 4, Appendix A as it relates to structures, systems, and components (SSCs) important to safety being designed to accommodate the effects of and to be compatible with the environmental conditions associated with postulated accidents.
2. 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.
3. 10 CFR 50.34(f)(2)(xxviii), "Contents of applications; technical information," as it relates to evaluations and design provisions to preclude certain control room habitability problems. (For 10 CFR Part 50 applicants not listed in 10 CFR 50.34(f), the provisions of 10 CFR 50.34(f) will be made a requirement during the licensing review. This is a requirement for the U.S. EPR, which is not a plant listed as exempt from the requirements in Paragraph 57.34(f).)
4. 10 CFR Part 52, "Design Certification Rule for the U.S. EPR Design," Section VIII, "Processes for Changes and Departures," as it relates to departing from the FSAR Tier 2 information in the U.S. EPR certified design without prior NRC approval. The staff notes that the review of the U.S. EPR design certification application is not complete. The staff will update Chapter 6 of this report to reflect the final disposition of the design certification application.

The related acceptance criteria are as follows:

1. RG 1.196, "Control Room Habitability at Light-Water Nuclear Power Reactors," and RG 1.197, "Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors," provide acceptable guidance for meeting control room habitability requirements.
2. RG 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," as it relates to guidance on dose analysis for the U.S. EPR using alternate source term (AST) pursuant to 10 CFR 50.67, "Accident source term."
3. 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," as it relates to guidance on emergency filtration.
4. RG 1.78 as it relates to guidance on protection of control room personnel from releases of chlorine or other toxic gases.
5. ASME Code AG-1, "Code on Nuclear Air and Gas Treatment."

6.4.4 Technical Evaluation

The staff reviewed COL FSAR Section 6.4 and checked the referenced design certification FSAR to ensure that the combination of the information in the U.S. EPR FSAR and the information in the COL FSAR represents the complete scope of required information relating to this review topic. The review confirmed that the information contained in the COL application and incorporated by reference addresses the required information relating to this section. U.S. EPR FSAR Tier 2, Section 6.4 has been reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the information incorporated by reference related to MCR habitability systems has been documented in the staff safety evaluation report on the design certification application for the U.S. EPR.

The staff's review of the information contained in the COL FSAR is discussed as follows:

Compliance with the following regulatory requirements and conformance to the following regulatory guidance documents are addressed in the U.S. EPR Safety Evaluation Report and, therefore, are not specifically discussed with the supplements and departures provided in the COL application and evaluated in this technical evaluation:

- GDC 4, 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
- 10 CFR 50.34(f)(2)(xxviii), as it relates to evaluation pathways and design provisions to preclude certain control room habitability problems
- RG 1.52, as it relates to emergency filtration requirements
- RG 1.183, as it relates to using AST pursuant to 10 CFR 50.67
- RG 1.197 as it relates to control room envelope integrity for habitability requirements

Departures and Exemption Request

The CCNPP Unit 3 COL application, Part 7, identifies U.S. EPR FSAR Tier 2 departures related to the MCR habitability systems in case of a release of hazardous toxic chemicals. COL FSAR Section 2.2.3 states that there are no credible toxic chemical accidents that exceed the limits established in RG 1.78. Based on this finding, the COL applicant has made the following departures from U.S. EPR FSAR Tier 2, Section 6.4:

- No protective provisions are required in the control room envelope design for an event involving a release of toxic gases; toxic gas detectors and isolations will not be provided (COL FSAR Section 6.4.1, "Design Basis").
- No protective provisions are required to protect operators from an event involving release of toxic gases and toxic gas detectors and isolation will not be provided (COL FSAR Section 6.4.2.1, "Definition of a Control Room Envelope"; COL FSAR Section 6.4.2.2, "Ventilation System Design"; COL FSAR Section 6.4.2.4, "Interaction with Other Zones and Pressure-Containing Equipment"; COL FSAR Section 6.4.3, "System Operational Procedures"; and COL FSAR Section 6.4.6, "Instrumentation Requirements").

