9.0 AUXILIARY SYSTEMS

The auxiliary systems provide support systems that support the safe shutdown of the plant or the protection of the health and safety of the public. This area covers a wide range of systems including fuel storage and handling, water systems, compressed air, process sampling, drains, heating, ventilation, and air conditioning (HVAC), fire protection, communications, lighting, and emergency diesel generator support systems.

9.1 Fuel Storage and Handling

9.1.1 New Fuel Storage (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.1.1, "Criticality Safety of Fresh and Spent Fuel Storage and Handling," and C.I.9.1.2, "New and Spent Fuel Storage")

The new fuel storage facilities include the fuel assembly storage racks, the concrete storage pit that contains the storage racks, and auxiliary components including the spent fuel handling crane and pit cover. The storage facilities must maintain the new fuel in subcritical arrays during all credible storage conditions. In addition, new fuel must remain subcritical during fuel handling.

Section 9.1 of the V.C. Summer Nuclear Station (VCSNS) combined license (COL) Final Safety Analysis Report (FSAR), Revision 5 incorporates by reference, with no departures or supplements, Section 9.1.1, "New Fuel Storage," 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 VCSNS COL application are documented in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

9.1.2 Spent Fuel Storage (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.1.1, "Criticality Safety of Fresh and Spent Fuel Storage and Handling," and C.I.9.1.2, "New and Spent Fuel Storage")

9.1.2.1 *Introduction*

The spent fuel storage facilities include the spent fuel storage racks, the spent fuel storage pool that contains the storage racks, and the associated equipment storage pits. The storage facilities must maintain the spent fuel in subcritical arrays during all credible storage conditions. In addition, spent fuel must remain subcritical during fuel handling.

9.1.2.2 *Summary of Application*

Section 9.1 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 19. Section 9.1 of the DCD includes Section 9.1.2.

[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 VCSNS COL FSAR Section 9.1.6, the applicant provided the following:

AP1000 COL Information Item

- STD COL 9.1-7

The applicant provided additional information in standard (STD) COL 9.1-7 to address COL Information Item 9.1-7.

License Condition

- Part 10, License Condition 2, Item 9.1-7

The applicant proposed a license condition related to STD COL 9.1-7 that sets the implementation milestone for the Metamic Coupon Monitoring Program.

- Part 10, License Condition 6

The applicant proposed a license condition to provide a schedule to support the NRC's inspection of operational programs and proposed to add the Metamic Monitoring Program to this list. The VCSNS applicant made this proposal through its endorsement, in a letter dated August 24, 2010, of the letter dated April 23, 2010, from the Vogtle Electric Generating Plant (VEGP) applicant on this issue.

9.1.2.3 *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 fuel storage and handling are given in Section 9.1.2 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)."

The regulatory basis for acceptance of the COL information and supplementary information items are established in:

- Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic licensing of production and utilization facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criteria (GDC) 4, "Environmental and Dynamic Effects Design Bases"

- GDC 61, "Fuel Storage and Handling and Radioactivity Control"

9.1.2.4 *Technical Evaluation*

The NRC staff reviewed Section 9.1.2 of the VCSNS 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 spent fuel storage. The results of the NRC staff's evaluation of the

information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this safety evaluation report (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 VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS 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 VCSNS 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) includes evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application. Any confirmatory items in the standard content material retain the numbers assigned in the VEGP SER. Confirmatory items that are first identified in this SER section have a VCSNS designation (e.g., Confirmatory Item VCSNS 9.1-1).

The following portion of this technical evaluation section is reproduced from Section 9.1.2.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 9.1-7*

COL Information Item 9.1-7 states:

> *The Combined License holder will implement a spent fuel rack Metamic coupon monitoring program when the plant is placed into commercial operation. This program will include tests to monitor bubbling, blistering, cracking, or flaking; and a test to monitor for corrosion, such as weight loss measurements and or visual examination.*

STD COL 9.1-7 states:

> *A spent fuel rack Metamic coupon monitoring program is to be implemented when the plant is placed into commercial operation. This program includes tests to monitor bubbling, blistering,*

cracking, or flaking; and a test to monitor for corrosion, such as weight loss measurements and or visual examination.

The NRC staff reviewed STD COL 9.1-7 related to the Metamic coupon monitoring program included under Section 9.1 of the BLN COL FSAR. No additional details on the Metamic Coupon Monitoring Program are provided in Section 9.1 of the FSAR.

