5.0 REACTOR COOLANT SYSTEM AND CONNECTED SYSTEMS

5.1 Introduction

The reactor coolant system (RCS) consists of two heat transfer circuits, each with a steam generator, two reactor coolant pumps and a single hot leg and two cold legs for circulating reactor coolant. In addition, the system includes the pressurizer, interconnecting piping/valves and instrumentation for operational control and safeguards actuation. All RCS equipment is located in the reactor containment. The RCS is designed to transfer heat generated by the reactor core, located in the reactor vessel (RV), to the secondary side of the steam generators for plant power generation.

Section 5.1 of the Turkey Point Units 6 and 7 combined license (COL) Final Safety Analysis Report (FSAR), Revision 7, incorporates by reference, with no departures or supplements, Section 5.1 of Revision 19 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 results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

5.2 Integrity of Reactor Coolant Pressure Boundary

5.2.1.1 *Compliance with 10 CFR 50.55a*

5.2.1.1.1 Introduction

Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a, "Codes and standards," incorporates by reference the American Society of Mechanical Engineers (ASME) *Boiler & Pressure Vessel Code* (BPV Code) and ASME Code for Operation and Maintenance for Nuclear Power Plants (OM Code), including Editions and Addenda for ASME Class 1, 2, and 3 components, required for component design, construction, inservice inspection (ISI), and inservice testing (IST).

AP1000 DCD, Tier 2, Table 3.2-1 classifies the pressure-retaining components of the reactor coolant pressure boundary (RCPB) as ASME BPV Code, Section III, Class 1 components. These Class 1 components are designated quality group (QG) A in conformance with Regulatory Guide (RG) 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," Revision 3.

5.2.1.1.2 Summary of Application

Section 5.2 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference Section 5.2 of the AP1000 DCD, Revision 19. Section 5.2 of the DCD includes Section 5.2.1.1.

[1] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a design certification (DC).

In addition, in Turkey Point Units 6 and 7 COL FSAR Section 5.2.1.1, the applicant provided the following:

AP1000 COL Information Item

- STD COL 5.2-1

The applicant provided additional information in Standard (STD) COL 5.2-1 to address COL Action Item 5.2.1.1-1 identified in NUREG-1793, Appendix F, "Combined License Action Items" and COL Information Item 5.2-1 discussed in Section 5.2.6.1, "ASME Code and Addenda," of the AP1000 DCD. The portion of STD COL 5.2-1 evaluated here applies to ASME BPV Code reconciliation. The portion applicable to Code cases is reviewed in Section 5.2.1.2 of this safety evaluation report (SER).

In particular, Turkey Point Units 6 and 7 COL FSAR Section 5.2.1.1 states:

> If a later Code edition/addenda than the Design Certification Code edition/addenda is used by the material and/or component supplier, then a code reconciliation to determine acceptability is performed as required by the ASME Code, Section III, NCA-1140. The later Code edition/addenda must be authorized in 10 CFR 50.55a or in a specific authorization as provided in 50.55a(a)(3). Code Cases to be used in design and construction are identified in the DCD; additional Code Cases for design and construction beyond those for the design certification are not required.
>
> Inservice inspection of the reactor coolant pressure boundary is conducted in accordance with the applicable edition and addenda of the ASME Boiler and Pressure Vessel Code Section XI, as described in Subsection 5.2.4. Inservice testing of the reactor coolant pressure boundary components is in accordance with the edition and addenda of the ASME OM Code as discussed in Subsection 3.9.6 for pumps and valves, and as discussed in Subsection 3.9.3.4.4 for dynamic restraints.

5.2.1.1.3 Regulatory Basis

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the ASME BPV Code reconciliation are given in Section 5.2.1 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)."

The applicable regulatory requirements for the NRC staff's review of STD COL 5.2-1 are provided in 10 CFR 50.55a, as it relates to the establishment of the minimum quality standards for the design, fabrication, erection, construction, testing, and inspection of RCPB components and other safety-related fluid systems of pressurized-water reactor (PWR) nuclear power plants by compliance with appropriate editions of published industry codes and standards. The regulatory basis is also provided in 10 CFR Part 50, "Domestic licensing of production and utilization facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion (GDC) 1, "Quality Standards and Records," as it relates to requirements that

nuclear power plant structures, systems, and components (SSCs) important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed.

5.2.1.1.4 Technical Evaluation

The NRC staff reviewed Section 5.2.1.1 of the Turkey Point Units 6 and 7 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 in the application and incorporated by reference addresses the required information relating to integrity of the RCPB. The results of the NRC staff's evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the design certification (DC) and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant [VEGP], Units 3 and 4) were equally applicable to the Turkey Point Units 6 and 7 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5, to the Turkey Point Units 6 and 7 COL FSAR. In performing this comparison, the staff considered changes made to the Turkey Point Units 6 and 7 COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs).

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the Turkey Point Units 6 and 7 COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application. There was a change to the AP1000 DCD and NUREG-1793 referenced in the standard content material. This change is discussed in this SER.

The following portion of this technical evaluation section is reproduced from Section 5.2.1.1.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 5.2-1*

The NRC staff reviewed STD COL 5.2-1 related to ASME BPV Code reconciliation included under Section 5.2.1.1 of the BLN COL FSAR.

The regulations in 10 CFR 50.55a(a)(3) provide requirements to authorize alternatives to the regulations in 10 CFR 50.55a, while 10 CFR 50.55a(f)(6)(i) and 10 CFR 50.55(g)(6)(i) provide requirements to grant requests for relief from impractical ASME Code requirements. In addition, NUREG-1793, Section 5.2.1.1 provides a discussion on the need for allowing changes to the ASME Code Edition and Addenda during plant construction to ensure consistency between design and construction requirements.

Section 5.2.1.1 of the NRC staff's NUREG-1793 states:

> *DCD Tier 2, Section 5.2.1.1, states that the baseline code used to support the AP1000 DCD is ASME Code, Section III, 1998 Edition, up to and including the 2000 Addenda. However, the ASME Code, Section III, 1989 Edition, 1989 Addenda will be used for Articles NB-3200, NB-3600, NC-3600, and ND-3600 in lieu of the later edition and addenda. The use of these editions and addenda meets the requirements of 10 CFR 50.55a(b) and the associated modifications in 10 CFR 50.55a(b)(1)(iii) and is, thus, acceptable. Any proposed change to the use of the ASME Code editions or addenda by a Combined License (COL) applicant will require NRC approval prior to implementation.*

The issue was also captured as COL Action Item 5.2.1.1-1 in Appendix F of NUREG-1793. The NRC staff states in Section 5.2.1.1 of NUREG-1793:

> *The COL applicant should ensure that the design is consistent with the construction practices (including inspection and examination methods) of the ASME Code edition and addenda, as endorsed in 10 CFR 50.55a. DCD Tier 2, Section 5.2.6.1, "ASME Code and Addenda," contains a commitment that the COL applicant will address consistency of the design with the construction practices (including inspection and examination methods) of the later ASME Code edition and addenda. The staff finds this to be an acceptable commitment. This is COL Action Item 5.2.1.1-1.*

Specifically, the AP1000 DCD in Section 5.2.6.1 identified a COL information item stating:

> *The Combined License applicant will address in its application the portions of later Code editions and addenda to be used to construct components that will require NRC staff review and approval. The Combined License applicant will address consistency of the design with the construction practices*

> *(including inspection and examination methods) of the later ASME Code edition and addenda added as part of the Combined License application. The Combined License applicant will address the addition of ASME Code cases approved subsequent to design certification.*

The staff reviewed conformance of BLN's resolution to COL Action Item 5.2.1.1-1 to the guidance in NUREG-0800, Section 5.2.1.1, "Compliance with the Codes and Standards Rule, 10 CFR 50.55a." ASME Code, Section III, NCA-1140, "Use of Code Editions, Addenda, and Cases," states that specific provisions within an Edition or Addenda later than those established in the design specifications may be used, provided that all the related requirements are met. NCA-1140(a)(1) also states:

> *Under the rules of this Section [Section III], the Owner or his designee shall establish the Code Edition and Addenda to be included in the Design Specifications. All items of a nuclear power plant may be constructed to a single Code Edition and Addenda, or each item may be constructed to individually specified Code Editions and Addenda.*

Accordingly, a COL applicant should establish whether it plans to use a single Code Edition and Addenda consistent with the certified design or to use individually specified Code Editions and Addenda. If individually specified Code Editions and Addenda are used, then differences between those Editions and Addenda are required to be reconciled consistent with requirements in the ASME BPV Code, Section III, NCA-1140.

The NRC staff found that Revision 0 to the BLN COL FSAR did not address NCA-1140 in describing the use of later Code Editions and Addenda. Therefore, in request for additional information (RAI) 5.2.1.1-1, the staff requested that the applicant explain the methodology for the ASME BPV Code reconciliation consistent with NCA-1140.

In its response to RAI 5.2.1.1-1 (this also applies to RAI 5.2.1.2-1 and RAI 5.2.1.1-3), the COL applicant described a revision to the FSAR to address this issue. Revision 1 to BLN COL FSAR Section 5.2.1.1, specifies that the methodology used to ensure consistency of design and construction practices when using later Section III Code Editions and Addenda would conform to the provisions of NCA-1140, and that all related requirements of the Code case(s) would be met. The use of NCA-1140 addresses the provisions to be followed for reconciliation of later Editions/Addenda of the ASME BPV Code. As a result, RAI 5.2.1.1-1 and RAI 5.2.1.2-1 are closed.

Revision 0 of the BLN COL FSAR referred to the use of ASME BPV Code, Section XI, as part of the reconciliation process if a later-Code year/Addenda than the DC Code year/Addenda is used by the material and/or component supplier. In RAI 5.2.1.1-3, the staff requested that the applicant provide justification for the use of ASME BPV Code, Section XI, which addresses ISI at operating nuclear power plants, in the reconciliation process for new reactor designs.

In its response to RAI 5.2.1.1-3 (referring to the response to RAI 5.2.1.1-1), the applicant noted that ASME BPV Code, Section III components are being designed using the baseline ASME BPV Code defined in DCD Section 5.2.1.1. Design specifications for component and material procurement will specify the ASME BPV Code to be used for design and construction to be that identified in the DCD. The applicant also noted that the reference in FSAR Section 5.2.1.1 to the ASME BPV Code, Section XI reconciliation process for repair and replacement was inappropriate for the original design and construction. Therefore, the applicant stated that this reference would be corrected. Revision 1 to the BLN COL FSAR in Section 5.2.1.1 removes the reference to ASME BPV Code, Section XI, and states, if a later Code Edition/Addenda than the DC Code Edition/Addenda is used by the material and/or component supplier, then a Code reconciliation to determine acceptability is performed as required by the ASME Code, Section III, NCA-1140. The staff finds that Revision 1 to the BLN COL FSAR meets the requirements of 10 CFR 50.55a. As a result, RAI 5.2.1.1-3 is closed.

Revision 0 of the BLN COL FSAR referenced Revision 16 of the AP1000 DCD. AP1000 DCD, Revision 16 required the use of the 1989 Edition, 1989 Addenda for NB-3200, NB-3600, NC-3600 and ND-3600 for construction of components and piping. In RAI 5.2.1.1-5, the NRC staff requested that the applicant identify components that are designed and constructed using the 1989 ASME BPV Code and discuss whether these components will meet the requirements of the 1998 Edition through and including the 2000 Addenda ASME BPV Code, which is the Code of record for the AP1000 DCD. In its response to RAI 5.2.1.1-5, the applicant indicated that in a letter dated May 16, 2008, Westinghouse submitted a document (APP-GW-GLE-005) to address the limitation on the use of ASME Section III Code for seismic design in accordance with 10 CFR 50.55a(b)(1)(iii) as related to the use of the above four articles. The AP1000 DCD was accordingly changed in Revision 17 to limit the use of the 1989 Edition, 1989 Addenda to piping design only. Since BLN COL FSAR, Revision 1 incorporated by reference Revision 17 of AP1000 DCD, no components will be constructed using the 1989 Edition, 1989 Addenda Code and they will be used for piping design only. As a result, RAI 5.2.1.1-5 is closed.

AP1000 DCD, Section 5.2.1.1 discusses the application of ASME BPV Code, Section III, for the design and fabrication of RCPB components. In RAI 5.2.1.1-2, the NRC staff requested that the applicant discuss the application of other sections of the ASME BPV Code and the ASME Code for Operation and Maintenance of Nuclear Power Plants (OM Code) not specified in the AP1000 DCD, Section 5.2.1.1. In its response to RAI 5.2.1.1-2, provided in a letter dated July 25, 2008, the applicant discussed other sections in the AP1000 DCD and the BLN COL FSAR that reference the ASME BPV Code and the ASME OM Code. In response to RAI 5.2.1.1-2, the applicant stated that BLN COL FSAR Section 5.2.1.1 would be revised to address this issue. Revision 1 to the BLN COL FSAR in Section 5.2.1.1, specifies that ISI of the RCPB will be conducted in accordance with the applicable Edition and Addenda of the ASME BPV Code, Section XI, as described in BLN COL FSAR Section 5.2.4, "Inservice Inspection and Testing of Class 1 Components." The BLN COL FSAR, Revision 1 also specifies that IST of the RCPB components will be performed in

accordance with the applicable Edition and Addenda of the ASME OM Code as discussed in BLN COL FSAR Section 3.9.6, "Inservice Testing of Pumps and Valves," and as discussed in BLN COL FSAR Section 3.9.3.4.4, "Inspection, Testing, Repair and/or Replacement of Snubbers." Revision 1 to the BLN COL FSAR clarified the application of other sections of the ASME BPV Code and the ASME OM Code in the design, construction, and operation of BLN Units 3 and 4. As a result, RAI 5.2.1.1-2 is closed.

As discussed in NUREG-1793, use of the ASME BPV Code for the AP1000 reactor is Tier 1 information while the specific Edition and Addenda are designated Tier 2 because of the continually evolving design and construction practices (including inspection and examination techniques) of the ASME BPV Code. The NRC staff finds that the design and construction of ASME BPV Code Class 1, 2, and 3 components and their supports will conform to the appropriate ASME BPV Code Editions and Addenda and, thus, meet the relevant NRC regulations governing the use of codes and standards. The use of Editions and Addenda of the ASME BPV Code, Section III issued subsequent to the AP1000 design code of record may be used provided the Edition and Addenda are incorporated by reference in the regulations, and NRC staff approval is obtained as required for Tier 2* changes to the AP1000 DC information. Generic NRC approval of the Tier 2* changes related to use of later Editions and Addenda during construction may be obtained by a COL applicant through NCA-1140(a)(1) for components other than piping. Further, the staff finds that quality standards used will be commensurate with the importance of the safety function of all safety-related components because the ASME BPV Code, Section III that is incorporated by reference into the NRC regulations will be used by the COL licensee to ensure consistency with design, construction, and inspection requirements. The staff finds this to be an acceptable basis for satisfying the requirements of GDC 1. Finally, STD COL 5.2-1 states that any proposed alternatives to the ASME BPV Code must be authorized by the NRC pursuant to 10 CFR 50.55a(a)(3). This meets the regulations and is, therefore, acceptable.*

<u>Correction to the Standard Content Evaluation Text</u>

The section of the technical evaluation above, which discusses the Tier 2* information is no longer valid. Westinghouse revised its DCD to change the Edition and Addenda of the ASME BPV Code from a Tier 2* designation to Tier 2. This change is evaluated in a supplement to NUREG-1793.

This change does not impact the conclusions of the BLN or VEGP standard content evaluations described above.

5.2.1.1.5 Post Combined License Activities

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

5.2.1.1.6 Conclusion

The NRC staff reviewed the application and the referenced DCD. The staff's review confirmed that the applicant has addressed the relevant information relating to this section, and no outstanding information related to this section remains to be addressed in the Turkey Point

Units 6 and 7 COL FSAR. The results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the Turkey Point Units 6 and 7 COL FSAR is acceptable and meets the requirements of 10 CFR 50.55a and GDC 1. The staff based its conclusion on the following:

- STD COL 5.2-1, as related to ASME Code reconciliation, is acceptable because the design and construction of ASME BPV Code Class 1, 2, and 3 components and their supports will conform to the appropriate ASME BPV Code Editions and Addenda and, thus, meet the relevant NRC regulations in 10 CFR 50.55a governing the use of codes and standards. Further, the staff finds that quality standards used will be commensurate with the importance of the safety function of all safety-related components and is an acceptable basis for satisfying the requirements of GDC 1. Also, STD COL 5.2-1 states that any proposed alternatives to the ASME BPV Code must be authorized by the NRC pursuant to 10 CFR 50.55a(a)(3).