The staff reviewed each of the above departures. The COL applicant's evaluation determined that the departures are acceptable, since COL FSAR Section 2.2.3 determined that there are no credible toxic chemical accidents that need to be considered in the design. In the review of COL FSAR Section 2.2.3, the staff determined that only hydrochloric acid has the potential to challenge control room habitability. The COL applicant's analysis showed that it is possible to achieve a concentration outside the control room that exceeds the concentration that would be immediately damaging to life and health (IDLH). However, the COL applicant's analysis showed that the concentrations in the control room remained well below the IDLH. The staff performed independent calculations with the guidance in RG 1.78. The staff's calculations also concluded that the concentration in the control room would not exceed the IDLH.

Because the COL applicant's analysis shows that there is no design-basis toxic gas threat, the staff agrees that the U.S. EPR FSAR Tier 2 departures are acceptable. The staff notes that the COL applicant has also identified a U.S. EPR FSAR Tier 1 departure that requires an exemption. The exemption is being reviewed by the staff and will be documented in Section 9.4.1 of this report.

Combined License Information Items:

The staff reviewed COL Information Item Nos. 6.4-1 through 6.4-4 from U.S. EPR FSAR Tier 2, Table 1.8-2 included under COL FSAR Section 6.4.

These items are:

- Toxic gas sensors necessary for control room operator protection
- Emergency planning and procedures in the event of a radiological or a hazardous chemical release
- Evaluation of toxic chemical accidents and their impact on control room habitability
- Radiation exposure of control room occupants resulting from a design-basis accident at a nearby unit

Since there are no hazardous chemical or toxic gas accidents that need to be considered at this site, the first and third items above are not applicable to CCNPP Unit 3. The staff's review of COL FSAR Section 2.2.3 confirmed that there are no hazardous chemicals or toxic gas accidents that need to be considered. One chemical, hydrochloric acid, was identified as having the potential for challenging the control room habitability. As described above, the staff performed independent calculations for this chemical and confirmed the COL applicant's assertion that no design-basis toxic gas threat exists.

The remaining two items: Emergency planning and procedures in the event of a radiological or hazardous chemical release, and radiation exposure of control room occupants resulting from a design-basis accident at a nearby unit are discussed below.

In COL FSAR Section 6.4.3, the COL applicant committed to provide written emergency planning and procedures for use in the event of a radiological or hazardous chemical release within or near the plant and will provide training of control room personnel prior to receipt of fuel onsite at CCNPP Unit 3. No additional details were provided.

The implementation schedule is acceptable to the staff. However, the COL applicant should provide in the COL FSAR the essential elements of the training program and procedures to facilitate staff review and show compliance with applicable regulatory requirements and conformance to the guidance in RG 1.196. Specifically, the COL FSAR should outline what operators will be directed and trained to do when they either detect or are notified of the presence of a toxic gas. Therefore, in RAI 296, Question 06.04-5, the staff requested that the COL applicant provide the details on operator training and procedures to be followed if a toxic gas release is detected. **RAI 296, Question 06.04-5 is being tracked as an open item.**

In order to comply with GDC 19, the COL applicant is required to show that radiation exposure to control room occupants at CCNPP Unit 3, resulting from a postulated design-basis accident either at CCNPP Unit 1 or Unit 2, will not exceed 0.05 Sv (5 rem) TEDE for the duration of the accident. The COL FSAR should be devoted solely to the habitability of the Unit 3 control room. As mentioned in U.S. EPR FSAR Tier 2, Section 6.4.4, "Design Evaluations," the COL applicant can either confirm that the radiation exposure to MCR occupants resulting from a DBA at a nearby unit is bounded by the radiation exposure from the postulated DBAs analyzed by the U.S. EPR; or confirm that the limits of GDC 19 are met. In an April 15, 2009, response to RAI 83, Question 06.04-4, the applicant stated that the U.S. EPR radiation exposure analysis bounds exposure from Unit 1 and Unit 2.