Since the applicant's proposed resolution of COL Information Item 9.1-7 was a restatement of the text of the COL information item from the DCD, the staff required additional information to be able to evaluate the applicant's closure of the item. An additional Request for Additional Information (RAI) response related to AP1000 DCD Section 9.1.2 (ML091120720) proposed a modification to the text of COL Information Item 9.1-7. The modified wording added neutron attenuation and thickness testing to the list of tests to be included in the Metamic monitoring program to be implemented by the COL holder. In RAI 9.1.2-1, the NRC staff requested that the applicant describe in detail the implementation of the aspects of the Metamic coupon monitoring program that are listed in STD COL 9.1-7, as modified by the additional AP1000 RAI response. In response to RAI 9.1.2-1, the applicant proposed modified wording for STD COL 9.1-7 as follows:

STD COL 9.1-7

A spent fuel rack Metamic coupon monitoring program is to be implemented when the plant is placed into commercial operation. This program includes tests to monitor bubbling, blistering, cracking, or flaking; and a test to monitor for corrosion, such as weight loss measurements and / or visual examination. The program will also include tests to monitor changes in physical properties of the absorber material, including neutron attenuation and thickness measurements.

*This proposed wording matches the proposed revised text for AP1000 COL Information Item 9.1-7. However, the proposed wording is still a restatement of the COL information item and does not contain the level of detail needed by the staff to evaluate the adequacy of the Metamic monitoring program. Therefore, in RAI 9.1.2-2, the staff requested that the applicant describe the methodology and acceptance criteria for the tests listed, provide the corrective action requirements and provide the administrative controls applicable to the program. Additionally, the applicant should confirm the number of coupons and the withdrawal schedule will be the same as recommended in the DCD or provide an alternative. The staff has identified this as **Open Item 9.1-1** to track resolution of this issue and to ensure that the additional details are included in the BLN COL FSAR.*

<u>Resolution of Standard Content Open Item 9.1-1</u>

To resolve Open Item 9.1-1, the VEGP applicant provided additional information in a letter dated April 23, 2010, which superseded the original response to Open Item 9.1-1 provided in a letter dated December 30, 2009.

With respect to the number of coupons and the withdrawal schedule, the applicant confirmed that the number of coupons and the withdrawal schedule will be the same as stated in AP1000 DCD, Section 9.1.2.2.1. The applicant further stated that since AP1000 DCD Section 9.1 is incorporated by reference into the FSAR, no additional FSAR change would be required. The staff finds the applicant's response regarding the number of coupons and withdrawal schedule acceptable, because the applicant has confirmed the number of coupons and schedule will be the same as described in the AP1000 DCD.

With respect to methodology and acceptance criteria, corrective actions and administrative controls, the applicant stated that since the Metamic Coupon Monitoring Program has not yet been established, the level of detail requested is not completely available. The applicant further stated, "As stated in FSAR Subsection 9.1.6, a Metamic monitoring program will be implemented when the plant is placed into commercial operation. This program will include methodology to be employed, acceptance criteria, corrective actions and a description of administrative controls based on vendor recommendations and industry operating experience."

The applicant additionally stated that the VEGP COL FSAR will be revised to add the following to the end of the STD COL 9.1-7 discussion:

> *The program will include the methodology and acceptance criteria for the tests listed and provide corrective action requirements based on vendor recommendations and industry operating experience. The program will be implemented through plant procedures.*
>
> *<u>Metamic Monitoring Acceptance Criteria</u>:*
>
> - *Verification of continued presence of the boron is performed by neutron attenuation measurement. A decrease of no more than 5 percent in Boron-10 content, as determined by neutron attenuation, is acceptable. This is equivalent to a requirement for no loss in boron within the accuracy of the measurement.*
>
> - *Coupons are monitored for unacceptable swelling by measuring coupon thickness. An increase in coupon thickness at any point of no more than 10 percent of the initial thickness at that point is acceptable.*

Changes in excess of either of the above two acceptance criteria are investigated under the corrective action program and may require early retrieval and measurement of one or more of the remaining coupons to provide validation that the indicated changes are real. If the deviation is determined to be real, an engineering evaluation is performed to identify further testing or any corrective action that may be necessary.

Additional parameters are examined for early indications of the potential onset of Metamic degradation that would suggest a need for further attention and possibly

a change in the coupon withdrawal schedule. These include visual inspection for surface pitting, blistering, cracking, corrosion or edge deterioration, or unaccountable weight loss in excess of the measurement accuracy.