5.2.1.2 *Applicable Code Cases (Related to RG 1.206, Section C.III.1, Chapter 5, C.I.5.2.1.2, "Compliance with Applicable ASME Code Cases")*

5.2.1.2.1 Introduction

This section addresses the ASME Code cases to be used at Turkey Point Units 6 and 7. In general, a Code case is developed by ASME based on inquiries from the nuclear industry associated with Code clarification, modification or alternative to the Code. All Code cases will remain valid and available for use until annulled by the ASME BPV Standards Committee. ASME Code cases acceptable to the NRC staff are published in RG 1.84, "Design and Fabrication Code Case Acceptability, ASME Section III, Division 1"; RG 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1"; and RG 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code"; in accordance with requirements of 10 CFR 50.55a(b)(4), 10 CFR 50.55a(b)(5) and 10 CFR 50.55a(b)(6).

5.2.1.2.2 Summary of Application

Section 5.2 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference Section 5.2 of the AP1000 DCD, Revision 19. Section 5.2 of the DCD includes Section 5.2.1.2.

Turkey Point Units 6 and 7 COL FSAR Section 5.2 does not include supplemental information in the incorporation by reference of Section 5.2.1.2 of the AP1000 DCD. However, Turkey Point Units 6 and 7 COL FSAR Section 5.2 specifies supplementary information in STD COL 5.2-1 that relates to applicable Code cases.

In addition, in Turkey Point Units 6 and 7 COL FSAR Section 5.2.1.1, the applicant provided the following:

AP1000 COL Information Item

- STD COL 5.2-1

The applicant provided additional information in STD COL 5.2-1 to address COL Action Item 5.2.1.1-1 identified in NUREG-1793 and COL Information Item 5.2-1 discussed in Section 5.2.6.1, "ASME Code and Addenda," of the AP1000 DCD. The portion of STD COL 5.2-1 evaluated here applies to applicable Code cases.

5.2.1.2.3 Regulatory Basis

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the applicable Code cases are given in Section 5.2.1.2 of NUREG-0800.

The applicable regulatory requirements for the NRC staff's review of the Turkey Point Units 6 and 7 COL application are as follows:

GDC 1 in Appendix A to 10 CFR Part 50 and 10 CFR 50.55a, as related to the establishment of the minimum quality standards for the design, fabrication, erection, construction, testing, and inspection of nuclear power plant components, require conformance with appropriate editions of published industry codes and standards.

As one means of meeting the applicable NRC regulations, RG 1.84 lists ASME BPV Code, Section III Code cases oriented to design, fabrication, materials, and testing, which are acceptable with applicable conditions for implementation at nuclear power plants. RG 1.147 lists ASME BPV Code, Section XI Code cases, which are acceptable with applicable conditions for use in the ISI of nuclear power plant components and their supports. RG 1.192 lists Code cases related to the ASME OM Code oriented to operation and maintenance of nuclear power plant components, which are acceptable with applicable conditions for implementation at nuclear power plants.

5.2.1.2.4 Technical Evaluation

The NRC staff reviewed Section 5.2 of the Turkey Point Units 6 and 7 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 in the application and incorporated by reference addresses the required information relating to applicable Code cases. The results of the NRC staff's evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

In NUREG-1793 Section 5.2.1.2, the NRC staff states that the COL applicant may submit, with its COL application, future Code cases that are endorsed in RG 1.84 at the time of the application, provided that they do not alter the staff's safety findings on the AP1000 certified design. The staff also states that the COL applicant should submit those Code cases that are in effect at the time of the COL application and apply to operational programs involving ISI and IST. The supplement to NUREG-1793 describes the staff's technical evaluation of modifications to the list of ASME Code cases in Table 5.2-3 of Revision 19 to the AP1000 DCD.

The NRC staff followed the guidance provided in NUREG-0800, Section 5.2.1.2, "Applicable Code Cases," and RG 1.206, "Combined License Applications for Nuclear Power Plants

(LWR Edition)," Section C.III.1, Chapter 5, C.I.5.2.1.2, in evaluating Turkey Point Units 6 and 7 COL FSAR Section 5.2.1.2 for compliance with the NRC regulations.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the Turkey Point Units 6 and 7 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5, to the Turkey Point Units 6 and 7 COL FSAR. In performing this comparison, the staff considered changes made to the Turkey Point Units 6 and 7 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the Turkey Point Units 6 and 7 COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 5.2.1.2.4 of the VEGP SER:

<u>AP1000 COL Information Item</u>

- *STD COL 5.2-1*

Revision 0 to the BLN COL FSAR in Section 5.2.1.1 had referenced ASME BPV Code, Section XI, as part of the reconciliation process for the use of ASME Code cases other than those included in AP1000 DCD Table 5.2-3. In RAI 5.2.1.1-4, the staff requested that the applicant explain how this met 10 CFR 50.55a(a)(3), 10 CFR 50.55a(b)(4), 10 CFR 50.55a(b)(5), and10 CFR 50.55a(b)(6).

In its response to RAI 5.2.1.1-4, the applicant noted that no Code cases other than those included in the DCD have been identified as necessary at this time. Code cases approved by the NRC in RG 1.147 may be used, and if so, they will be identified in a revision to the FSAR. The applicant also indicated that the FSAR statement regarding reconciliation of Code cases was incorrect and would be revised. Revision 1 to the BLN COL FSAR in Section 5.2.1.1 specifies that Code cases to be used in design and construction are identified in the DCD and that additional Code cases for design and construction beyond those for the DC are not required. The staff considers Revision 1 to the BLN COL FSAR Section 5.2.1.1 to be acceptable. As a result, RAI 5.2.1.1-4 is closed.

AP1000 DCD, Revision 17, Section 5.2.1.2 indicated that use of Code cases approved in revisions of the RGs issued subsequent to the DC may be used as discussed in Section 5.2.6.1 by using the process outlined for updating the ASME Code Edition and Addenda. Section 5.2.6.1 stated that the COL applicant will address in its application, the addition of ASME Code cases approved subsequent to DC. Similar to the Section III Code cases listed in DCD Table 5.2-3, in RAI 5.2.1.2-2, the staff requested that the applicant identify the ASME BPV Code, Section XI ISI and the ASME OM Code cases that are used for BLN design and construction. The applicant was also requested to confirm whether these Code cases are approved by the NRC as documented in RGs 1.147 and 1.192. If not, these Code cases must be submitted to the NRC for authorization pursuant to 10 CFR 50.55a(a)(3).

In its response to RAI 5.2.1.2-2, the applicant referred to its response to RAI 5.2.1.1-4 and noted that there are no additional Code cases used for design and construction beyond those identified in the DCD. In its RAI response, the applicant stated that the IST Program described in BLN COL FSAR Section 3.9.6 will utilize Code Case OMN- 1, Revision 1, "Alternative Rules for the Preservice and In-service Testing of Certain Electric Motor-Operated Valve Assemblies in Light Water Reactor Power Plants," which establishes alternate rules and requirements for preservice and IST to assess the operational readiness of certain motor operated valves. The staff notes that the current revision to RG 1.192 at the time of this COL review conditionally accepts the use of Code Case OMN-1, Revision 0, and does not address Revision 1 to Code Case OMN-1. The applicant will need to submit a request under 10 CFR 50.55a for authorization to apply Revision 1 to Code Case OMN-1, if RG 1.192 is not updated to accept this revision to the Code case prior to development of the IST Program for BLN. The NRC staff's review of the use of OMN-1, Revision 1, for BLN is discussed in Section 3.9.6 of this SER. In its response to RAI 5.2.1.2-2, the applicant stated that no code cases other than those included in the DCD are used for BLN and the FSAR would be revised as indicated in response to RAI 5.2.1.1-4. As noted above, Revision 1 to the BLN COL FSAR resolved RAI 5.2.1.1-4. Therefore, RAI 5.2.1.2-2 is also closed.

Based on its review, the NRC staff has determined that BLN COL FSAR Section 5.2 appropriately incorporates by reference AP1000 DCD, Section 5.2.1.2, in satisfying the NRC regulations for the design, fabrication, erection, testing, and inspection of plant SSCs commensurate with the importance of the safety function to be performed by referencing the use of accepted ASME Code cases. As a result, the staff concludes that compliance by the applicant with the provisions of the ASME Code cases accepted in RGs 1.84, 1.147, and 1.192, or individually reviewed and accepted in NUREG-1793 or its supplements, will result in component quality that is commensurate with the importance of the safety functions of the components at BLN Units 3 and 4. This satisfies the requirements of GDC 1, and, therefore, is acceptable.

AP1000 DCD, Section 5.2.6.1 states, in part, that the COL applicant will address the addition of ASME Code cases approved subsequent to the DC. As noted above, the applicant has not identified any Code cases other than those included in the AP1000 DCD as necessary at this time for the design and construction of

BLN Units 3 and 4. If the applicant determines the need to apply other ASME Code cases in the future, it may apply those ASME Code cases in accordance with their acceptance in RG 1.84, RG 1.147, or RG 1.192, including any applicable conditions, or must request NRC authorization to use those Code cases.

5.2.1.2.5 Post Combined License Activities

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

5.2.1.2.6 Conclusion

The NRC staff reviewed the application and the referenced DCD. The staff's review confirmed that the applicant has addressed the relevant information relating to this section, and no outstanding information related to this section remains to be addressed in the Turkey Point Units 6 and 7 COL FSAR. The results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the Turkey Point Units 6 and 7 COL FSAR is acceptable and meets the requirements of 10 CFR 50.55a and GDC 1, and complies with the provisions of the ASME Code cases accepted in RGs 1.84, 1.147, and 1.192. The staff based its conclusion on the following:

- STD COL 5.2-1, as related to applicable ASME Code cases, is acceptable because the NRC staff has determined that Turkey Point Units 6 and 7 COL FSAR Section 5.2 appropriately incorporates by reference AP1000 DCD Section 5.2.1.2, in satisfying the NRC regulations for the design, fabrication, erection, testing, and inspection of plant SSCs commensurate with the importance of the safety function to be performed by referencing the use of accepted ASME Code cases. As a result, the staff concludes that compliance by the applicant with the provisions of the ASME Code cases accepted in RGs 1.84, 1.147, and 1.192, or individually reviewed and accepted in NUREG-1793 or its supplements, will result in component quality that is commensurate with the importance of the safety functions of the components at Turkey Point Units 6 and 7. This satisfies the requirements of GDC 1, and, therefore, is acceptable.

5.2.1.3 *Alternate Classification*

In the standard plant design, Westinghouse applies an alternate classification for the chemical and volume control system (CVCS).

Section 5.2 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference, with no departures or supplements, Section 5.2.1.3, "Alternate Classification," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

5.2.2 Overpressure Protection

RCS and steam system overpressure protection during power operation is provided by the pressurizer safety valves and the steam generator safety valves, in conjunction with the action of the reactor protection system. In addition, a relief valve in the suction line of the normal residual heat removal system (RNS) provides low-temperature overpressure protection (LTOP) for the RCPB during low-temperature operation of the plant (startup, shutdown).

Section 5.2 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference, with no departures or supplements, Section 5.2.2, "Overpressure Protection," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

5.2.3 Reactor Coolant Pressure Boundary Materials

5.2.3.1 *Introduction*

Materials selected for RCS components must be compatible with reactor coolant water chemistry, thermal insulation materials, and the atmosphere. The specific processes (including heat treatment and welding practices) used to fabricate RCS components must maximize the corrosion resistance and fracture toughness of the components.

5.2.3.2 *Summary of Application*

Section 5.2 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference Section 5.2 of the AP1000 DCD, Revision 19. Section 5.2 of the DCD includes Section 5.2.3.

In addition, in Turkey Point Units 6 and 7 COL FSAR Section 5.2.3.2.1, the applicant provided the following:

Supplemental Information

- STD SUP 5.2-1

The applicant provided supplemental (SUP) information to describe the monitoring program for primary water chemistry to be implemented at the plant during plant operation.

5.2.3.3 *Regulatory Basis*

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the RCPB materials are given in Section 5.2.3 of NUREG-0800.

The applicable regulatory requirements for acceptance of the supplementary information on water chemistry monitoring is established in GDC 14, "Reactor Coolant Pressure Boundary," of Appendix A to 10 CFR Part 50, which requires that the RCPB shall be designed, fabricated,

erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.

5.2.3.4 *Technical Evaluation*

The NRC staff reviewed Section 5.2 of the Turkey Point Units 6 and 7 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 RCPB materials. The results of the NRC staff's evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the Turkey Point Units 6 and 7 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5, to the Turkey Point Units 6 and 7 COL FSAR. In performing this comparison, the staff considered changes made to the Turkey Point Units 6 and 7 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the Turkey Point Units 6 and 7 COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 5.2.3.4 of the VEGP SER:

<u>Supplemental Information</u>

- *STD SUP 5.2-1*

The NRC staff reviewed the standard supplementary information on water chemistry as discussed in Section 5.2.3.2.1 of the BLN COL FSAR. In its review of the supplemental information the staff used the applicable sections of NUREG-0800 and RG 1.206 as guidance. However, Section 5.2.3 of NUREG-0800 does not directly address PWR reactor coolant chemistry, but, rather, refers the reviewer to NUREG-0800, Section 9.3.4, "Chemical and

Volume Control System (PWR) Including Boron Recovery." Section 9.3.4 of NUREG-0800 recommends that the Chemical and Volume Control System (CVCS) ensure that RCS chemistry meets GDC 14, by maintaining acceptable purity levels in the reactor coolant through the removal of insoluble corrosion products and dissolved ionic material by filtration and ion exchange. In addition, Section 9.3.4 of NUREG-0800 recommends that the CVCS maintain proper RCS chemistry by controlling total dissolved solids, pH, oxygen concentration, and halide concentrations within the acceptable ranges. RG 1.206, Section C.III.1, Chapter 5, C.I.5.2.3.2 recommends that COL applications referencing PWR standard designs describe the chemistry of the reactor coolant and the additives (such as inhibitors), the water chemistry, including maximum allowable content of chloride, fluoride, sulfate, and oxygen and permissible content of hydrogen and soluble poisons, the methods to control water chemistry, including pH, the industry-recommended methodologies to be used to monitor water chemistry, and provide appropriate references. Additionally, RG 1.206, Section C.III.1, Chapter 5, C.I.5.2.3.2 also states that "this section may reference the Electric Power Research Institute (EPRI) water chemistry guidelines to support the plant-specific program. However, this section should fully describe and discuss the plant-specific water coolant chemistry control program and its compatibility with the RCPB materials."

The supplementary information in the BLN COL FSAR states that monitoring of water chemistry is implemented using the guidance of EPRI TR-1002884, "Pressurized Water Reactor Primary Water Chemistry Guidelines: Volume 1," Appendix F (Revision 5, dated October 2003). The cited appendix pertains specifically to sampling of soluble and insoluble corrosion products from the RCS. Use of this appendix is consistent with the recommendation in NUREG-0800 that the CVCS system maintains acceptable purity levels in the reactor coolant through the removal of insoluble corrosion products and dissolved ionic material by filtration and ion exchange, and must maintain proper RCS chemistry by controlling total dissolved solids, pH, oxygen concentration, and halide concentrations within the acceptable ranges. Accurate sampling of corrosion products supports this recommendation.