Due to the lower power level and lower allowable leakage rate at CCNPP Units 1 and 2, the source term of these units is less than the Unit 3 source term. Also, the CCNPP Unit 3 design provides increased shielding and safety-related intake duct radiation monitors that automatically isolate the MCR envelope. The lower source term and the CCNPP Unit 3 design features assure that the radiological evaluation of CCNPP Unit 3 bounds radiation exposure from either a Unit 1 or Unit 2 DBA. The COL applicant's assessment is in conformance with the U.S. EPR statement and provides sufficient assurance that GDC 19 is met. However, the change proposed to COL FSAR Section 6.4.4 in the COL applicant's April 15, 2009, response to RAI 83, Question 06.04-4 should be revised. The RAI response should address only the habitability of the Unit 3 control room, and it should present the complete argument showing that the U.S. EPR radiation exposure analysis bounds exposures from either Unit 1 or Unit 2. Therefore, in RAI 296, Question 06.04-6, the staff requested that the COL applicant provide revised proposed changes to COL FSAR Section 6.4.4 to address only the habitability of the Unit 3 control room, and to justify that the U.S. EPR radiological evaluation bounds radiation exposure from postulated DBAs at Unit 1 or 2. **RAI 296, Question 06.04-6 is being tracked as an open item.**

Post COL activities related to this section are provided in Section 6.4.5 of this report and have been determined to be adequate.

6.4.5 Post Combined License Activities

U.S. EPR FSAR Tier 2, Table 1.8-2 contains COL information items that the COL applicant is required to address. The following COL information items in Table 6.4-1 of this report include the proposed combined license activities which the staff has evaluated in this report, but that will be completed following issuance of the license as discussed in the section listed below.

Table 6.4.5-1 Post Combined License Activities

Item No.	Description	COL FSAR Section	COL SER Section
6.4-2	A COL applicant that references the U.S. EPR design certification will provide written emergency planning and procedures in the event of a radiological or a hazardous chemical release within or near the plant, and will provide training of control room personnel prior to receipt of fuel onsite at CCNPP Unit 3.	6.4.2	6.4.4

6.4.6 Conclusions

The staff reviewed the COL application and checked the referenced U.S. EPR FSAR. The staff's review confirmed that the COL applicant addressed the required information relating to MCR habitability systems. The staff reviewed the information in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to MCR habitability systems incorporated by reference in the COL FSAR have been documented in the staff's safety evaluation report on the design certification application for the U.S. EPR. The staff notes that the SER on the U.S. EPR is not yet complete. The staff will update Section 6.4 of this report to reflect the final disposition of the design certification application. The staff will update Chapter 6 of this report to reflect the final disposition of the design certification application.

Supplementary information was provided on emergency planning and procedures, and on radiation exposure to control room occupants in the event of LOCAs. The COL applicant committed to a schedule for the submittal of procedures for use in the event of radiological or hazardous chemical release, and to the training of control room personnel. The staff finds the proposed schedule acceptable.

However, as a result of the open items, the staff is unable to finalize its conclusions on operator training and procedures and on control room habitability in accordance with the requirements of GDC 19.

In addition, the COL applicant identified COL FSAR Tier 2 departures relating to the release of hazardous chemicals and toxic gases. Based on the staff's finding in Section 2.2.3 of this report and the staff's confirmatory calculations, it is reasonable to assume that toxic chemical accidents that exceed the limits established in RG 1.78 do not have to be considered at CCNPP Unit 3. As a result, with the exception of the noted open items, and pending acceptable reviews in Section 2.2.3 of this report and the U.S. EPR FSAR Tier 1 exemption request, the staff finds COL FSAR Section 6.4 acceptable. The staff will update Chapter 6 of this report to reflect the final disposition of the design certification application.

6.5 Fission Product Removal and Control Systems

The U.S. EPR fission product removal control systems are designed to prevent or limit the release of fission products following a postulated DBA or fuel handling accident. These systems include the engineered safety features filter systems, the primary and secondary containment structures and systems, and the containment isolation system.

The staff reviewed the COL application and checked the referenced U.S. EPR design certification FSAR. The staff's review confirmed that the COL applicant addressed the required information relating to the fission product removal and control systems. The staff is reviewing the information in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to the fission product removal and control systems incorporated by reference in the COL FSAR will be documented in the staff safety evaluation report on the design certification application for the U.S. EPR. The staff notes that the SER on the U.S. EPR is not yet complete. The staff will update this report to reflect the final disposition of the design certification application. The staff will update Chapter 6 of this report to reflect the final disposition of the design certification application.

6.6 Inservice Inspection of ASME Code 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 American Society of Mechanical Engineers (ASME) Code, Section XI 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

COL FSAR Section 6.6 incorporates by reference U.S. EPR FSAR Tier 2, Revision 0, Section 6.6.