The NRC staff concludes that the above information to be added to the VEGP COL FSAR provides the necessary level of detail for the Metamic Monitoring Program, including the methodology and acceptance criteria for the tests listed, the corrective action requirements, and the administrative controls applicable to the program.

The applicant proposed a markup of the VEGP COL application, Part 10, License Condition 6, adding a line item for the Metamic Monitoring Program. After the addition of this line item, the version of License Condition 6 included in Part 10 of the COL application, Revision 2, would be:

> *The licensee shall develop a schedule that supports planning for and conduct of NRC inspection of the operational program listed in VEGP COL FSAR Table 13.4-201, "Operational Program Required by NRC Regulations." This schedule must be available to the NRC staff no later than 12 months after issuance of the COL. The schedule shall be updated every 6 months until 12 months before scheduled fuel load, and every month thereafter until the operational programs listed in VEGP COL FSAR Table 13.4-201 have been fully implemented or the plant has been placed in commercial service, whichever comes first. This schedule shall address:*
>
> *a. the implementation of site-specific Severe Accident Management Guidance.*
>
> *b. the reactor vessel pressurized thermal shock evaluation at least 18 months prior to initial fuel load.*
>
> *c. the approved preoperational and startup test procedures in accordance with FSAR Section 14.2.3.*
>
> *d. the flow accelerated corrosion (FAC) program implementation, including the construction phase activities.*
>
> *#. the spent fuel rack Metamic coupon monitoring program implementation.*
>
> *(Where # will be replaced with the next sequential number in the final version of this license condition.)*

The inclusion of the Metamic Coupon Monitoring Program in License Condition 6 ensures that the program will be treated as an operational program with respect to providing a schedule to support the NRC's inspection; thus, the applicant must submit and update the schedule for program implementation following the issuance of the COL, in order to support planning of NRC inspections. The staff, therefore, finds the applicant's proposed resolution of ***Open Item 9.1-1***

acceptable because the applicant will modify proposed License Condition 6 to ensure the appropriate information is available for the staff's review of the details of the Metamic Monitoring Program prior to the start of plant operation. ***Open Item 9.1-1*** *is, therefore, resolved. Incorporation of the proposed revision to Chapter 9 of the VEGP COL FSAR and to License Condition 6 in the VEGP COL application is being tracked as* ***Confirmatory Item 9.1-1****.*

Resolution of Standard Content Confirmatory Item 9.1-1

Confirmatory Item 9.1-1 is an applicant commitment to revise its FSAR Section 9.1.6 to include a requirement for inclusion of methodology, acceptance criteria and corrective action in the Metamic Coupon Monitoring Program. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 9.1-1 is now closed.

9.1.2.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation section above, the staff finds the following license condition proposed by the applicant acceptable:

- License Condition (9-1) - Prior to initial fuel load, the licensee shall implement the spent fuel rack Metamic Coupon Monitoring Program. No later than 12 months after issuance of the COL, the licensee shall submit to the Director of the Office of New Reactors (NRO) a schedule that supports planning for and conduct of NRC inspections of the spent fuel rack Metamic Coupon Monitoring Program. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the spent fuel rack Metamic Coupon Monitoring Program has been fully implemented.

9.1.2.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to spent fuel storage, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.1.2 of NUREG-0800. The staff based its conclusion on the following:

- STD COL 9.1-7 is acceptable because the necessary level of detail for the Metamic Coupon Monitoring Program has been provided by the applicant, including the methodology and acceptance criteria for the tests listed, the corrective action requirements, and the administrative controls applicable to the program.

9.1.3 Spent Fuel Pool Cooling System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.1.3, "Spent Fuel Pool Cooling and Cleanup System")

9.1.3.1 *Introduction*

The spent fuel pool cooling system (SFS) is designed to remove decay heat, which is generated by stored fuel assemblies from the water in the spent fuel pool (SFP). The safety-related portion of the SFS credits the water inventory in the pool and safety-related makeup water to remove the decay heat. The nonsafety-related portion of the system is an active system during normal operations that pumps the high temperature water from within the fuel pool through a heat exchanger, and then returns the water to the pool. The SFS heat exchangers are cooled by the component cooling water system (CCS). A secondary function of the SFS is clarification and purification of the refueling water and the SFP.