Appendix F of the Primary Water Chemistry Guidelines only provides a recommended methodology for sampling RCS corrosion products, and does not provide acceptance criteria or methods for reducing/controlling RCS corrosion products. Further, other primary water chemistry parameters that NUREG-0800 and RG 1.206 recommend be addressed in the FSAR are not addressed by Appendix F, such as pH, oxygen, and halide concentrations. These parameters are addressed in DCD Section 5.2.3 and DCD Table 5.2.2, which provides maximum values of primary water chemistry parameters including oxygen, pH and halide concentration for the various plant operating modes. Referencing Appendix F only of the Primary Water Chemistry Guidelines does not add any more detail or specificity for these other parameters. Therefore, in a letter dated April 10, 2008, the staff requested additional information (RAI 5.2.3-1) from the applicant to address these items.

Specifically, the NRC staff requested that the applicant explain the rationale for referencing only Appendix F to the "Pressurized Water Reactor Primary Water Chemistry Guidelines" rather than referencing the entire guidelines document.

The applicant responded to RAI 5.2.3-1, in a letter dated May 23, 2008, stating that "the AP1000 Design Control Document (DCD) describes, in Section 5.2.3.2.1, the RCS chemistry specifications and the methods to control water chemistry. In addition, DCD Table 5.2-2 summarizes these specifications for conductivity, pH, oxygen, chloride, hydrogen, suspended solids (corrosion product particulates), pH control agent, boric acid, silica, aluminum, calcium, magnesium, and zinc."

The applicant's response further stated that FSAR Section 5.2 incorporates the aforementioned DCD section by reference and refers to Appendix F of EPRI TR-1002884 as the industry recommended methodology to be used to monitor water chemistry. As noted by the question, Appendix F of the EPRI document is limited to corrosion products and as such, is insufficient to address the remaining details of the program. As such, the text of FSAR Section 5.2.3.2.1 will be revised to reference the complete EPRI document which does address the requested program attributes not covered by the DCD.

The applicant also proposed changes to the BLN COL FSAR Chapter 5, Section 5.2.3.2.1. The following information is to replace the previous supplemental information:

> *The water chemistry program is based on industry guidelines as described In EPRI TR-1002884, "Pressurized Water Reactor Primary Water Chemistry." The program includes periodic monitoring and control of chemical additives and reactor coolant impurities listed in DCD Table 5.2-2. Detailed procedures implement the program requirements for sampling and analysis frequencies, and corrective actions for control of reactor water chemistry. The frequency of sampling water chemistry varies (e.g., continuous, daily, weekly, or as needed) based on plant operating conditions and the EPRI water chemistry guidelines. Whenever corrective actions are taken to address an abnormal chemistry condition, increased sampling is utilized to verify the effectiveness of these actions. When measured water chemistry parameters are outside the specified range, corrective actions are taken to bring the parameter back within the acceptable range and within the time period specified in the EPRI water chemistry guidelines. Following corrective actions, additional samples are taken and analyzed to verify that the corrective actions were effective in returning the concentrations of contaminants.*
>
> *Chemistry procedures will provide guidance for the sampling and monitoring of primary coolant properties.*

The staff finds the applicant's response, and the proposed COL application changes, acceptable because it meets the acceptance criteria in Section 9.3.4 of NUREG-0800 related to the evaluation of the proposed chemistry program using the latest version in the EPRI report series, "PWR Primary Water Guidelines." The staff verified that Revision 1 of the FSAR (STD SUP 5.2-1) adequately incorporates the above. As a result, RAI 5.2.3-1 is closed.

Additionally, the staff finds that the BLN FSAR meets the recommendation in RG 1.206, Section C.III.1, Chapter 5, C.I.5.2.3.2 to fully describe the primary water chemistry control program in the FSAR by referencing the most recent version of the "EPRI PWR Primary Water Guidelines" in its entirety. Although Section 5.2 of the AP1000 DCD, Revision 17, provides maximum values (and in some cases, normal ranges) for the key primary water chemistry parameters, referencing the EPRI PWR Primary Water Guidelines provides a more detailed description of the chemistry control program because various action levels (at which varying levels of corrective action are required) are specified for the key parameters for different reactor operating modes, as well as the required periodicity for sampling the various parameters.

Although the staff does not formally review or issue a safety evaluation of the revisions to the EPRI water chemistry guidelines (including the PWR Primary Water Chemistry Guidelines), the guidelines are recognized as representing industry best practices in water chemistry control. Extensive experience in operating reactors has demonstrated that following the EPRI guidelines minimizes the occurrence of corrosion related failures. Further, the EPRI guidelines are periodically revised to reflect evolving knowledge with respect to best practices in chemistry control. Therefore, the staff accepts the use of the EPRI PWR Primary Water Chemistry Guidelines as a basis for a primary water chemistry program for a COL referencing a standard reactor design.

5.2.3.5 *Post Combined License Activities*

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

5.2.3.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the relevant information relating to this section, and no outstanding information related to this section remains to be addressed in the Turkey Point Units 6 and 7 COL FSAR. The results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the Turkey Point Units 6 and 7 COL FSAR is acceptable and meets the requirements of GDC 14. The staff based its conclusion on the following:

- STD SUP 5.2-1 meets the relevant guidance in Section 9.3.4 of NUREG-0800 with respect to developing a water chemistry program consistent with the latest EPRI guidelines and is acceptable. Conformance with these guidelines provides an acceptable basis for satisfying, in part, the requirements of GDC 14.

5.2.4 Inservice Inspection and Testing of Class 1 Components (Related to RG 1.206, Section C.III.1, Chapter 5, C.I.5.2.4, "Inservice Inspection and Testing of Reactor Coolant Pressure Boundary")

5.2.4.1 *Introduction*

Components that are part of the RCPB must be designed to permit periodic inspection and testing of important areas and features to assess their structural and leaktight integrity. ISI programs are based on the requirements of 10 CFR 50.55a in that Code Class 1 components, as defined in Section III of the ASME BPV Code, meet the applicable inspection requirements set forth in Section XI of the ASME Code, "Rules for Inservice Inspection of Nuclear Power Plant Components."

5.2.4.2 *Summary of Application*

Section 5.2 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference Section 5.2 of the AP1000 DCD, Revision 19. Section 5.2 of the DCD includes Section 5.2.4. The advanced safety evaluation (ASE) with confirmatory items for Section 5.2.4 was based on the VEGP COL FSAR, Revision 2 and DCD Revision 17. After submitting DCD Revision 17 to the NRC, Westinghouse added a new COL Information Item (COL 5.3-7). This COL information item has been incorporated into Revision 18 of the DCD; however, the discussion of the COL information item below did not change.

In addition, in Turkey Point Units 6 and 7 COL FSAR Section 5.2.4, the applicant provided the following:

AP1000 COL Information Item

- STD COL 5.2-2

The applicant provided additional information in STD COL 5.2-2 to address COL Information Item 5.2-2. The information relates to plant-specific preservice inspection (PSI) and ISI programs.

- STD COL 5.3-7

In a letter dated August 27, 2010, the VEGP applicant proposed a new STD COL 5.3-7 to address AP1000 DCD COL Information Item 5.3-7 included in a Westinghouse letter dated August 3, 2010. The new information states that the COL holder will augment the plant-specific ISI program in VEGP COL FSAR Section 5.2.4.1, related to the Quickloc weld buildup on the reactor vessel head. In its letter dated April 20, 2011, the Turkey Point Units 6 and 7 applicant endorsed that VEGP letter as standard, thereby adopting STD COL 5.3-7 for the Turkey Point Units 6 and 7 COL application. The April 20, 2011 letter also stated that the information in the August 27, 2010, letter will be incorporated into the future revision to the Turkey Point Units 6 and 7 COL FSAR. Revision 5 of the Turkey Point Units 6 and 7 COL FSAR is appropriately revised.

Supplemental Information

- STD SUP 5.2-2

The applicant provided supplemental information regarding guidance for inspecting the integrity of bolting and threaded fasteners.

License Condition

- License Condition 6, regarding PSI/ISI program details

5.2.4.3 *Regulatory Basis*

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for ISI are given in Section 5.2.4 of NUREG-0800.

The applicable regulatory requirements for acceptance of the resolution to COL Information Items 5.2-2 and 5.3-7 and supplementary information on ISI and testing of Class 1 components are established in GDC 32, "Inspection of Reactor Coolant Pressure Boundary," found in Appendix A to 10 CFR Part 50, as it relates to periodic inspection and testing of the RCPB, and 10 CFR 50.55a, as it relates to the requirements for inspecting and testing ASME Code Class 1 components of the RCPB.

The applicable policy for acceptance of COL Information Items 5.2-2 and 5.3-7, 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," dated October 28, 2005.

5.2.4.4 *Technical Evaluation*

The NRC staff reviewed Section 5.2.4 of the Turkey Point Units 6 and 7 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 in the application and incorporated by reference addresses the required information relating to the RCPB ISI and testing. The results of the NRC staff's evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

In Section 5.2.4 of NUREG-1793, the staff concluded that the AP1000 ISI program for Code Class 1 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 IST 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 1 components remains unchanged with Revision 17 of the AP1000 DCD, except for the newly identified STD COL Information Item 5.3-7, which is addressed below. 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. The staff's evaluation in this section also addresses the operational program aspects of the ASME Code Class 1, 2, and 3 PSI and ISI programs.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the Turkey Point Units 6 and 7 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5, to the Turkey Point Units 6 and 7 COL FSAR. In performing this comparison, the staff considered changes made to the Turkey Point Units 6 and 7 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the Turkey Point Units 6 and 7 COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 5.2.4.4 of the VEGP SER:

<u>AP1000 COL Information Item</u>

The following portion of this technical evaluation section is reproduced from Section 5.2.4.4 of the BLN SER:

- *STD COL 5.2-2*

The COL applicant added the following after the first paragraph in DCD Section 5.2.4:

> *The initial inservice inspection program incorporates the latest edition and addenda of the ASME Boiler and Pressure Vessel Code approved in 10 CFR 50.55a(b) on the date 12 months before the 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 Code incorporated by reference in 10 CFR 50.55a(b) 12 months before the start of the 120-month inspection interval (or the optional ASEM* [sic] *Code cases listed in NRC Regulatory Guide 1.147, that are incorporated by reference in 10 CFR 50.55a(b), subject to the limitations and modifications listed in 10 CFR 50.55a(b).*

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 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 combined license 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.

The COL applicant added the following at the end of DCD Section 5.2.4.1:

> *The Class 1 system boundary for both preservice and inservice inspection programs and the system pressure test program include those items within the Class 1 and Quality Group A (Equipment Class A [in accordance with] DCD Section 3.2.2 and DCD Table 3.2-3 boundary). Based on 10 CFR Part 50 and Regulatory Guide 1.26, the Class 1 boundary includes the following:*
>
> - *reactor pressure vessel;*
> - *portions of the reactor system (RXS);*
> - *portions of the chemical and volume control system (CVS);*
> - *portion of the incore instrumentation system (IIS);*
> - *portions of the passive core cooling system (PXS);*
> - *portions of the reactor coolant system;*
> - *portions of the normal residual heat removal system.*
>
> *Those portions of the above systems within the Class 1 boundary are those items that are part of the RCPB as defined in Section 5.2 of the Bellefonte COL FSAR.*
>
> ***Exclusions***
>
> *Portions of the systems within the reactor coolant pressure boundary [RCPB], as defined above, that are excluded from the Class 1 boundary in accordance with 10 CFR Part 50, Section 50.55a, are as follows:*
>
> - *Those components where, in the event of postulated failure of the component during normal operation, the reactor can be shut down and cooled down in an orderly manner, assuming makeup is provided by the reactor coolant makeup system only; or*

- *Components that are or can be isolated from the reactor coolant system by two valves (both closed, both open, or one closed and other open). Each open valve is capable of automatic actuation and, assuming the other valve is open, its closure time is such that, in the event of postulated failure of the component during normal reactor operation each valve remains operable and the reactor can be shut down and cooled down in an orderly manner, assuming makeup is provided by the reactor coolant makeup system only.*

The NRC staff compared the proposed description of the system boundary subject to inspection and the exclusions with ASME Section XI and 10 CFR 50.55a. The staff found that the proposed system boundary and exclusions were in agreement with the ASME guidelines and regulations, and are therefore, acceptable. This portion of STD COL 5.2-2 is acceptable.

In Revision 0 of the BLN COL FSAR, the COL applicant states that NRC First Revised Order, EA-03-009, "Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors," will be used to establish the required inspections of RPV heads and associated penetration nozzles to detect primary stress corrosion cracking. In addition, the COL applicant states that ASME Code Case N-729-1 (N-729-1), "Alternative Examination Requirements for Pressurized-Water Reactor (PWR) Vessel Upper Heads With Nozzles Having Pressure-Retaining Partial-Penetration Welds," will be used. N-729-1, as modified by the NRC staff may be used to perform the inspection of the AP1000 RPV head. Finally, a visual inspection to identify potential boric acid leaks from pressure-retaining components above the RPV head is performed each refueling outage.

COL Information Item 5.2-2 includes a commitment that the COL applicant's PSI program will include specific preservice examinations of the RV closure head equivalent to those outlined in AP1000 DCD Tier 2, Section 5.3.4.7. The BLN COL FSAR added supplemental information to the end of Section 5.2.4.3.1, describing the design of the RV closure head as it pertains to meeting the PSI requirements. The staff could not determine from the information provided, the extent of PSI examinations. Based on the information provided by the applicant, the staff requested additional information in RAI 5.2.4-1.

In response to RAI 5.2.4-1, the COL applicant stated that the PSI related to the RV closure head and penetrations as discussed in DCD Section 5.3.4.7 includes the regions identified in the first revised order, EA-03-009. The design specification includes a requirement for PSIs consistent with the first revised order EA-03-009. As part of the RPV and integrated head package design finalization, the RV closure head design and the design of components connected to, and in the region of, the RV closure head was reviewed.

The COL applicant determined that the required PSI/ISI examinations can be performed as required by ASME Section III and Section XI. Based on the information provided by the COL applicant, the staff concludes that the PSI and

ISI examinations will be accomplished in accordance with the first revised order, EA-03-009, ASME Sections III and XI, and are, thus, acceptable. As a result, RAI 5.2.4-1 is closed.

In Revision 1 to the BLN COL FSAR, the COL applicant states that its augmented inspection for the reactor vessel top head uses N-729-1 as modified by the NRC in the proposed rulemaking dated April 5, 2007 (72 FR 16740). The COL applicant further noted in response to RAI 5.2.4-5, that the wording in the final rule will be adopted when the final rule is issued. The final rule to amend 10 CFR 50.55a was issued on September 10, 2008 (73 FR 52730) and includes a requirement to inspect the RPV head in accordance with N-729-1 as amended by 10 CFR 50.55a(g)(6)(ii)(D). The COL applicant's methodology to inspect the RPV head in accordance with N-729-1, as amended by 10 CFR 50.55a(g)(6)(ii)(D) meets the regulations, and is therefore acceptable. The staff will verify that the next update of the BLN COL FSAR (Section 5.2.4.1) adequately incorporates reference to the final rule. This is ***Confirmatory Item 5.2-1.***

The COL applicant added the following after the second sentence of the first paragraph of DCD Section 5.2.4.4:

> *Because 10 CFR 50.55a(g)(4) requires 120-month inspection intervals, inspection Program B of IWB-2400 must be chosen. The inspection interval is divided into three periods. Each period can be extended up to one year to enable an inspection to coincide with a plant outage. The adjustment of period end dates shall not alter the rules and requirements for scheduling inspection intervals.*

RG 1.206 recommends that inspection intervals be described in comparison with the ASME Code. The information provided by the COL applicant indicated that Inspection Program B of IWB-2400 would be used over a 10-year interval. The three periods would be three, four, and three years to comprise the interval and extensions of a period may be performed up to a year to coincide with a plant outage. The staff finds that the supplemental information provided by the COL applicant meets the requirements of the ASME Code, Section XI and the guidelines of RG 1.206, and is, thus, acceptable.