In addition, in COL FSAR Section 6.6, the COL applicant provided the following:

Combined License Information Items:

The COL applicant provided additional information in COL FSAR Section 6.6 to address COL Information Item 6.6-1 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

A COL applicant that references the U.S. EPR design certification will identify the implementation milestones for the site-specific ASME Section XI preservice and inservice inspection program for Class 2 and 3 components, consistent with the requirements of 10 CFR 50.55a(g). The program will identify the applicable

edition and addenda of the ASME Code Section XI, and will identify additional relief requests and alternatives to Code requirements.

The COL applicant stated that the implementation milestones for the site-specific ASME Section XI preservice and inservice inspection programs for ASME Code Class 2 and 3 components are identified in COL FSAR Table 13.4-1.

The initial inservice inspection program will be based upon the latest edition and addenda of the ASME Boiler and Pressure Vessel (B&PV) Code incorporated by reference in 10 CFR 50.55a(b) on the date 12 months before initial fuel load. Inservice examination of components and system pressure tests conducted during successive 120-month inspection intervals must comply with the requirements of the latest edition and addenda of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months before the start of the 120-month inspection interval. In lieu of meeting specific ASME B&PV Code requirements, the COL applicant may implement optional ASME Code cases as approved in RG 1.147 and incorporated by reference in 10 CFR 50.55a(b).

The NRC may also grant relief from impractical ASME Code inspection requirements pursuant to 10 CFR 50.55a (g)(6)(i). The NRC may also authorize as an alternative(s) to ASME Code an inspection requirement(s) where the alternative(s) provides an acceptable level of quality and safety (pursuant to 10 CFR 50.55a(a)(3)(i)) or where compliance with the specified requirement(s) would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety (pursuant to 10 CFR 50.55a(a)(3)(ii)).

Supplemental Information:

The COL applicant provided supplemental information in COL FSAR Sections 6.6.1 and 6.6.4 as follows:

Site-specific inservice inspection requirements for the ASME Code Class 3 site-specific ultimate heat sink (UHS) makeup water system are provided in COL FSAR Table 6.6-1 (e.g., part examined, examination area, examination method, extent of examination).

6.6.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed within the FSER related to the U.S. EPR FSAR.

In addition, the relevant requirements of the NRC regulations for the inservice inspection of ASME Code Class 2 and 3 components, and the associated acceptance criteria, are given in NUREG-0800, Section 6.6.

The applicable regulatory requirements for inservice inspection of ASME Code Class 2 and 3 components are as follows:

- 10 CFR 50.55a, as it pertains to specification of the preservice and periodic inspection and testing requirements of the ASME Code for Class 2 and 3 systems and components.

The related acceptance criteria are as follows:

The regulatory basis for acceptance of the COL information item as it relates to fully describing an operational program is found in SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria," October 28, 2005.

6.6.4 Technical Evaluation

The staff reviewed COL FSAR Section 6.6 and checked the referenced design certification FSAR to ensure that the combination of the U.S. EPR FSAR and the information in the COL FSAR represents the complete scope of information relating to this review topic. The staff's review confirmed that the information contained in the application and incorporated by reference addresses the required information relating to this section. U.S. EPR FSAR Tier 2 Section 6.6 is being reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the information incorporated by reference related to the inservice inspection of ASME Code Class 2 and 3 components will be documented in the staff safety evaluation report on the design certification application for the U.S. EPR.

The staff reviewed the information contained in the COL FSAR:

The staff's evaluation of the operational program aspects of the ASME Code Class 2 and 3 preservice inspection / inservice inspection (PSI/ISI) program is addressed with ASME Code Class 1 components in Section 5.2.4 of this report. Accordingly, the staff's evaluation of this section focuses on the acceptability of the COL applicant's supplemental information and responses to U.S. EPR FSAR COL information items and action items as they relate to PSI/ISI of ASME Code Class 2 and 3 components. The staff reviewed conformance of COL FSAR Revision 4, Section 6.6, to the guidance in RG 1.206, Section C.III.1, Chapter 6, C.I.6.6, "Inservice Inspection of Class 2 and 3 Components."