9.1.3.2 *Summary of Application*

Section 9.1 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 19. Section 9.1 of the DCD includes Section 9.1.3. The advanced safety evaluation (ASE) with confirmatory items for Section 9.1.3 was based on VCSNS COL FSAR, Revision 2 and DCD, Revision 17. After submitting VCSNS COL FSAR, Revision 2, the applicant revised a COL information item (COL VCS DEP 2.0-2) that affected this section. This revised COL information item has been incorporated into VCSNS COL FSAR, Revision 4 and the resolution of the confirmatory item associated with this revision is discussed below.

For VCSNS COL FSAR Section 9.1.3, no departures and/or supplements were identified in Revision 2 of the VCSNS COL FSAR; however, based on a letter dated June 30, 2010, additional information was provided by the applicant, as described below.

In addition, in VCSNS COL Part 7, the applicant provided the following:

Tier 1 and Tier 2 Exemption and Departure Request

The applicant proposed the following Tier 1 and Tier 2 departure (DEP) from the AP1000 DCD:

- VCS DEP 2.0-2

The Tier 1 departure request is from a site parameter value provided in AP1000 DCD Tier 1, Table 5.0-1 for the maximum safety wet-bulb (noncoincident) air temperature, which is 30.06 °Celsius (C) (86.1 °Fahrenheit (F)). The Tier 2 departure request is because this site parameter value is also listed as the maximum safety wet-bulb (noncoincident) air temperature in AP1000 DCD Tier 2, Table 2-1.

In its June 30, 2010, letter, the applicant proposed to add the following information as part of VCS DEP 2.0-2 at the end of the third bullet in VCSNS COL FSAR Section 9.1.3.1.3.1:

> SFS performance following restart after a normal refueling is affected by a change in maximum safety wet bulb temperature. Calculations confirm that spent fuel pool temperature remains below 115°F with a CCS supply temperature of 97°F at the specified pool spent fuel loading condition and decay time on the fuel fraction just replaced during the previous 17 day refueling outage. While the maximum CCS temperature expected for VCSNS Units 2 and 3 is 97.3°F, an

increase of 0.3°F in CCS supply temperature will produce a similar increase in the spent fuel pool maximum temperature; therefore, the requirement to maintain spent fuel temperature below 120°F is met with margin ([FSAR] Reference 201).

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 VCSNS 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 2.0.4 of this SER.

9.1.3.3 *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 SFS are given in Section 9.1.3 of NUREG-0800.

9.1.3.4 *Technical Evaluation*

The NRC staff reviewed Section 9.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the CCS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Tier 1 and Tier 2 Departure

- VCS DEP 2.0-2

VCS DEP 2.0-2 proposes to increase the maximum safety wet-bulb (noncoincident) air temperature from 30.06 °C (86.1 °F) to 30.72 °C (87.3 °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, 5.4, 6.2, 6.4, 9.2.2, and 9.2.7 of this SER.

The nonsafety portion of the SFS is designed to remove decay heat generated by the stored fuel assemblies from the water in the SFP and transfer it to the CCS. The site temperature (wet and dry bulb) impacts the cooling tower performance, which affect the temperature of the CCS. The SFS heat exchanger is cooled by the CCS, and a change in the CCS temperature affects the performance of the SFS. The impact of the proposed change on the CCS system is evaluated in Section 9.2.2 of this SER. Since the safety-related portion of the SFS does not credit the use of the CCS, it remains unaffected by the proposed change.

The performance of the SFS is evaluated in the AP1000 DCD for several limiting offload scenarios. Of all the evaluated scenarios, only one scenario uses the maximum safety wet-bulb (noncoincident) air temperature as the basis to determine the system's heat removal performance. In this scenario, the analysis must demonstrate that the SFS is capable of maintaining the temperature of the SFP water below 48.9 °C (120 °F) following a partial core fuel shuffle refueling, with the wet bulb temperature at the maximum safety wet-bulb (noncoincident) air temperature (most limiting case).