The COL applicant proposed adding the following section after the last paragraph of DCD Section 5.2.4.7:

> *5.2.4.8 Relief Requests*
>
> *The specific areas where the applicable ASME Code requirements cannot be met are identified after the initial examinations are performed. Should relief requests be required, they will be developed through the regulatory process and submitted to the NRC for approval in accordance with 10 CFR 50.55a(a)(3) or 10 CFR 50.55a(g)(5). The relief requests include appropriate justifications and proposed alternative inspection methods.*

In addition to the above, the COL applicant stated at the end of Section 5.2.4.3:

> *The RPV nozzle-to-shell welds are 100 percent accessible for preservice inspection but might have limited areas that may not be accessible from the outer surface for inservice examination techniques. If accessibility is limited, an inservice inspection program relief request is prepared and submitted for review approval by the NRC.*

The information lead [sic] *the staff to believe that areas where preservice and inservice examination requirements cannot be met or where compliance with the ASME Code is impractical will result in a need for the licensee to submit a request for relief from impractical Code requirements pursuant to 10 CFR 50.55a(g)(5)(iii). This is not consistent with the regulations in 10 CFR 50.55a(g)(3)(i) which state that Class 1 components must be designed and provided with access to enable the performance of preservice and inservice examinations in accordance with the requirements of the ASME Code, Section XI. Furthermore, the information is not consistent with AP1000 DCD Section 5.2.4.2, which states that the components will be designed to eliminate any hindrances to performing preservice or inservice examinations. The only time a relief request for a newly designed system or component should occur is when the updated edition and addenda to the ASME Code, Section XI is selected 1 year before the initial fuel load date for the first 120-month ISI interval and during subsequent ISI intervals when later edition and addenda of the ASME Code, Section XI that are incorporated by reference in 10 CFR 50.55a(b) change the examination requirements or coverage.*

The staff considers accessibility to perform ISI on both sides of austenitic and dissimilar metal welds critical to making its safety determination in order to monitor structural integrity of these welds due to their history of cracking. Cracking of these welds due to primary water stress corrosion cracking (PWSCC) or intergranular stress corrosion cracking (IGSCC) is a well-known occurrence and a safety significant issue. Consequently, the NRC staff is not expecting to grant requests for relief from ISIs of these susceptible welds on the basis of design, geometry or materials of construction, since these factors can be rectified at the design stage before the plant is constructed. Based on the above discussion, the staff requested additional information from the COL applicant in

RAIs 5.2.4-2 and 5.2.4-3 on accessibility for nondestructive examinations of the RV head and austenitic/dissimilar metal welds.

The COL applicant stated in its response to RAI 5.2.4-2 that as part of the design-for-inspectability process, the capability of examining the RV welds was assessed. The result was that with ISI tooling design and consideration of the AP1000 RV design, examinations from the inside of the AP1000 pressure vessel, including examinations of the reactor nozzle-to-shell welds, can be completed without a need for the applicant to request relief from the ASME Code, Section XI examination requirements. Based on the response provided by the applicant, the staff concludes that the reactor nozzle-to-shell welds are adequately designed to enable the performance of inservice examinations in accordance with 10 CFR 50.55a(g)(3)(ii), and is, thus, acceptable. As a result, RAI 5.2.4-2 is closed.

The COL applicant stated in its response to RAI 5.2.4-3 that as part of the design-for-inspectability process, the ASME Class 1 portion of welds are designed for two-sided access for austenitic stainless steel piping welds wherever possible. Where two-sided access is not feasible, such as branch connection examination for circumferential degradation, the weld crowns are ground flush for one-sided examinations. The COL applicant stated that the examination procedures, equipment and personnel for one-sided examinations of austenitic/dissimilar metal welds would be qualified in accordance with Appendix VIII, as modified by 10 CFR 50.55a(b)(2)(xv)(A)(2) and 10 CFR 50.55a(b)(2)(xvi)(B). Based on the response provided by the applicant, in instances where one-sided examinations have to be performed for austenitic/dissimilar metal welds, the examinations will be conducted with ultrasonic systems that have demonstrated the capability to detect flaws, and is, thus, acceptable. As a result, RAI 5.2.4-3 is closed.

The COL applicant proposed adding the following section after the last paragraph of DCD Section 5.2.4.7:

> *<u>5.2.4.9 Preservice Inspection of Class 1 Components</u>*
>
> *Preservice examinations required by design specification and preservice documentation are in accordance with ASME Section III, NB-5281. Volumetric and surface examinations are performed as specified in ASME Section III, NB-5282. Components described in ASME Section III, NB-5283 are exempt from preservice examination.*

RG 1.206, Section C.III.1, Chapter 5, C.I.5.2.4 recommends that a preservice examination program that meets the standards of NB-5280 of ASME Code, Section III, Division 1, be described because it is an operational program and that the program implementation milestones should be fully described. The information indicated that preservice examinations and documentation are in accordance with ASME Code, Section III, NB-5281, and that volumetric and surface examinations are performed as specified in ASME Code, Section III, NB-5282. The information stated that components described in ASME Code, Section III, NB-5283 are exempt from preservice examination. The staff found

that the information did not fully describe the preservice examination program, in scope and a level of detail, necessary for the staff to reach a reasonable assurance finding. Therefore, the staff requested additional information in RAI 5.2.4-4.

In its response to RAI 5.2.4-4, the applicant noted that AP1000 DCD Section 5.2.4.5, which is incorporated by reference in the COL FSAR, indicates PSI will meet the requirements in the ASME Code, Section XI, paragraph IWB-2200 consistent with NUREG-0800 acceptance criteria. FSAR Section 5.2.4.1 provides a discussion of the scope of the PSI and ISI programs by system. FSAR Section 5.2.4.3.1 describes the methods for examination for both PSI and ISI. FSAR Section 5.2.4.3.1 [sic] [5.2.4.3.2] *describes the qualification requirements of personnel performing ultrasonic examinations. In addition, DCD Section 5.2.4.5, incorporated by reference in the COL FSAR, indicates that PSIs of Class 1 components will meet the requirements of IWB-2200, and as indicated in the response to RAI 5.2.4-1, RV head preservice examinations are described in DCD Section 5.3.4.7, and are also incorporated by reference in the COL FSAR. These FSAR sections, combined with the DCD sections, provide a full description of the PSI program consistent with by SECY-05-0197. The response provided by the applicant addressed PSI program areas involving qualification requirements, scope, exemptions and methods of examination. The areas addressed meet the guidelines of Section 5.2.4 of NUREG-0800, and are therefore acceptable. Based on the information provided by the applicant, the staff concludes that the PSI program is fully described. As a result, RAI 5.2.4-4 is closed.*

The COL applicant proposed adding the following section after the last paragraph of DCD Section 5.2.4.7:

> *<u>5.2.4.10 Program Implementation</u>*
>
> *The milestones for preservice and inservice inspection program implementation are identified in Table 13.4-201.*

RG 1.206 states that the detailed procedures for performing the examinations may not be available at the time of the COL application, and the COL applicant should make a commitment to provide sufficient information to demonstrate that the procedures meet ASME Code standards. This information should be provided at a predetermined time agreed upon by both parties. In the BLN COL FSAR, Part 10, "License Conditions and ITAAC," proposed License Condition 6, "Operational Program Readiness," the COL applicant states:

> *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 the NRC inspection of the operational programs listed in the operation program FSAR Table 13.4-201. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the operation programs in the FSAR table have been fully implemented or the plant has been placed in commercial service.*

The staff reviewed the BLN COL FSAR Table 13.4-201, and notes that both the PSI and ISI programs are listed as operational programs required by NRC regulations. The staff concludes that the commitment under proposed License Condition 6 meets the guidelines in RG 1.206, Section C.III.1, Chapter 5, C.I.5.2.4.1, and is, thus, acceptable.

The COL applicant proposed to add the following paragraphs at the end of Section 5.2.4.3 of the AP1000 DCD:

> ***Ultrasonic Examination of the Reactor Vessel***
>
> *Ultrasonic (UT) examination for the RPV is conducted in accordance with the ASME Code, Section XI. The RPV shell welds are designed for 100 percent accessibility for both preservice and inservice examinations. The RPV nozzle-to-shell welds are 100 percent accessible for preservice examinations but might have limited areas that may not be accessible from the outer surface for inservice examination techniques. If accessibility is limited, an inservice inspection program relief request is prepared and submitted for review approval by the NRC.*
>
> *Inner radius examinations are performed from the outside of the nozzle using several compound angle transducer wedges to obtain complete coverage of the required examination volume. Alternatively, nozzle inner radius examinations may be performed using enhanced visual techniques as allowed by 10 CFR 50.55a(b)(2)(xxi).*

The staff finds that the information provided by the COL applicant meets ASME Section XI and is in compliance with 10 CFR 50.55a. With respect to relief requests and accessibility, see the staff evaluation of BLN COL FSAR Section 5.4.2.8.

The COL applicant added the following after the first sentence of DCD Section 5.2.4.5:

> *Class 1 piping supports will be examined in accordance with ASME Section XI, IWF-2500.*
>
> *Preservice examinations required by design specifications and preservice documentation are in accordance with ASME Section III, NB-5280. Components exempt from preservice examination are described in ASME Section III, NB-5283.*

The staff finds that the information provided by the COL applicant meets ASME Section XI and is in compliance with 10 CFR 50.55a. With respect to preservice inspection, see the staff evaluation of BLN COL FSAR Section 5.4.2.9.

The COL applicant proposed adding the following after the last sentence of DCD Section 5.2.4.5:

> *The preservice examination is performed once in accordance with ASME Section XI, IWB-2200, on all of the items selected for inservice examination, with the exception of the examinations specifically excluded by ASME Section XI from preservice requirements, such ASME Section XI VT-3 examination of valve body and pump casing internal surfaces (B-L-2 and B-M-2 examination categories, respectively) and the visual VT-2 examinations for category B-P.*

The staff finds that the information provided by the COL applicant meets ASME Section XI and is in compliance with 10 CFR 50.55a. With respect to preservice inspection, see the staff evaluation of BLN COL FSAR Section 5.4.2.9.

The COL applicant proposed adding the following after the last sentence of DCD Section 5.2.4.3:

> ***Visual Examination***
>
> *Visual examination methods VT-1, VT-2, and VT-3 are conducted in accordance with ASME Section XI, IWA-2210. In addition, VT-2 examinations will meet the requirements of IWA-5240.*
>
> *Where direct VT-1 examinations are conducted without the use of mirrors or with other viewing aids, clearance is provided where feasible for the head and shoulders of a man within a working arm's length of the surface to be examined.*
>
> ***Surface Examination***
>
> *Magnetic particle (MT) and liquid penetrant (PT) examination techniques are performed in accordance with ASME Section XI, IWA-2221 and IWA-2222, respectively. Direct examination access for magnetic particle [MT] and liquid penetrant [PT] examination is the same as that required for direct visual (VT-1) examination (See Visual Examination), except that the additional access is provided as necessary to enable physical contact with the item in order to perform the examination. Remote MT and PT generally are not appropriate as a standard examination process; however, boroscopes and mirrors can be used at close range to improve the angle of vision.*
>
> ***Alternative Examination Techniques***
>
> *As provided by ASME Section XI, IWA-2240, alternative examination methods, a combination of methods, or newly developed techniques may be substituted for the methods specified for a given item in this section, provided that they are demonstrated to be equivalent or superior to the specified*

methods, techniques, etc., which may result in improvements in examination reliability and reductions in personnel exposure. In accordance with 10 CFR 50.55a(b)(2)(xix), IWA-2240 as written in the 1997 Addenda of ASME Section XI must be used when applying these provisions.

5.2.4.3.2 Qualification of Personnel and Examination Systems for Ultrasonic Examination

Personnel performing examinations shall be qualified in accordance with ASME Section XI, Appendix VII. Ultrasonic examination systems shall be qualified in accordance with industry accepted programs for implementation of ASME Section XI, Appendix VIII. Qualification to ASME Section XI, Appendix VIII, in compliance with the provisions of 10 CFR 50.55a is considered as a satisfactory alternative to Regulatory Guide 1.150.

The COL applicant also proposed adding the following at the end of AP1000 DCD Section 5.2.4.6:

Components containing flaws or relevant conditions and accepted for continued service in accordance with the requirements of IWB-3132.4 or IWB-3142.4 are subjected to successive period examinations in accordance with the requirements of IWB-2420. Examinations that reveal flaws or relevant conditions exceeding Table IWB-3410-1 acceptance standards are extended to include additional examinations in accordance with the requirements of IWB-2430.

10 CFR 50.55a requires that nondestructive testing procedures, methods, and techniques meet ASME Code standards, including ASME Section XI, Appendix VIII requirements for ultrasonic examinations and methodology for evaluation of flaws. The COL applicant indicated that the qualification of ultrasonic testing personnel and procedures would be in accordance with ASME Section XI, Appendices VII and VIII, respectively. Based on the information provided by the COL applicant, the staff concludes that the COL applicant referenced the appropriate sections of the ASME Code to describe visual, surface volumetric and alternative examinations.

The staff concludes that the PSI and ISI programs will conform to the guidelines and requirements provided under NUREG-0800, Order EA-03-009, and the ASME Code. Therefore, the staff finds that the COL applicant's proposed resolution to the COL information items and its supplementary information are acceptable on the basis that it meets GDC 32 of Appendix A to 10 CFR Part 50, as it relates to periodic inspection and testing of the RCPB and 10 CFR 50.55a.

<u>Resolution of Standard Content Confirmatory Item 5.2-1</u>

Confirmatory Item 5.2-1 required the applicant to update its FSAR to incorporate reference to the final rule. The NRC staff verified that the VEGP COL FSAR was

appropriately updated to incorporate reference to 10 CFR 50.55a(g)(6)(ii)(D). As a result, Confirmatory Item 5.2-1 is now resolved.

Correction of Error in the Standard Content Evaluation Text

The NRC staff identified an error in the text reproduced above from the BLN SER, Section 5.2.4.4, that requires correction. The BLN SER quotes an applicant-proposed addition to its FSAR stating, in part:

> *Qualification to ASME Section XI, Appendix VIII, in compliance with the provisions of 10 CFR 50.55a is considered as a satisfactory alternative to Regulatory Guide 1.150.*

That quote is from Revision 0 of the BLN FSAR. The correct quote from Revision 1 of the BLN FSAR is:

> *Qualification to ASME Section XI, Appendix VIII, is in compliance with the provisions of 10 CFR 50.55a.*

This error does not impact the conclusions of the BLN or VEGP evaluations.

- *STD COL 5.3-7*

The NRC reviewed the applicant's proposal submitted in a letter dated August 27, 2010, to include additional information which addresses newly identified COL Information Item 5.3-7 in the AP1000 DCD. The applicant proposes to add the following item, STD COL 5.3-7, to the end of Section 5.2.4.1 of the VEGP COL FSAR:

> *The in-service inspection program is augmented to include the performance of a 100 percent volumetric examination of the weld build-up on the reactor vessel head for the instrumentation penetrations (Quickloc) conducted once during each 120-month inspection interval in accordance with the ASME Code, Section XI. The weld build-up acceptance standards are those provided in ASME Code, Section XI, IWB-3514. Personnel performing examinations and the ultrasonic examination systems are qualified in accordance with ASME Code, Section XI, Appendix VIII. Alternatively, an alternative inspection may be developed in conjunction with the voluntary consensus standards bodies (i.e., ASME) and submitted to the NRC for approval.*

The proposed information, which will augment the plant-specific ISI program to include a 100 percent volumetric examination of the weld build-up on the reactor vessel head for the instrumentation penetrations (Quickloc) conducted once during each 120-month inspection interval in accordance with the ASME Code, Section XI, is acceptable to the NRC staff because a volumetric examination ensures that potential degradation of the inside surface of the weld build-up during plant operation will be detected before it progresses through-wall. In addition, the NRC staff finds it acceptable that any alternative inspection will be submitted to the NRC for approval because it will ensure that (1) the NRC staff is

informed of changes to inservice inspection requirements established in the reference design certification and (2) licensee submittals for NRC authorization to use alternatives to the regulations in 10 CFR 50.55a will be reviewed by the NRC staff pursuant to 10 CFR 50.55a(a)(3). The NRC staff finds that this adequately addresses COL Information Item 5.3-7 and will ensure the integrity of the reactor coolant pressure boundary weld during service. The staff notes that since this information augments the ISI program, this augmentation is part of License Condition (5-1) described in SER Section 5.2.4.5. The incorporation of the changes associated with proposed STD COL 5.3-7 into a future revision of the VEGP COL FSAR is ***Confirmatory Item 5.2-2****.*

Resolution of Standard Content Confirmatory Item 5.2-2

Confirmatory Item 5.2-2 is an applicant commitment to revise its FSAR Table 1.8-202 and Section 5.2.4.1 to address COL Information Item STD COL 5.3-7. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 5.2-2 is now closed.