In the staff's review of U.S. EPR FSAR Tier 2, Section 6.6, the staff concluded that the U.S. EPR 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 U.S. EPR certified design is the 2004 Edition. It should be noted that the staff did not identify any portions of the U.S. EPR ISI program for ASME Code Class 1, 2, and 3 components that were excluded from the scope of the staff's review of the U.S. EPR design certification (as the staff did for inservice testing of valves in U.S. EPR FSER Section 3.9.6.4). Therefore, the staff's conclusions regarding the acceptability of the U.S. EPR ISI program based on the 2004 Edition of the ASME Code, Section XI with regard to preservice and inservice inspectability of ASME Code Class 2 and 3 components remains unchanged. The adequacy of the ISI program for steel containment (Class MC Components) is addressed in Section 3.8.2 of this report. The SER on the U.S. EPR is not yet complete. The staff will update Chapter 6 of this report to reflect the final disposition of the design certification application.

In U.S. EPR FSAR Tier 2, Section 6.6, COL Information Item 6.6-1 was identified which required that:

A COL applicant that references the U.S. EPR design certification will identify the implementation milestones for the site-specific ASME Section XI preservice and inservice inspection program for Class 2 and 3 components, consistent with the requirements of 10 CFR 50.55a(g). The program will identify the applicable

edition and addenda of the ASME Code Section XI, and will identify additional relief requests and alternatives to Code requirements.

In COL FSAR Section 6.6, the COL applicant stated that the preservice and inservice inspection programs for ASME Code Class 2 and 3 components will meet the requirements of the 2004 Edition of the ASME Code, Section XI and that no relief requests or alternatives are required. The COL applicant also stated that the initial inservice inspection program shall incorporate the latest edition and addenda of the ASME Code approved in 10 CFR 50.55a on the date 12 months before initial fuel load, and the implementation milestones for the preservice and inservice inspection programs are identified in COL FSAR Table 13.4-1.

The staff notes that 10 CFR 50.55a(g) requires 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 ASME Code incorporated by reference in 10 CFR 50.55a, paragraph (b) on the date 12 months before the date scheduled for initial loading of fuel under a combined license under 10 CFR Part 52. The staff concludes that the supplemental information provided by the COL applicant meets the regulations; no relief requests or alternatives are identified; the milestones are identified in COL FSAR Table 13.4-1, and are therefore acceptable. COL Information Item 6.6 for ASME Code Class 2 and 3 components is considered closed.

The staff reviewed the supplemental information submitted in COL FSAR Section 6.6, COL FSAR Table 6.6-1, "Inservice Inspection Requirements for Class 3 Site-Specific UHS Makeup Water System." The staff compared COL FSAR Table 6.6-1 to the 2004 Edition of the ASME Code, Section XI, Table IWD-2500-1, for Examination Category D-A, Welded Attachments for Vessels, Piping, Pumps, and Valves. The staff noted that COL FSAR Table 6.6-1 did not contain the Examination Requirements/Fig. No., Acceptance Standard, Frequency, or Notes that Table IWD-2500-1 contained. The staff could not determine if the COL applicant was going to comply with examination requirements under the Table IWD-2500-1 and submitted an incomplete table or was taking exception to the ASME Code requirements for Examination Category D-A items. Based on the above, in RAI 88, Question 01-3, the staff requested that the applicant revise Table 6.6-1 to include all of the information listed under Table IWD-2500-1 for Examination Category D-A items or justify an alternative. .

In a May 8, 2009, response to RAI 88, Question 01-3, the COL applicant stated that it intended to revise the COL FSAR to state that no departures or supplements under COL FSAR Section 6.6.1, "Components Subject to Examination," and COL FSAR Section 6.6.4, "Inspection Intervals." In addition, COL FSAR Table 6.6-1 was to be deleted. The staff concludes that the COL applicant changes comply with the requirements as stated in the ASME Code, with no supplements/departures, meeting the SRP acceptance criteria. The staff reviewed COL FSAR, Revision 7, Section 6.6, and found that the proposed changes were made to the COL FSAR. Therefore, the staff considers RAI 88, Question 01-3 resolved.