In its June 30, 2010, letter, the applicant included Enclosure 3, "Evaluation Impacts: Change to Maximum Safety Non-Coincident Ambient Wet Bulb Temperature." This report references the calculation "APP-SFS-M3C-042, Revision 0, SFS HX Sizing Calculation Using Florida Power and Light (Turkey Point) Increased Wet Bulb Temperatures" as the basis that demonstrate that the VCSNS SFS still meets its design basis with the new wet bulb temperature. APP-SFS-M3C-042 concluded that with a CCS temperature of 36.1 °C (97 °F), the Turkey Point SFP temperature remains below 46.1 °C (115 °F). This report was performed following the same methodology used in Westinghouse Technical Report (TR)-36 (APP-GW-GLE-036), "Impact of a Revision to the Current Wet Bulb Temperature Identified in Table 5.0-1 (Tier 1) and Table 2-1 (Sheet 1 of 3) of the DCD (Revision 16)" for the AP1000 DC. The staff has evaluated this Westinghouse methodology as part of its AP1000 DCD review and found it acceptable in Supplement 2 of NUREG-1793. Therefore, the staff finds that referencing APP-SFS-M3C-042 for VCSNS is acceptable.

As described in the markup for VCSNS FSAR Section 9.2, the maximum design temperature for the CCS is 36.27 °C (97.3 °F). The VCSNS CCS maximum temperature is 0.17 °C (0.3 °F) higher than the temperature assumed for Turkey Point CCS in APP-SFS-M3C-042. The applicant stated that an increase in the CCS temperature will cause a proportional increase in the SFP temperature of approximately 0.17 °C (0.3 °F). This would result in a VCSNS SFP water temperature of approximately 46.3 °C (115.3 °F). Therefore, the staff finds that the VCSNS SFS is capable of maintaining the SFP water temperature below 48.9 °C (120 °F) following a partial core fuel shuffle refueling at the maximum safety wet-bulb (noncoincident) air temperature.

The applicant also proposed to revise VCSNS FSAR Section 9.1.3.1.3.1 to reflect the impact of the change in the maximum safety wet-bulb (noncoincident) air temperature. Since the modification clarifies that only the refueling scenario discussed in this section (following a restart after a normal refueling, while the reactor is at power) has been impacted by the change in the maximum safety wet-bulb (noncoincident) air temperature, and that the VCSNS SFS is still capable of maintaining the SFP water temperature below the limit of 48.9 °C (120 °F), the staff finds this proposed FSAR change acceptable. This is being tracked as **Confirmatory Item VCSNS 9.1-1** pending the applicant's issuance of a future revision to the VCSNS COL FSAR. Since this confirmatory item is unique to VCSNS, it has a VCSNS designation.

Resolution of Confirmatory Item VCSNS 9.1-1

Confirmatory Item VCSNS 9.1-1 is an applicant commitment to revise its FSAR Section 9.1.3.1.3.1 to reflect the impact of the change in the maximum safety wet-bulb (noncoincident) air temperature. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item VCSNS 9.1-1 is now closed.

9.1.3.5 *Post Combined License Activities*

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

9.1.3.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to SFS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the requirements of NRC regulations, and the acceptance criteria in NUREG-0800, Section 9.1.3. The staff based its conclusion on the following:

- VCS DEP 2.0-2 is acceptable because the staff determined that the SFS is capable of maintaining the SFP water temperature below 48.9 °C (120 °F) following a partial core fuel shuffle refueling, with the wet bulb temperature at the maximum safety wet-bulb (noncoincident) air temperature of 30.72 °C (87.3 °F). Therefore, the staff concludes that the VCSNS SFS is acceptable.

9.1.4 Light Load Handling System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.1.4, "Light Load Handling System (Related to Refueling)")

9.1.4.1 *Introduction*

The light-load handling system (LLHS) consists of the equipment and structures needed for the refueling operation. This equipment is comprised of fuel assemblies, core component and reactor component hoisting equipment, handling equipment, and a dual basket fuel transfer system. The structures associated with the fuel handling equipment are the refueling cavity, the transfer canal, the fuel transfer tube, the SFP, the cask loading area, the new fuel storage area, and the new fuel receiving and inspection area.

9.1.4.2 *Summary of Application*

Section 9.1 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 19. Section 9.1 of the DCD includes Section 9.1.4.

In addition, in VCSNS COL FSAR Section 9.1.4, the applicant provided the following:

AP1000 COL Information Items

- STD COL 9.1-5

The applicant provided additional information in STD COL 9.1-5 to address COL Information Item 9.1-5 (COL Action Item 9.1.6-5).

- STD COL 9.1-6

The applicant provided additional information in STD COL 9.1-6 to address COL Information Item 9.1-6 (COL Action Item 9.1.6-6).

9.1.4.3 *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 LLHS are given in Section 9.1.4 of NUREG-0800.