The following portion of this technical evaluation section is reproduced from Section 5.2.4.4 of the BLN SER:

License Condition

- *License Condition 6, regarding PSI/ISI program details*

The BLN COL FSAR addresses implementation milestones for the PSI/ISI programs in Part 10, or the application "Proposed License Conditions (Including ITAAC)." As discussed in Part 10, Section 6, the applicant proposes 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. This proposed license condition is consistent with the policy established in SECY-05-0197, and is therefore acceptable.

For PSI/ISI programs, the ASME Code, Section XI provides requirements for program implementation in Paragraph IWB-2200(a) for PSI programs and Paragraph IWA-2430(b) for ISI programs. As such, a license condition for program implementation requirements is not necessary in the BLN COL FSAR. However, submittal of the schedule for the program development is necessary to plan for and conduct NRC inspections during construction. The staff finds that the license condition complies with RG 1.206, and is therefore acceptable.

Operational programs are specific programs required by regulations. The COL application should fully describe operational programs as defined in SECY-05-0197. In addition, COL applicants should provide schedules for implementation milestones of these operational programs. The PSI and ISI programs are identified as operational programs in RG 1.206. This section of the SER addresses the PSI and ISI operational programs for ASME Code Class 1, 2, and 3 components.

As discussed in RG 1.206, a fully described PSI and ISI program should address: (1) system boundary subject to inspection; (2) accessibility; (3) examination categories and methods; (4) inspection intervals; (5) evaluation of examination results; (6) system pressure tests; (7) Code exemptions; (8) relief requests; and (9) ASME Code cases. For BLN, the applicant incorporated by reference the PSI and ISI programs descriptions from AP1000 DCD Sections 5.2.4 and 6.6. The DCD descriptions as supplemented by the BLN COL FSAR address these nine items and therefore fully describe the PSI/ISI operational programs.

Supplemental Information

- *STD SUP 5.2-2*

The COL applicant added the following text at the end of DCD Section 5.2.4.1:

> *The inservice inspection program, along with the boric acid corrosion control procedures, provides guidance for inspecting the integrity of bolting and threaded fasteners.*

NUREG-0800, Section 3.13, "Threaded Fasteners – ASME Code Class 1, 2, and 3," acceptance criteria states that the inspection provisions are acceptable if they conform to ASME Section XI. In addition, the staff position in Generic Letter 88-05, "Staff Position on Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants," specifically recommends inspection in accordance with a boric acid corrosion control program. GL 88-05 also recommends that a boric acid control program contain four elements consisting of inspections, discovery of leak path, assessment, and follow-up inspections. In its proposed changes to Section 5.2.4.1, the COL applicant described the boric acid corrosion control procedures. The staff noted that the program description was in compliance with the four elements described under GL 88-05. Based on compliance with both ASME Section XI and staff guidance, the staff concludes that the proposed change under STD SUP 5.2-2 is acceptable.

Exception to RG 1.65

The Bellefonte FSAR Appendix 1AA provides conformance discussions for Regulatory Guides (RGs) applicable to the Bellefonte COLA. RG 1.65, "Materials and Inspections for Reactor Vessel Closure Studs," was not addressed in Revision 0 of the FSAR. In a response to the staff's RAI-1-5, the COL applicant added a conformance discussion for RG 1.65 which takes an exception to RG position C.4. The exception states:

> *ASME XI ISI criteria for reactor vessel closure stud examinations are applied in lieu of the ASME Section III, NB-2545 and NB-2546 surface examinations. The volumetric examination currently required by ASME Section XI provides improved (since 1973) detection of bolting degradation.*

The staff reviewed ASME Section XI, Table IWB-2500-1 examination requirements for the reactor vessel closure studs, Examination Category B-G-1,

Item No. B 6.20. The subject table lists volumetric examination of the studs when in place. The staff finds that the COL applicant's proposed exception to RG 1.65 is in compliance with the 1998 Edition of the ASME Code with the 2000 Addenda, and is therefore, acceptable. This portion of RAI 1-5 is closed.

5.2.4.5 *Post Combined License Activities*

The license condition language in this section has been clarified from previously considered language. In a letter dated April 8, 2016 (ADAMS Accession No. ML16103A507), the applicant did not identify any concerns with the clarified license condition language. The changes do not affect the staff's above analysis of the conditions, and therefore, for the reasons discussed in the technical evaluation section above, the staff finds the following license condition acceptable:

- License Condition (5-1) – No later than 12 months after issuance of the COL, the licensee shall submit to the Director of NRO, or the Director's designee, a schedule for implementation of the operational programs listed in FSAR Table 13.4-201, including the associated estimated date for initial loading of fuel. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until all the operational programs listed in FSAR Table 13.4-201 have been fully implemented.

5.2.4.6 *Conclusion*

The NRC staff reviewed the application and the referenced DCD. The staff's review confirmed that the applicant has addressed the relevant information relating to this section, and no outstanding information related to this section remains to be addressed in the Turkey Point Units 6 and 7 COL FSAR. The results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in the Turkey Point Units 6 and 7 COL FSAR meets the relevant acceptance criteria provided in Section 5.2.4 of NUREG-0800, the policy established in SECY-05-0197, the guidelines addressed in RG 1.206, and the requirements of GDC 32, staff positions, and 10 CFR 50.55a. The staff based its conclusion on the following:

- STD COL 5.2-2, relating to the PSI and ISI programs, conforms to the guidelines provided under NUREG-0800, Order EA-03-009, and the ASME Code. Therefore, the staff finds that the COL applicant's proposed resolution to the COL information items is acceptable on the basis that it meets GDC 32 of Appendix A to 10 CFR Part 50, as it relates to periodic inspection and testing of the RCPB and 10 CFR 50.55a.

- STD SUP 5.2-2, relating to guidance for inspecting the integrity of bolting and threaded fasteners, is acceptable because it meets the relevant guidelines in the ASME Code Section XI; NUREG-0800, Section 3.13; and GL 88-05.

- STD COL 5.3-7, relating to the ISI program augmentation to include 100 percent volumetric examination of the weld build-up on the reactor vessel head for the Quick lock penetrations ensures that the integrity of the reactor coolant pressure boundary weld will be maintained. Therefore, the staff finds that the applicant's proposed resolution as stated in their letter, dated April 20, 2011, and as incorporated into the Turkey Point

Units 6 and 7 COL FSAR, to COL Information Item 5.3-7 is acceptable on the basis that it meets GDC 32 of Appendix A to 10 CFR Part 50, as it relates to periodic inspection to ensure the integrity of the RCPB is maintained.

5.2.5 Detection of Leakage through Reactor Coolant Pressure Boundary (Related to RG 1.206, Section C.III.1, Chapter 5, C.I.5.2.5, "Reactor Coolant Pressure Boundary Leakage Detection")

5.2.5.1 *Introduction*

The RCPB leakage detection systems are designed to detect and, to the extent practical, identify the source of reactor coolant leakage.

5.2.5.2 *Summary of Application*

Section 5.2 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference Section 5.2.5 of Revision 19 of the AP1000 DCD. The ASE with confirmatory items for Section 5.2.5 was based on the VEGP COL FSAR, Revision 2 and DCD Revision 17. After submitting DCD Revision 17 to the NRC, Westinghouse added a new COL Information Item (COL 5.2-3). This COL information item has been incorporated into Revision 19 of the DCD; however, the discussion of the COL information item below did not change.

In addition, the applicant proposed the following:

AP1000 COL Information Item

- STD COL 5.2-3

In a letter, dated August 5, 2010, the applicant for the reference COL (VEGP Units 3 and 4) provided additional information in the markups of VEGP COL FSAR Table 1.8-202, Section 5.2.6.3, and Section 5.2.5.3.5 to add STD COL 5.2-3 to address COL Information Item 5.2-3. The VEGP applicant provided additional information regarding the response to unidentified RCS leakage inside containment to deal with the prolonged low-level RCS leakage issue. In its letter dated April 20, 2011, the Turkey Point Units 6 and 7 applicant endorsed that VEGP letter as standard thereby adopting STD COL 5.2-3 for the Turkey Point Units 6 and 7 COL application.

5.2.5.3 *Regulatory Basis*

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

The regulatory basis for raising the issue of prolonged low-level RCS leakage is in 10 CFR 52.79(a)(37), as it relates to "information necessary to demonstrate how operating experience insights have been incorporated into the plant design." The applicable regulatory requirements for acceptance of the resolution to COL Information Item 5.2-3 are established in GDC 30, "Quality of Reactor Coolant Pressure Boundary," found in Appendix A to 10 CFR Part 50, as it relates to detecting RCPB leakage. The guidance for the staff's review is in RG 1.45, Revision 1, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage."

5.2.5.4 *Technical Evaluation*

Section 5.2 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference, with no departures or supplements, Section 5.2.5 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section, with one exception. That exception is discussed in the standard content material below. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the Turkey Point Units 6 and 7 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5, to the Turkey Point Units 6 and 7 COL FSAR. In performing this comparison, the staff considered changes made to the Turkey Point Units 6 and 7 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the Turkey Point Units 6 and 7 COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 5.2.5.4 of the VEGP SER:

> *The exception, which the NRC staff identified in its review, pertains to the operating experiences at Davis Besse concerning prolonged low-level RCS leakage. The operating experiences at Davis Besse (NRC Bulletin 2002-01) indicated that prolonged low-level unidentified reactor coolant leakage inside containment could cause corrosion and material degradation such that it could compromise the integrity of a system leading to the gross rupture of the RCPB. Therefore, pursuant to 10 CFR 52.79(a) 37, "information necessary to demonstrate how operating experience insights have been incorporated into the plant design," the NRC staff requested additional information from both the DCD applicant (Westinghouse) and the COL applicant (Southern Nuclear Operating Company [SNC]) to address the issue of prolonged low-level RCS leakage. The NRC staff requested the COL applicant in VEGP RAI 5.2.5-1 and RAI 5.2.5-2 to*

address this issue as it relates to operating procedures. The NRC staff also asked Westinghouse in RAI-DCP-CN45-SBP-01 to address this issue as it related to Design Change Package (DCP) Change Number 45 for AP1000 DCD. The procedures should specify operator actions in response to prolonged low-level unidentified reactor coolant leakage conditions that exist above normal leakage rates and below the Technical Specification (TS) limits to provide operators sufficient time to take action before the TS limit is reached. The procedures would include identifying, monitoring, trending, and managing prolonged low-level leakage.

In a letter, dated July 29, 2010, Westinghouse responded to RAI-DCP-CN45-SBP-01 by stating that Revision 18 of the AP1000 DCD would add new COL Information Item 5.2-3, and described the COL item in Section 5.2.6.3 of the AP1000 DCD to address the prolonged low-level RCS leakage. The staff's review of DCP 45 is in Chapter 23 of a supplement to NUREG-1793.

<u>AP1000 COL Information Item</u>

- *STD COL 5.2-3*

In a letter, dated August 5, 2010, SNC responded to VEGP RAI 5.2.5-1 and RAI 5.2.5-2 and provided additional information in the markups of VEGP COL FSAR Table 1.8-202, Section 5.2.6.3 and Section 5.2.5.3.5 to add STD COL 5.2-3 to address the COL information item. VEGP COL FSAR Section 5.2.6.3 states that the COL item is addressed in Section 5.2.5.3.5. The proposed Section 5.2.5.3.5 reads as follows:

> *5.2.5.3.5 Response to Reactor Coolant System Leakage*
>
> *Operating procedures specify operator actions in response to prolonged low level unidentified reactor coolant leakage conditions that exist above normal leakage rates and below the Technical Specification (TS) limits to provide operators sufficient time to take action before the TS limit is reached. The procedures include identifying, monitoring, trending, and addressing prolonged low level leakage. The procedures for effective management of leakage, including low level leakage, are developed including the following operations related activities:*
>
> - *Trends in the unidentified leakage rates are periodically analyzed. When the leakage rate increases noticeably from the baseline leakage rate, the safety significance of the leak is evaluated. The rate of increase in the leakage is determined to verify that plant actions can be taken before the plant exceeds TS limits.*
>
> - *Procedures are established for responding to leakage. These procedures address the following considerations to prevent adverse safety consequences from the leakage:*

- *Plant procedures specify operator actions in response to leakage rates less than the limits set forth in the Technical Specifications. The procedures include actions for confirming the existence of a leak, identifying its source, increasing the frequency of monitoring, verifying the leakage rate (through a water inventory balance), responding to trends in the leakage rate, performing a walkdown outside containment, planning a containment entry, adjusting alarm setpoints, limiting the amount of time that operation is permitted when the sources of the leakage are unknown, and determining the safety significance of the leakage.*

- *Plant procedures specify the amount of time the leakage detection and monitoring instruments (other than those required by Technical Specifications) may be out of service to effectively monitor the leakage rate during plant operation (i.e., hot shutdown, hot standby, startup, transients, and power operation).*

- *The output and alarms from leakage monitoring systems are provided in the main control room. Procedures are readily available to the operators for converting the instrument output to a common leakage rate. (Alternatively, these procedures may be part of a computer program so that the operators have a real-time indication of the leakage rate as determined from the output of these monitors.) Periodic calibration and testing of leakage monitoring systems are conducted. The alarm(s), and associated setpoint(s), provide operators an early warning signal so that they can take corrective actions, as discussed above, i.e., before the plant exceeds TS limits.*

- *During maintenance and refueling outages, actions are taken to identify the source of any unidentified leakage that was detected during plant operation. In addition, corrective action is taken to eliminate the condition resulting in the leakage.*

The procedures described above will be available prior to fuel load.

The staff found in the RAI response that the COL applicant committed to develop operating procedures prior to fuel load, and the procedures include identifying, monitoring, trending, and managing the prolonged low-level RCS leakage. Further, the procedures include converting the instrument output to a common leakage rate and the alarm setpoints for early warning for the operators. Therefore, the staff determined that the RAI response addressed all the questions being asked in VEGP RAI 5.2.5-1 and RAI 5.2.5-2 regarding the procedures for the prolonged low-level RCS leakage. Further, the staff reviewed the description of the procedures in the proposed VEGP COL FSAR

Section 5.2.5.3.5 and determined that it is consistent with the guidance in RG 1.45, Revision 1, pertaining to managing the prolonged low-level RCS leakage. Therefore, the staff finds that the RAI response is acceptable and concludes that GDC 30 is met based on the applicant's conformance to RG 1.45. The incorporation of the changes associated with proposed STD COL 5.2-3 into a future revision of the VEGP COL FSAR is ***Confirmatory Item 5.2-3****.*

Resolution of Standard Content Confirmatory Item 5.2-3

Confirmatory Item 5.2-3 is an applicant commitment to revise its FSAR Table 1.8-202 and Section 5.2.5.3.5 to address COL Information Item STD COL 5.2-3. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 5.2-3 is now closed.

5.2.5.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation above, the following FSAR commitment is identified as the responsibility of the licensee:

- Prior to initial fuel load, the operating procedures, which include identifying, monitoring, trending, and managing the prolonged low-level RCS leakage, will be developed.

5.2.5.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the relevant information relating to this section, and no outstanding information related to this section remains to be addressed in the Turkey Point Units 6 and 7 COL FSAR. The results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in the Turkey Point Units 6 and 7 COL FSAR is acceptable and meets the requirements of GDC 30. The staff based its conclusion on the following:

- STD COL 5.2-3 meets the relevant guidance in RG 1.45, Revision 1 with respect to operating procedures for the prolonged low-level RCS leakage detection. Conformance with these guidelines provides an acceptable basis for satisfying the requirements of GDC 30.

5.3 Reactor Vessel

5.3.1 Reactor Vessel Design

The RV, as an integral part of the RCPB, will be designed, fabricated, erected and tested to quality standards commensurate with the requirements set forth in 10 CFR Part 50, 10 CFR 50.55a, and GDC 1.