The PSI and ISI programs are considered operational programs and are listed in the COL FSAR Table 13.4-1, "Operational Programs Required by NRC Regulations and Program Implementation." COL FSAR Table 13.4-1 lists the operational programs with specific milestones for program implementation. Many operational programs listed in COL FSAR Table 13.4-1 identify a license condition as their implementation requirement. However, the COL applicant has not yet established the specific wording for these license conditions. In addition, the COL applicant has not established a license condition to provide implementation

schedules for operational program readiness as discussed in SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria." Because these programs will not be fully implemented before COL issuance, the staff is developing generic license conditions, consistent with the policy established in SECY-05-0197 requiring (1) the implementation of the operational program for those operational programs for which regulations do not specify implementation requirements and (2) the licensee to provide operational program implementation schedules to facilitate NRC inspections. More specifically, the first license condition will require the licensee to implement the operational program or portions of the program identified in COL FSAR Table 13.4-1 on or before established milestones. For the PSI and ISI programs, the regulations and the ASME B&PVI Code, Section XI contain specific implementation requirements, thus, obviating the need for this first license condition for these two operational programs. A second license condition will require that the licensee submit to the NRC, a schedule, 12 months after issuance of a COL that supports planning for and conduct of NRC inspections of operational programs listed in the operational program FSAR table. The schedule shall be updated every 6 months before scheduled fuel load, and every month thereafter until either the operational program listed in the FSAR table has been fully implemented or the plant has been placed in commercial service; whichever comes first. The second license condition is necessary for the PSI and ISI programs. As described in Section 5.2.4 of this report, the COL applicant's proposed license condition is consistent with the policy and guidance established in SECY-05-0197, and is thus acceptable, and adequately addresses COL Information Item 5.2-3, COL FSAR Sections 5.2.4 and 6.6 addresses the PSI and ISI operational programs for ASME Code Class 1, 2, and 3 components. For CCNPP Unit 3, the COL applicant incorporated by reference the PSI and ISI programs descriptions from the U.S. EPR FSAR Tier 2, Sections 5.2.4, "Inservice Inspection and Testing of the RCPB," and 6.6, "Inservice Inspection of Class 2 and 3 Components," with no departures.

6.6.5 Post Combined Operating License Activities

The licensee will have available for the staff's review its PSI and ISI programs, including non-destructive examination procedures to verify compliance with the ASME Code, Section XI. The milestone schedule for this activity will be in accordance with the license conditions specified in COL FSAR Table 13.4-1, "Operational Programs Required by NRC Regulations and Program Implementation." The staff will inspect the PSI and ISI program plan to verify compliance with 10 CFR 50.55a requirements prior to fuel load.

6.6.6 Conclusions

The staff reviewed the application and checked the referenced U.S. EPR FSAR. The staff's review confirmed that the COL applicant addressed the required information relating to the inservice inspection of ASME Code Class 2 and 3 components. The staff is reviewing the information in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to the inservice inspection of ASME Code Class 2 and 3 components incorporated by reference in the COL FSAR will be documented in the staff safety evaluation report on the design certification application for the U.S. EPR. The staff notes that the SER on the U.S. EPR is not yet complete. The staff will update this SER to reflect the final disposition of the design certification application. The staff will update Chapter 6 of this report to reflect the final disposition of the design certification application.

In addition, the staff concludes that the COL applicant's proposed resolution to COL information items and supplementary information provided in COL FSAR Revision 4, Section 6.6, meets the relevant guidelines in SRP Section 6.6. Compliance with these guidelines provides an acceptable basis for satisfying, in part, the requirements of 10 CFR 50.55a.

6.7 Main Steamline Isolation Valve Leakage Control System (BWRs)

This section is not applicable to CCNPP Unit 3 or the U.S. EPR design.

6.8 Extra Borating System

The extra borating system (EBS) is designed to inject concentrated boron solution into the reactor coolant system at a rate sufficient to maintain subcriticality during the cool down from any operational or anticipated transient, and is required to maintain subcriticality for the steam generator tube rupture event. The EBS also provides reactivity control to support the capability to take the reactor from normal operating conditions to cold shutdown using only safety-related systems.

The staff reviewed the application and checked the referenced U.S. EPR design certification FSAR. The staff's review confirmed that the applicant addressed the required information relating to the extra borating system, and there is no outstanding information expected to be addressed in the COL FSAR related to this section.

The staff is reviewing the information in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to the extra borating system incorporated by reference in the COL FSAR will be documented in the staff safety evaluation report on the design certification application for the U.S. EPR. The SER on the U.S. EPR is not yet complete. The staff will update Chapter 6 of this report to reflect the final disposition of the design certification application.