Section 5.3 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference, with no departures or supplements, Section 5.3.1 of Revision 19 of the AP1000 DCD. The NRC

staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

5.3.2 Reactor Vessel Materials

5.3.2.1 *Introduction*

This section addresses material specifications, special processes used for manufacture and fabrication of components, special methods for nondestructive examination, special controls and special processes used for ferritic steels and austenitic stainless steels, fracture toughness, material surveillance (which will be referred to as the reactor vessel surveillance capsule program (RVSP) to avoid confusion with material surveillance programs that exist in other parts of a nuclear power plant), and RV fasteners. RCS components are addressed separately in Section 5.2.3 of this SER.

5.3.2.2 *Summary of Application*

Section 5.3 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference Section 5.3 of the AP1000 DCD, Revision 19. Section 5.3 of the DCD includes Section 5.3.2.

In addition, in Turkey Point Units 6 and 7 COL FSAR Section 5.3.2.6, the applicant provided the following:

AP1000 COL Information Item

- STD COL 5.3-2

The applicant provided additional information in STD COL 5.3-2 to address COL Information Item 5.3-2 and COL Action Item 5.3.2.4-1 identified in Appendix F of NUREG-1793. The additional information discusses the RV material surveillance program.

License Conditions

- Part 10, License Condition 3.J.1, Reactor Vessel Material Surveillance

The COL Holder shall implement this operational program prior to initial criticality.

- Part 10, License Condition 6

The COL applicant shall provide an operational program schedule to support NRC inspections.

5.3.2.3 *Regulatory Basis*

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the RV materials are given in Section 5.3.1 of NUREG-0800.

The applicable regulatory requirements and guidance for acceptance of the COL information item are as follows:

1. GDC 32 found in Appendix A to 10 CFR Part 50, as it relates to the design of the components of the RCPB to allow for an RVSP;

2. 10 CFR 50.60, "Acceptance criteria for fracture prevention measures for light water nuclear power reactors for normal operation," as it relates to compliance with the material surveillance program requirements of 10 CFR Part 50, Appendix G, "Fracture Toughness Requirements";

3. 10 CFR Part 50, Appendix G, as it relates to materials testing and acceptance criteria for fracture toughness;

4. 10 CFR 50.55a, as it relates to the requirements for testing and inspecting Code Class 1 components of the RCPB as specified in Section XI of the ASME Code;

5. SECY-05-0197, as it relates to fully describing an operational program; and

6. 10 CFR Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements," as it relates to RVSP requirements.

5.3.2.4 *Technical Evaluation*

The NRC staff reviewed Section 5.3.2 of the Turkey Point Units 6 and 7 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 in the application and incorporated by reference addresses the relevant information related to the RV materials. The results of the NRC staff's evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the Turkey Point Units 6 and 7 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5, to the Turkey Point Units 6 and 7 COL FSAR. In performing this comparison, the staff considered changes made to the Turkey Point Units 6 and 7 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the Turkey Point Units 6 and 7 COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 5.3.2.4 of the VEGP SER:

> *The NRC staff reviewed conformance of Section 5.3 of the BLN COL FSAR to the guidance in RG 1.206, Section C.III.1, Chapter 5, C.I.5.3.1, "Reactor Vessel Materials." The RG 1.206 sections related to Material Specifications, Special Processes Used for Manufacturing and Fabrication, Special Methods for Nondestructive Examination, Special Controls for Ferritic and Austenitic Stainless Steels, Fracture Toughness and Reactor Vessel Fasteners all state that the COL applicants that reference a certified design do not need to include additional information. These topic areas were previously addressed in the AP1000 DCD and evaluated in NUREG-1793, Section 5.3.2. No COL action items were identified in these topic areas. The remaining topic area, RVSP, has a COL action item that must be addressed by a COL applicant.*
>
> *Appendix G to 10 CFR Part 50 specifies the fracture toughness requirements for ferritic materials of the pressure-retaining components of the RCPB. The RV beltline materials must have a Charpy Upper Shelf Energy (USE) in the transverse direction for base material and along the weld for weld material, of no less than 75 ft-lbs initially, and must maintain Charpy USE throughout the life of the vessel of no less than 50 ft-lbs. The fracture toughness tests required by ASME Code and by Appendix G to 10 CFR Part 50 provide reasonable assurance that adequate safety margins against the possibility of non-ductile behavior or rapidly propagating fracture can be established for all pressure-retaining components of the reactor coolant boundary. Appendix H to 10 CFR Part 50 presents the requirements for an RVSP to monitor the changes in the fracture toughness properties of the materials in the RV beltline region resulting from exposure to neutron irradiation and the thermal environment.*
>
> *Operational programs are specific programs required by regulations. The COL application should fully describe operational programs as defined in SECY-05-0197. In addition, COL applicants should provide schedules for implementation milestones for these operational programs. The RVSP is identified as an operational program in RG 1.206. This section of the SER addresses the adequacy of the RVSP description as it relates to meeting the requirements of Appendix H to 10 CFR Part 50.*
>
> *RG 1.206, Section C.III.1, Chapter 5, C.I.5.3.1.6, "Material Surveillance," provides guidelines for fully describing a material surveillance program. Specifically, this section states that the RVSP and its implementation must be described in sufficient detail to ensure that the program meets the requirements of Appendix H to 10 CFR Part 50.*

In addition, the application should describe the method for calculating neutron fluence for the RV beltline and the surveillance capsules. RG 1.206 lists some of the topics that should be addressed in the description of the RVSP:

- *Basis for the selection of material in the program.*
- *Number and type of specimens in each capsule.*
- *Number of capsules and proposed withdrawal schedule in compliance with the edition of American Society for Testing Materials (ASTM) E-185 Annual Book of ASTM Standards, Part 30, referenced in Appendix H to 10 CFR Part 50.*
- *Neutron flux and fluence calculations for vessel wall and surveillance specimens.*
- *Projected radiation embrittlement on vessel wall.*
- *Location of capsules, method of attachment, and provisions to ensure that capsules are retained in position throughout the vessel lifetime.*

Section 5.3.2.6 of the AP1000 DCD addresses the description of the RVSP. The DCD states that the base metal specimens are oriented both parallel and normal to the principal rolling direction of the limiting base material located in the core region of the RV. In accordance with the current DCD, there are no welds in the beltline region. Therefore, the applicant has addressed the entire beltline region in their RVSP. The DCD also addresses the number and type of specimens by meeting the ASTM E-185 requirements and describing 8 capsules, along with their proposed withdrawal schedule, that contain 72 tensile specimens, 480 Charpy V-notch specimens, and 48 compact tension specimens.

The DCD states that the neutron fluence assessments of the AP1000 RV are conducted in accordance with the guidelines that are specified in RG 1.190. The vessel fracture toughness data are given in Table 5.3-3 of the AP1000 DCD, Revision 17. The end-of-life nil-ductility reference transition temperature (RT_{NDT}) and upper shelf energy projections were estimated using RG 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," for the end-of-life neutron fluence at the ¼-thickness and inner-diameter RV locations.

Finally, BLN has addressed the location of the capsules, their method of attachment, and the provisions to ensure that capsules are retained in position throughout the vessel lifetime by referencing AP1000 DCD, Section 5.3.2.6, which states that the capsules are located in guide baskets welded to the outside of the core barrel and positioned directly opposite the center portion of the core. DCD Figure 5.3-4 shows the azimuthal locations of the capsules around the RV.

Information about the implementation of the BLN RVSP is provided in Part 10 of the BLN COL. Section 3 proposes the following license condition:

> *J. Initial Criticality – The licensee shall implement each operational program identified below prior to initial criticality.*
> *J.1 – Reactor Vessel Material Surveillance*

In addition, Section 6, "Operational Program Readiness," states that the licensee will submit to the NRC a schedule, no later than 12 months after issuance of the COL, that supports the planning for and conduct of NRC inspections of operational programs, including RVSP.

<u>AP1000 COL Information Item</u>

- *STD COL 5.3-2*

The NRC staff reviewed STD COL 5.3-2 related to the COL information item included under Section 5.3.6.2 of the BLN COL FSAR, which states:

> *The Combined License applicant will address a Reactor Vessel Reactor Material Surveillance program based on Section 5.3.2.6.*

The commitment was also captured as COL Action Item 5.3.2.4-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will provide its Reactor Vessel Material Surveillance program.*

RG 1.206 clarifies the intent of the COL information item. RG 1.206 Section C.III.1, Chapter 5, C.I.5.3.1.6, provides guidelines for addressing an RVSP. The applicant should fully describe the program and identify the implementation milestones. As previously discussed, the applicant references Section 5.3.2 of the AP1000 DCD, which addresses the topics listed in RG 1.206 that should be included in the description of the RVSP. The applicant provided License Condition 3.J.1 to implement the RVSP and License Condition 6 to support scheduling of NRC staff inspections, consistent with SECY-05-0197.

In addition, the applicant provided supplemental information in its FSAR to address COL Information Item 5.3-2 regarding the RVSP. The applicant added text between the first and second paragraphs of Section 5.3.2.6 to the AP1000 DCD, Revision 17 to reference the milestone of initial criticality for RVSP implementation. The applicant also added a new Section 5.3.2.6.3, "Report of Test Results," to the AP1000 DCD, Revision 17 to outline the reporting criteria associated with the RVSP. When each capsule is withdrawn, a summary technical report of the data required by ASTM E-185-82 and the results of the fracture toughness tests conducted on the beltline materials in the irradiated and unirradiated conditions will be submitted to the NRC within one year of the date of capsule withdrawal.

In its review of the FSAR, the staff noted that the information provided in Section 5.3.2 of the DCD, in addition to the RVSP program implementation

information provided in Part 10 of the BLN COL application, meets the minimum guidelines in RG 1.206 for a description of the RVSP and its implementation. However, the staff determined that more information was needed to fully describe the RVSP in accordance with SECY-05-0197 to reach a resolution of the COL information item. A description of the process for preparing the capsule specimens must confirm that the materials selected for the capsules are samples of the same materials used in the fabrication of the RV. Therefore, the staff must receive this information before the vessel is fabricated. Other information, such as the capsule environment and the material types of the capsule specimens, can be provided after the RV has been procured. Thus, the staff requested additional information in RAI 5.3.1-1 to complete its review.

First, the staff requested additional information about the RVSP description. The purpose of the RVSP, as described in ASTM E-185, is to monitor radiation effects on RV materials under operating conditions. Section C.III.1, Chapter 5, C.I.5.3.1.6 of RG 1.206 states, "because the material surveillance program is an operational program, as discussed in SECY-05-0197, the applicant must describe the program and its implementation in sufficient scope and level of detail for the staff to make a reasonable assurance finding on its acceptability." The NRC staff recognizes that certain information about the program, such as actual material properties of the RV, is not currently known, but in order to complete its review of the adequacy of the RVSP, the staff requested that the applicant describe its process for preparing the capsule specimens. This description should confirm that the materials selected for the capsules are samples of those materials most likely to limit the operation of the RV.

Secondly, the staff requested additional information about the RVSP. The COL applicant must fully describe its RVSP to ensure that it meets ASTM E-185 and other requirements listed in 10 CFR Part 50, Appendix H. Specifically, the NRC staff requested detailed information on the RVSP associated with the AP1000 design, including, but not limited to, the capsule environment and the material types of the capsule specimens.

In RAI 5.3.1-1, the staff requested that the applicant describe the process for preparing the capsule specimens and to include detailed information on the capsule environment and material types of the capsule specimens. The applicant responded with a detailed description of the capsule specimen preparation process to be incorporated into the next revision of the BLN COL FSAR. The applicant also stated that the capsule environment and the material types of the capsule specimens are addressed in AP1000 DCD, Section 5.3.2.6 which is incorporated by reference.

The staff finds that the response to RAI 5.3.1-1 is acceptable, provided that the BLN COL FSAR is revised as stated by the applicant, and that the applicant confirms the staff's understanding that the surveillance capsules are backfilled with inert gas. Therefore, the staff identifies ***Confirmatory Item 5.3-1*** *to confirm that the BLN COL FSAR is revised as stated, and to confirm the staff's understanding that the surveillance capsules are backfilled with inert gas.*

Generic Letter 92-01

Generic Letter (GL) 92-01, "Reactor Vessel Structural Integrity," addressed NRC concerns regarding compliance with the requirements of Appendices G and H to 10 CFR Part 50, which address fracture toughness requirements and RVSP requirements, respectively. Specifically, NRC had concerns about Charpy USE predictions for end-of-life for the limiting beltline weld and the plate or forging, RVs constructed to an ASME Code earlier than the Summer 1972 Addenda of the 1971 Edition, and use of RG 1.99, Revision 2, to estimate the embrittlement of the materials in the RV beltline. These topics have been addressed in the AP1000 DCD, Revision 17, which is incorporated by reference in the BLN COL FSAR.

The AP1000 DCD, Revision 17, also states that end-of-life RT_{NDT} and USE projections were estimated using RG 1.99. The construction of the RV to an ASME Code earlier than the Summer 1972 Addenda of the 1971 Edition is not a concern for new reactors, including BLN. In the BLN COL FSAR Section 5.3.2.6.3, the applicant provides additional information, which states that when each capsule is withdrawn, a summary technical report of the data required by ASTM E-185-82 and the results of the fracture toughness tests conducted on the beltline materials in the irradiated and unirradiated conditions will be submitted to the NRC within one year of the date of capsule withdrawal.

On the basis of the information discussed above, the NRC staff concludes that the applicant has adequately addressed the issues in GL 92-01.

Resolution of Standard Content Confirmatory Item 5.3-1

The NRC staff verified that the VEGP FSAR was updated to include a detailed description of the capsule specimen preparation process and to document that the surveillance capsules are backfilled with inert gas. As a result, Confirmatory Item 5.3-1 is resolved.

5.3.2.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation section above, the staff finds the following license conditions related to the RV Material Surveillance program acceptable:

- License Condition (5-2) – The licensee shall implement the RV Material Surveillance program prior to initial criticality.

- License Condition (5-3) – No later than 12 months after issuance of the COL, the licensee shall submit to the Director of NRO a schedule that supports planning for and conduct of NRC inspections of the RV Material Surveillance program. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the RV Material Surveillance program has been fully implemented.

5.3.2.6 *Conclusion*

The NRC staff reviewed the application and the referenced DCD. The staff's review confirmed that the applicant has addressed the relevant information relating to this section, and no outstanding information related to this section remains to be addressed in the Turkey Point Units 6 and 7 COL FSAR. The results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in the Turkey Point Units 6 and 7 COL FSAR is acceptable and meets the relevant regulatory guidance provided in Section 5.3.1 of NUREG-0800 and RG 1.206, the policy established in SECY-05-0197, and the requirements of Appendices G and H to 10 CFR Part 50. The staff based its conclusion on the following:

- STD COL 5.3-2, relating to the RV material surveillance program, is acceptable because the program is consistent with the relevant guidelines addressed in Section 5.3.1 of NUREG-0800 and in RG 1.206, Section C.III.1, Chapter 5, C.I.5.3.1. Conformance with these guidelines provides an acceptable basis for satisfying, in part, the requirements of Appendices G and H to 10 CFR Part 50.

5.3.3 Pressure Temperature Limits (Related to RG 1.206, Section C.III.1, Chapter 5, C.I.5.3.2, "Pressure-Temperature Limits, Pressurized Thermal Shock, and Charpy Upper-Shelf Energy Data and Analyses")

5.3.3.1 *Introduction*

Pressure Temperature (P-T) limits are required as a means of protecting the RV during startup and shut down to minimize the possibility of fast fracture. The methods outlined in Appendix G of Section XI of the ASME Code are employed in the analysis of protection against nonductile failure. Beltline material properties degrade with radiation exposure and this degradation is measured in terms of the adjusted reference temperature, which includes a reference nil-ductility temperature shift, initial RT_{NDT}, and margin.

5.3.3.2 *Summary of Application*

Section 5.3 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference Section 5.3 of the AP1000 DCD, Revision 19. Section 5.3 of the AP1000 DCD includes Section 5.3.3.

In addition, in Turkey Point Units 6 and 7 COL FSAR Section 5.3.6.1, the applicant provided the following:

AP1000 COL Information Item

- STD COL 5.3-1

The applicant provided additional information in STD COL 5.3-1 to address COL Information Item 5.3-1 of the AP1000 DCD and COL Action Item 5.2.2.2-1 in NUREG-1793. The information relates to plant-specific P-T curves.

Supplemental Information

- STD SUP 5.3-1

The applicant provided supplemental information related to development of operating procedures as required by Technical Specification (TS) 5.6.6.

License Condition

- Part 10, License Condition 2, Item 5.3-1

The license condition related to COL Information Item 5.3-1 sets the implementation milestone for development of plant-specific P-T curves.

5.3.3.3 *Regulatory Basis*

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for P-T limits are given in Section 5.3.2 of NUREG-0800.

5.3.3.4 *Technical Evaluation*

The NRC staff reviewed Section 5.3.3 of the Turkey Point Units 6 and 7 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 in the application and incorporated by reference addresses the required information relating to P-T limits. The results of the NRC staff's evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the Turkey Point Units 6 and 7 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5, to the Turkey Point Units 6 and 7 COL FSAR. In performing this comparison, the staff considered changes made to the Turkey Point Units 6 and 7 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the Turkey Point Units 6 and 7 COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 5.3.3.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 5.3-1*

The NRC staff reviewed STD COL 5.3-1 related to COL Information Item 5.3-1 included under Section 5.3.6.1 of the COL FSAR. The applicant proposes to replace the text in AP1000 DCD Section 5.3.6.1 with the following:

> *The pressure-temperature curves shown in DCD Figures 5.3-2 and 5.3-3 are generic curves for AP1000 reactor vessel design, and they are limiting curves based on copper and nickel material composition. Plant-specific curves will be developed based on material composition of copper and nickel. Use of plant-specific curves will be addressed during procurement and fabrication of the reactor vessel. As noted in the bases to Technical Specification 3.4.14, use of plant-specific curves requires evaluation of the LTOP system. This includes an evaluation of the setpoint pressure for the RNS relief valve to determine if the setpoint pressure needs to be changed based on plant-specific pressure-temperature curves. The development of the plant-specific curves and evaluation of the setpoint pressure are required prior to fuel load.*

In addition, in Section 5.3.3.2 of NUREG-1793, the staff identified related COL Action Item 5.2.2.2-1 in which the COL applicant will address the use of plant-specific curves during procurement of the RV.

The COL applicant stated that the P-T limits shown in DCD Figures 5.3-2 and 5.3-3 are generic curves for AP1000 RV design, and they are limiting curves based on copper and nickel material composition. The applicant committed to provide P-T limits using the plant-specific material composition after the combined license is issued and when the RV is procured. The applicant also stated that the development of the plant-specific P-T limits is required prior to fuel load. The staff found that a more specific implementation milestone for completing the plant-specific P-T limits was needed. Thus, the following additional information was requested.

In RAI 5.3.2-1, the staff noted Westinghouse's plan to: a) submit a generic PTLR [pressure temperature limits report] for the AP1000 RV using the bounding properties for NRC staff review and approval; and b) update the AP1000 DCD to include the use of the generic AP1000 PTLR by all COL applicants. The NRC

staff requested that Part 10 of the BLN COL, proposed license conditions, Section 2, COL holder items, and COL Information Item 5.3-1 be revised by adding the following statement:

> *The COL Holder shall update the P/T limits using the PTLR methodologies approved in the AP1000 DCD, and using the plant-specific material properties. The COL Holder will inform the NRC of the updated P/T limits.*

The approach described above is consistent with that used for all operating reactors where licensees using PTLRs (reference: GL 96-03) inform the NRC staff of any subsequent change in P-T limits with no NRC approval necessary when there are no changes to the approved PTLR methodology. Subsequently, in a letter dated May 30, 2008, Westinghouse submitted a generic PTLR for AP1000 plants. The NRC staff reviewed the PTLR and approved its use for AP1000 RVs in a safety evaluation (ML083470258) dated December 30, 2008.

In response to RAI 5.3.2-1, the applicant proposed to modify the COL application Part 10, Proposed Combined License Conditions, Section 2, COL Holder Item 5.3-1. Accordingly, the modified license condition states, "The COL Holder shall update the P/T limits using the PTLR methodologies approved in the AP1000 DCD using plant-specific material properties or confirm that the reactor vessel material properties meet the specifications and use the Westinghouse generic PTLR curves."

The staff finds that the applicant's modification to the proposed license condition is adequate and the staff verified that the revision to Part 10 of the application incorporates the above. As a result, RAI 5.3.2-1 is closed.

Supplemental Information

- *STD SUP 5.3-1*

Development of plant operating procedures as required by TS 5.6.6 ensures that P-T limits are adhered to during normal and abnormal operating conditions and system tests and is therefore, acceptable.

5.3.3.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation section above, the staff finds the following license condition related to P-T limits acceptable:

- License Condition (5-4) – Before initial fuel load, the licensee shall update the P-T limits using the pressure-temperature limits report (PTLR) methodologies approved in the AP1000 DCD using the plant-specific material properties or confirm that the RV material properties meet the specifications and use the Westinghouse generic PTLR curves.

5.3.3.6 *Conclusion*

The NRC staff reviewed the application and the referenced DCD. The staff's review confirmed that the applicant has addressed the relevant information relating to this section, and no outstanding information related to this section remains to be addressed in the Turkey Point Units 6 and 7 COL FSAR. The results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the Turkey Point Units 6 and 7 COL FSAR is acceptable and meets the regulatory basis addressed in NUREG-1793. Specifically, the relevant regulatory basis includes Section 5.3.2 of NUREG-0800; GL 96-03, "Relocation of the Pressure Temperature Limit Curves and Low Temperature Overpressure Protection System Limits"; and Appendix G to 10 CFR Part 50. The staff based its conclusion on the following:

- STD COL 5.3-1, relating to plant-specific P-T curves, is acceptable because the program is consistent with the guidelines addressed in Section 5.3.2 of NUREG-0800. Conformance with these guidelines provides an acceptable basis for satisfying in part, the requirements of Appendix G to 10 CFR Part 50.

- STD SUP 5.3-1, relating to development of operating procedures, is acceptable because it ensures that P-T limits are adhered to during normal and abnormal operating conditions and system tests.

5.3.4 Reactor Vessel Integrity (Related to RG 1.206, Section C.III.1, Chapter 5, C.I.5.3.3 "Reactor Vessel Integrity")

5.3.4.1 *Introduction*

Section 5.3.4 of the AP1000 DCD describes the RV integrity. The RV is the RCPB used to support and enclose the reactor core. It provides flow direction with the reactor internals through the core and maintains a volume of coolant around the core. The vessel is fabricated by welding together the lower head, the transition ring, the lower shell, and the upper shell. The upper shell contains the penetrations from the inlet and outlet nozzles and direct vessel injection nozzles.

As part of the RV integrity, this section also addresses the pressurized thermal shock (PTS) for the PWR RV. PTS events are potential transients in a PWR RV that can cause severe overcooling of the vessel wall, followed by immediate repressurization. The thermal stresses, caused when the inside surface of the RV cools rapidly, combined with high-pressure stresses, will increase the potential for fracture if a flaw is present in a low-toughness material. The materials most susceptible to PTS are the materials in the RV beltline where neutron radiation gradually embrittles the material over time.

5.3.4.2 *Summary of Application*

Section 5.3 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference Section 5.3 of the AP1000 DCD, Revision 19. Section 5.3 of the DCD includes Section 5.3.4.

In addition, in Turkey Point Units 6 and 7 COL FSAR Section 5.3.6, the applicant provided the following:

AP1000 COL Information Item

- STD COL 5.3-4

The applicant provided additional information in STD COL 5.3-4 to address COL Information Item 5.3-4 and related COL Action Item 5.3.4.3-1. The applicant proposed to verify the plant-specific beltline material properties consistent with the requirements in DCD Section 5.3.3.1 and DCD Tables 5.3-1 and 5.3-3 prior to fuel load. The applicant also proposed in STD COL 5.3-4 to perform a PTS evaluation based on as procured RV material data and the projected neutron fluences for the plant design objective of 60 years.

License Condition

- Part 10, License Condition 2, Item 5.3-4

The milestone for the implementation of the proposed actions related to RV material properties will be prior to initial fuel load.

5.3.4.3 *Regulatory Basis*

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the RV integrity are given in Section 5.3.3 of NUREG-0800.

In addressing the COL information item, PWRs are required, in part, to have the pressurized thermal shock reference temperature (RT_{PTS}), evaluated for the end-of-life fluence for each of the RV beltline materials in accordance with requirements of 10 CFR 50.61, “Fracture toughness requirements for protection against pressurized thermal shock events.”

5.3.4.4 *Technical Evaluation*

The NRC staff reviewed Section 5.3.4 of the Turkey Point Units 6 and 7 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 RV integrity. The results of the NRC staff’s evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the Turkey Point Units 6 and 7 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5, to the Turkey Point Units 6 and 7 COL FSAR. In performing this comparison, the staff considered changes made to the Turkey Point Units 6 and 7 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the Turkey Point Units 6 and 7 COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 5.3.4.3 of the VEGP SER:

<u>AP1000 COL Information Item</u>

- *STD COL 5.3-4*

The NRC staff reviewed STD COL 5.3-4 related to COL Information Item 5.3-4 and related COL Action Item 5.3.4.3-1. The applicant proposed to verify the plant-specific beltline material properties consistent with the requirements in DCD Section 5.3.3.1 and DCD Tables 5.3-1 and 5.3-3 prior to fuel load. The applicant also proposed in STD COL 5.3-4 to perform a PTS evaluation based on as procured RV material data and the projected neutron fluences for the plant design objective of 60 years.

<u>License Condition</u>

- *Part 10, License Condition 2, Item 5.3-4*

In response to the COL information item, the applicant proposed a license condition (Part 10, Item 2, COL Information Item 5.3-4) that a plant-specific PTS evaluation would be performed by the COL holder using as-procured RV material data and submitted for NRC review prior to initial fuel loading.

The as-procured RV material properties will be available to the COL holder after the acceptance of the RV. In order to provide sufficient time for NRC review of

the PTS evaluation using the as-procured RV material properties as required by 10 CFR 50.61, the staff requested a more specific and timely milestone for submitting the PTS evaluation to the NRC be established. Therefore, the staff requested that the proposed license condition for COL Information Item 5.3-4 be revised to state that, within a reasonable period of time following acceptance of the RV, the COL holder submit to the NRC staff the plant-specific PTS evaluation, for example, one year after the acceptance of the RV. This was identified in RAI 5.3.3-1.

In response to RAI 5.3.3-1, the applicant proposed that the licensee shall submit to the appropriate Director of the NRC, a schedule, no later than 12 months after the issuance of the COL, that supports planning for and conduct of NRC inspections of operational programs listed in the operational program FSAR Table 13.4-201. This schedule shall include a submittal schedule for the RV pressurized thermal shock evaluation at least 18 months prior to initial fuel load. Accordingly, the applicant will revise the COL application, Part 10, proposed License Condition 6.

The staff finds that Revision 1 of the application incorporates the proposed change to the proposed License Condition 6, and therefore the applicant's response to COL Information Item 5.3-4 meets the implementation requirements of 10 CFR 50.61, and is therefore acceptable. As a result, RAI 5.3.3-1 is closed.

5.3.4.5 *Post Combined License Activities*

The license condition language in this section has been clarified from previously considered language. In a letter dated April 8, 2016 (ADAMS Accession No. ML16103A507), the applicant did not identify any concerns with the clarified license condition language. The changes do not affect the staff's above analysis of the conditions, and therefore, for the reasons discussed in the technical evaluation section above, the staff finds the following license condition acceptable:

- License Condition (5-5) – Before initial fuel load, the licensee shall verify that plant-specific belt line material properties are consistent with the properties given in AP1000 DCD Rev. 19, Section 5.3.3.1 and Tables 5.3-1 and 5.3-3. The verification must include a pressurized thermal shock (PTS) evaluation based on as-procured reactor vessel material data and the projected neutron fluence for the plant design objective. Submit this PTS evaluation report to the Director of NRO, or the Director's designee, in writing, at least 18 months before the latest date set forth in the schedule for completing the inspections, tests, and analyses in the ITAAC submitted in accordance with 10 CFR 52.99(a).

5.3.4.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the relevant information relating to this section, and no outstanding information related to this section remains to be addressed in the Turkey Point Units 6 and 7 COL FSAR. The results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the Turkey Point Units 6 and 7 COL FSAR meets the relevant acceptance criteria provided in Section 5.3.3 of NUREG-0800, and the requirements of Appendix B to 10 CFR Part 50 and 10 CFR 50.61. The staff based its conclusion on the following:

- STD COL 5.3-4, relating to plant-specific beltline material properties, is acceptable because the applicant's proposed resolution meets the relevant acceptance criteria addressed in Section 5.3.3 of NUREG-0800 and thus provides an acceptable basis for satisfying, in part, the requirements of Appendix B to 10 CFR Part 50 and 10 CFR 50.61.

5.3.5 Reactor Vessel Insulation

RV insulation is provided to minimize heat losses from the primary system. Nonsafety-related reflective insulation similar to that in use in current PWRs is utilized.

Section 5.3 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference, with no departures or supplements, Section 5.3.5 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

5.4 Component and Subsystem Design (Related to RG 1.206, Section C.III.1, Chapter 5, C.I.5.4, "Reactor Coolant System Component and Subsystem Design")

5.4.1 Introduction

This section pertains to the design of various components and subsystems within, or associated with, the RCS. Principal components or subsystems include the following:

- Reactor coolant pumps (RCPs)
- Steam generators (SGs), including materials and ISI
- RCS piping and valves
- Main steam line flow restriction
- Pressurizer and pressurizer relief discharge
- Automatic depressurization system valves
- Normal Residual Heat Removal System (RNS)
- RCS pressure relief devices
- Component supports
- RCS high point vents
- Core makeup tank
- Passive residual heat removal heat exchanger

The majority of the design-related information in the DCD is incorporated by reference in the COL application. Regarding the SGs, a program is developed by the COL applicant to ensure tube structural and leakage integrity will be maintained at a level comparable to that of the original design requirements. An effective program depends on both the program and the design features of the SGs.

The RNS is a nonsafety-related system. Since the RNS is not required to operate to mitigate design-basis events, it is not credited in the Chapter 15 safety analysis. However, the RNS is considered an important system because the RNS provides residual heat removal capability to several reactor systems. These major RNS nonsafety-related functions include the RCS shutdown heat removal, RCS LTOP, RCS and refueling cavity purification during refueling operations, in-containment refueling water storage tank (IRWST) cooling, low pressure makeup to the RCS, and post-accident heat removal recovery. In addition, the RNS provides safety-related functions that include containment isolation of the RNS lines penetrating the containment, preservation of the RCS pressure boundary, and long term post-accident makeup to the containment inventory.

5.4.2 Summary of Application

Section 5.4 of the Turkey Point Units 6 and 7 COL FSAR, Revision 7, incorporates by reference Section 5.4 of the AP1000 DCD, Revision 19.

In addition, in Turkey Point Units 6 and 7 COL FSAR Section 5.4 (and in letter dated May 9, 2016 (ADAMS Accession No. ML16132A293)), the applicant provided the following:

Departures

- PTN DEP 3.2-1 and PTN DEP 6.3-1

The applicant provided additional information in Turkey Point Units 6 and 7 COL FSAR Section 5.4 (letter dated May 9, 2016 (ADAMS Accession No. ML16132A293)) about PTN DEP 3.2-1 and PTN DEP 6.3-1 related to design modifications to the condensate return portion of the Passive Core Cooling System and quantifying the duration that the passive residual heat removal heat exchanger (PRHR-HX) can maintain safe shutdown conditions, respectively. This information, as well as related PTN DEP 3.2-1 and PTN DEP 6.3-1 information appearing in other chapters of the FSAR (letter dated May 9, 2016 (ADAMS Accession No. ML16132A293)), is reviewed in Section 21.1 of this SER.

- PTN DEP 2.0-3

In the Turkey Point Units 6 and 7 COL application, Part 7, and Turkey Point Units 6 and 7 COL FSAR Section 5.4.7.1, the applicant proposed a site-specific ambient design wet bulb air temperature of 87.4°Fahrenheit (F) as the basis for the component cooling water temperature to the RNS heat exchangers. That temperature exceeds the site parameter value for maximum safety wet bulb (noncoincident) air temperature specified in the DCD.

In Turkey Point Units 6 and 7 COL FSAR Section 5.4.7.1, the applicant replaced the second bulleted item regarding RNS cooling of the IRWST in DCD Section 5.4.7.1.2.3 with the following information:

> The component cooling water system supply temperature to the normal residual heat removal system heat exchangers is based on an ambient design wet bulb temperature of no greater than 87.4°F (100 year return estimate of 2-hour duration). The 87.4°F value is assumed for normal conditions and transients that start at normal conditions.

The exemption request related to the AP1000 DCD maximum safety wet bulb (noncoincident) air temperature involves an exemption to 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants," Appendix D, "Design Certification Rule for the AP1000 Design," Section IV.A.2.d. Specifically, the Turkey Point Units 6 and 7 applicant requested an exemption from a site parameter value provided in AP1000 DCD Tier 1, Table 5.0-1 for the maximum safety wet bulb (noncoincident) air temperature. The exemption request is evaluated in Section 9.2.2 of this SER.

AP1000 COL Information Item

- STD COL 5.4-1

The applicant provided additional information in STD COL 5.4-1 to address COL Information Item 5.4-1 as described in Section 5.4.15 of the AP1000 DCD. The information in STD COL 5.4-1 provides the SG program description, references the applicable ASME BPV Code, Section XI requirements and industry guidelines, and refers to the TS for the program requirements.

The detailed inspection and reporting requirements are provided in Turkey Point Units 6 and 7 COL FSAR, Part 4, "Technical Specifications," Sections 1.1 ("Definitions"), 3.4.7 ("RCS Operational Leakage"), 3.4.18 ("Steam Generator (SG) Tube Integrity"), 5.5.4 ("Steam Generator (SG) Program"), 5.6.8 ("Steam Generator Tube Inspection Report"), and in the associated bases sections of the TS.

5.4.3 Regulatory Basis

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the component and subsystem design are given in Section 5.4.2 of NUREG-0800.

The applicable regulatory requirements for acceptance of the COL information item are 10 CFR 50.55a, as it relates to periodic inspection and testing of the RCPB as detailed in Section XI of the ASME Code, and 10 CFR Part 50, Appendix A, GDC 32, as it relates to the accessibility of SG tubes for periodic testing. In addition, 10 CFR 50.55a(b)(2)(iii) states that if the TS include SG surveillance requirements that are different than those in Article IWB-2000 of the ASME Code, Section XI, then the SG tube inspection requirements are governed by the TS.

The regulatory basis for evaluating the RNS is documented in Section 5.4.7 of NUREG-1793 and its supplements. While the RNS is a nonsafety-related system, it is considered to be important to safety because it provides the first line of defense during an accident to prevent unnecessary actuation of the passive core cooling systems. Regulatory oversight of the active nonsafety systems in passive plant designs is subject to a staff evaluation of the regulatory treatment of nonsafety systems (RTNSS). Chapter 22 of NUREG-1793 provides a detailed evaluation of the RTNSS issue in accordance with the Commission's policy for passive reactor plant designs. Nonsafety-related systems that provide defense-in-depth capabilities for the AP1000 design includes the RNS. For this defense-in-depth system to operate, the associated systems and structures to support these functions must also be operable, including

nonsafety-related component cooling water system and the service water system. The staff's evaluation of the changes that are proposed focused primarily on confirming that the changes will not adversely affect safety-related SSCs or those that satisfy the criteria for RTNSS. Therefore, the proposed changes were evaluated using the guidance provided by NUREG-0800, Section 5.4.7, as it pertains to these considerations. Acceptability was determined based on conformance with the existing AP1000 licensing basis, the guidance specified by NUREG-0800, Section 5.4.7 (10 CFR Part 50, Appendix A, GDC 34, "Residual Heat Removal," as it relates to requirements for a RNS system), and the Commission's policy with respect to RTNSS as discussed in SECY-94-084, "Policy and Technical Issues Associated With the Regulatory Treatment of Non-Safety Systems in Passive Plant Designs," and SECY-95-132, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plant Designs (SECY-94-084)."

5.4.4 Technical Evaluation

The NRC staff reviewed Section 5.4 of the Turkey Point Units 6 and 7 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 in the application and incorporated by reference addresses the required information relating to RCS component and subsystem design. The results of the NRC staff's evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the Turkey Point Units 6 and 7 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5, to the Turkey Point Units 6 and 7 COL FSAR. In performing this comparison, the staff considered changes made to the Turkey Point Units 6 and 7 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the Turkey Point Units 6 and 7 COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 5.4.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 5.4-1*

In AP1000 DCD Section 5.4.15, Westinghouse identified COL Information Item 5.4-1 for the COL applicant to address the SG tube integrity with an SG Tube Surveillance Program and address the need to develop a program for periodic monitoring of degradation of steam generator internals. Similarly, in NUREG-1793, Section 5.4.2.2.2, the staff identified COL Action Item 5.4.2.2.3-1 and noted that an SG tube surveillance program is necessary to address the concerns raised in GL 97-06, "Degradation of Steam Generator Internals."

In Revision 17 of the AP1000 DCD, Westinghouse proposed changes to the AP1000 generic TS related to adopting TS Task Force Traveler (TSTF) 449, Revision 4, "Steam Generator Tube Integrity." TSTF 449 is incorporated in the current Westinghouse Owners Group Standard Technical Specifications (STS), NUREG-1431, Revision 3.1, December 1, 2005. The TS and bases sections listed above for SG tube integrity in the BLN SER are identical to those in Revision 17 of the AP1000 DCD.

With respect to the information provided in STD COL 5.4-1, the staff reviewed the description in Chapter 5 of the FSAR using the guidelines in RG 1.206, Section C.III.1, Chapter 5, C.I.5.4.2.2; Section 5.4.2.2 of NUREG-0800; and the TS proposed in the AP1000 DCD (which are based on NUREG-1431, Revision 3.1 and are the STS for Westinghouse operating plants). The staff confirmed tube inspection will meet the requirements of Section XI of the ASME Code, and that the applicant referenced an acceptable method (RG 1.121) for determining the tube repair criteria for maintaining structural integrity. The staff determined the TS proposed for BLN Nuclear Plant, Units 3 and 4 are consistent with the approved STS and the leakage limits and SG tube integrity requirements are appropriate as they apply to BLN, and are therefore acceptable. In addition, the applicant took exception to the guidance contained in Regulatory Guide 1.83, Revision 1 and stated that the applicant's program will be implemented according to Nuclear Energy Institute (NEI) 97-06 ("Steam Generator Program Guidelines") and EPRI SG guidelines, which are referenced in the STS and, thus, provide acceptable methods for implementing ASME Code requirements. With respect to tube integrity considerations, the Model Delta-125 SG planned for the BLN units closely resembles the Model Delta-75 installed as replacement SGs at some operating plants.

According to Section 5.4.2.2 of NUREG-0800, because the SG program is part of the ISI requirements, it is an operational program that should be fully described, with implementation milestones listed in the appropriate table in Chapter 13 of the FSAR. In response to RAI 5.4.2.2-1 from the staff, in a letter dated June 5, 2008, the applicant proposed revising FSAR Chapter 13, Table 13.4-201 to add Section 5.4.2.5 ("Steam Generator Inservice Inspection") as one of the FSAR sections addressed by the operational program titled "Inservice Inspection Program." Similarly, in response to RAI 5.4.2.2-2, the applicant proposed revising Table 13.4-201 to add Section 5.4.2.5 as one of the FSAR sections addressed by the operational program titled "Preservice Inspection Program." These proposed revisions are acceptable because they make the SG tube ISI

part of the operational programs and ensure PSIs will be performed, consistent with the acceptance criteria in Section 5.4.2.2 of NUREG-0800 and RG 1.206. The staff verified that Revision 1 of Table 13.4-201 adequately incorporates the above. As a result, RAI 5.4.2.2-1 and RAI 5.4.2.2-2 are closed.

Tier 1 and Tier 2 Departure

- PTN DEP 2.0-3

PTN DEP 2.0-3 proposes to increase the maximum safety wet bulb (noncoincident) air temperature from 86.1°F to 87.4°F. This change impacts the performance of various structures, systems, and components (SSCs) described in the AP1000 DCD. The staff's evaluation of this proposed change is also discussed in Sections 2.0, 2.3.1, 6.2, 6.4, 9.1.3, 9.2.2, and 9.2.7 of this SER.

The maximum safety noncoincident wet bulb temperature, referred to as the ambient design wet bulb temperature in Section 5.4.7, for the Turkey Point Units 6 and 7 site was recently reevaluated by Westinghouse and increased from the standard AP1000 DCD value to reflect expected site maximum temperature conditions. This change requires that an evaluation be performed for the various plant performance requirements and commitments affected by this parameter to confirm that the performance of the plant's nonsafety-related systems remains within the bounds described in the AP1000 DCD with respect to the ambient design wet bulb temperature. As described in AP1000 DCD Section 5.4.7.1.2.3, RNS cooling of the IRWST to maintain the IRWST temperature to within the temperature criteria during normal and abnormal conditions is dependent upon the RNS heat removal capacity to the component cooling water system (CCS). Since the CCS ambient design wet bulb temperature increased from the standard AP1000 DCD value used in nonsafety-related system analysis, the departure was reflected in a revision to the Turkey Point Units 6 and 7 COL application. For that reason, the staff considered the RNS as one of the systems that could be impacted by this change in that the ability to transfer heat to the CCS would be reduced.

The staff evaluated this departure and determined that additional information was needed to support this change regarding the RNS heat removal capability of cooling the IRWST. Therefore, the staff generated RAI 5403 (Question 09.02.02-1) and RAI 5492 (Question 09.02.02-2) to acquire additional information related to this change in the maximum safety design wet bulb temperature and the overall effects to various systems including the RNS heat transfer interface with CCS. These RAIs are discussed in chapter 9 of this SER.

In support of PTN DEP 2.0-3, maximum safety wet bulb (noncoincident) air temperature, the Turkey Point applicant provided a similar level of detail in revision 5 of Turkey Point Units 6 and 7 COL FSAR section 5.4.7.1 as did a previous AP1000 applicant addressing the same maximum safety wet bulb departure. The component cooling water system supply temperature to the normal residual heat removal system heat exchangers is based on an ambient design wet bulb temperature of no greater than 87.4°F (100 year return estimate of 2-hour duration). The 87.4°F value is assumed for normal conditions and transients that start at normal conditions.

The steaming prevention function is evaluated assuming the ambient wet bulb temperature is at the maximum safety value for the site. During plant operation, maximum IRWST temperature is reduced below 120°F whenever necessary by circulating IRWST water through one of the RNS heat exchangers, and removing the heat through the CCS and service water system SWS.

Since the RNS heat exchangers are not being used to remove decay heat with the plant at power, at least one is available for IRWST heat removal. Only one train of CCS (pump and heat exchanger) and one train of SWS (pump, strainer, and cooling tower cell) are normally in operation with the plant at power. There is sufficient margin in CCS pump flow capacity and motor size, and in CCS heat exchanger overall heat transfer coefficient and effective heat transfer area (UA), to valve in one of the RNS heat exchangers and remove IRWST heat by directing CCS flow through the heat exchanger and transferring the excess heat to the SWS cooling tower. CCS temperature rises slightly above the normal full power CCS temperature during this evolution, but does not approach the maximum allowable value of 100°F.

Prevention of IRWST steaming following high-pressure heat removal operations with the Passive Residual Heat Removal (PRHR) heat exchanger is accomplished in the same manner, by lining up both RNS heat exchangers to the CCS and the IRWST. CCS is delivered to the RNS heat exchangers at a temperature consistent with the maximum safety ambient wet bulb temperature and the CCS and SWS heat duty and flow rates. Cooling is assumed to begin two hours after reactor trip, with decay heat appropriate for that time after the event. Calculations performed to determine the maximum IRWST temperature achieved following a high pressure heat removal event using the PRHR heat exchanger assumed CCS temperature is determined by use of a maximum safety ambient wet bulb temperature value of 87.4°F. The maximum predicted IRWST liquid temperature is 201°F. Therefore, it can be concluded that IRWST cooling performance (prevention of steaming) is acceptable.

The staff finds that during normal power plant operations, the maximum IRWST temperature is kept below 120 °F by removing the IRWST heat through one train of the RNS, CCS and SWS. This heat removal process can be performed since the RNS, CCS, and SWS are not being used to remove decay heat with the plant at power.

During high pressure operation events, the calculation of the CCS temperature is determined by the use of the maximum safety ambient wet bulb temperature and not the maximum normal wet bulb temperature. As related to RNS and its ability to support defense in depth, RTNSS, and cooling of the IRWST, the RNS performance is dependent upon the maximum normal wet bulb temperature. Therefore, the staff finds the applicant's response acceptable with regard to maintaining the IRWST temperature below 120 °F during normal operation and prevention of IRWST steaming during high-pressure heat removal operational events.

In summary, the staff concludes that the proposed change in the maximum safety noncoincident wet bulb temperature does not impact the RNS capacity to perform its functions as described in DCD Section 5.4.7.

5.4.5 Post Combined License Activities

The license condition language in this section has been clarified from previously considered language. In a letter dated April 8, 2016 (ADAMS Accession No. ML16103A507), the applicant did not identify any concerns with the clarified license condition language. The changes do not affect the staff's above analysis of the conditions, and therefore, for the reasons discussed in the technical evaluation section above, the staff finds the following license condition acceptable:

- License Condition (5-6) – No later than 12 months after the issuance of the COL, the licensee shall submit to the Director of NRO a schedule that supports planning for and

conduct of NRC inspections of the PSI/ISI program. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the PSI/ISI program has been fully implemented.

5.4.6 Conclusion

The NRC staff reviewed the application and the referenced DCD. The staff's review confirmed that the applicant has addressed the relevant information relating to this section, and no outstanding information related to this section remains to be addressed in the Turkey Point Units 6 and 7 COL FSAR. The results of the NRC staff's technical evaluation of the information incorporated by reference in the Turkey Point Units 6 and 7 COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in the Turkey Point Units 6 and 7 COL FSAR is acceptable and meets the relevant regulatory requirements provided in Appendix A to 10 CFR Part 50, GDC 32 and 10 CFR 50.55a, and the regulatory guidance addressed in RG 1.206 and RG 1.121. The staff based its conclusion on the following:

- PTN DEP 3.2-1 and PTN DEP 6.3-1, related to design modifications to the condensate return portion of the Passive Core Cooling System and quantifying the duration that the passive residual heat removal heat exchanger can maintain safe shutdown conditions, respectively, are reviewed and found acceptable by the staff in Section 21.1 of this SER.

- PTN DEP 2.0-3 relating to IRWST temperature control with RNS cooling capacity is acceptable because the RNS cooling performance is determined based on the maximum safety wet bulb temperature and the cooling capability of the CCS to the RNS heat exchangers was evaluated and determined to provide sufficient cooling at the proposed ambient design wet bulb temperature. Therefore, the staff concludes that the Turkey Point Units 6 and 7 RNS, as described in Section 5.4.7 of the FSAR, is acceptable because GDC 34, as related to the requirements of a residual heat removal system, was not impacted by the proposed revision.

- STD COL 5.4-1 relating to the SG Program, is acceptable because it meets the relevant guidelines of RG 1.206, Section C.III.1, Chapter 5, C.I.5.4.2.2 and RG 1.121. Conformance with these guidelines provides an acceptable basis for satisfying, in part, the requirements of Appendix A to 10 CFR Part 50, GDC 32, and 10 CFR 50.55a including the specific modification provided in 10 CFR 50.55a(b)(2)(iii).