The regulatory basis for acceptance of the COL information items are established in:

- GDC 61

- American National Standards Institute/American Nuclear Society (ANSI/ANS) 57.1-1992, "Design Requirements for LWR Fuel Handling Systems"

9.1.4.4 *Technical Evaluation*

The NRC staff reviewed Section 9.1.4 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the LLHS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS 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 VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS 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 VCSNS 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) includes 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 9.1.4.4 of the VEGP SER:

AP1000 COL Information Items

- *STD COL 9.1-5*

COL Information Item 9.1-5 states:

> *The Combined License applicant is responsible for a program for inservice inspection of the light load handling system as specified in subsection 9.1.4.4 and the overhead heavy load handling system in accordance with ANSI B30.2, ANSI B30.9, ANSI N14.6, and ASME [American Society of Mechanical Engineers] NOG-1 as specified in subsection 9.1.5.4.*

The commitment was also captured as COL Action Item 9.1.6-5 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The Combined License applicant is responsible for a program for inservice inspection of the light load handling system as specified in DCD Tier 2, Section 9.1.4.4 and the overhead heavy load handling system in accordance with ANSI B30.2, ANSI B30.9, ANSI N14.6, and ASME NOG-1 as specified in DCD Tier 2, Section 9.1.5.4.*

STD COL 9.1-5 states:

> *The above requirements are part of the plant inspection program for the light load handling system, which is implemented through procedures. In addition to the above inspections, the procedures reflect the manufacturers' recommendations for inspection.*

The staff reviewed STD COL 9.1-5, which addresses COL Information Item 9.1-5 on the inservice inspection (ISI) program for the LLHS. The applicant stated that the inspection program for the LLHS is implemented through procedures and reflect the manufacturer's recommendations. RAI 9.1.4-1 requested that the applicant provide a copy of the procedures for verification by the staff or provide the schedule in relation to fuel loading for issuance of the procedures.

The applicant stated in its response to RAI 9.1.4-1, that an inspection and testing program will be developed to address the LLHS. Procedures defining the program will address the testing and inspection requirements outlined in Section 9.1.4.4, "Inspection and Test Requirements," of the AP1000 DCD and the procedures will include applicable manufacturer's recommendations and industry standards. The applicant stated that procedure development is tracked by the overall plant construction and test schedule. The applicant further stated that details of the implementation milestones for development of procedures are

not currently available and are not expected to be available until a detailed construction schedule has been developed. When it becomes available, scheduling information will be provided to the NRC as necessary to support timely completion of NRC inspection and audit functions.

Although the response to RAI 9.1.4-1 states that the plant inspection program schedule information will be provided when available, BLN COL FSAR Table 1.8-202 lists STD COL 9.1-5 as having been completed by the applicant. The staff notes that STD COL 9.1-5 has not been fully addressed. The applicant is asked to revise BLN COL FSAR Table 1.8-202 to commit in the BLN COL FSAR to implementing the plant inspection program for the LLHS before receipt of fuel. This is ***Open Item 9.1-2****.*

- *STD COL 9.1-6*

COL Information Item 9.1-6 states:

> *The Combined License applicant is responsible to ensure an operating radiation monitor is mounted on any crane or fuel handling machine when it is handling fuel.*

The commitment was also captured as COL Action Item 9.1.6-6 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant/holder will ensure that an operating radiation monitor is mounted on any crane or fuel handling machine when it is handling fuel.*

STD COL 9.1-6 states:

> *Plant procedures require that an operating radiation monitor is mounted on any machine when it is handling fuel. Refer to DCD Subsection 11.5.6.4, "Fuel Handling Area Criticality Monitors," for a discussion of augmented radiation monitoring during fuel handling operations.*

The NRC staff reviewed STD COL 9.1-6, which addresses COL Information Item 9.1-6 related to radiation monitoring included under Section 9.1.4 of the BLN COL FSAR. The proposed mounting of an operating radiation monitor on any crane or fuel handling machine during fuel handling is included under Section 9.1.4.3.8 of the BLN COL FSAR. The applicant committed to develop plant procedures that will specify that an operating radiation monitor be mounted on any fuel handling machine when it is handling fuel. DCD Section 11.5.6.4 specifies the need to augment area radiation monitoring during fuel handling operations by a portable radiation monitor on the machine handling fuel. The staff finds that with the addition of the portable radiation monitor to any fuel handling machine when it is handling fuel, the BLN COL FSAR meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 61 for the prevention of unacceptable radiation exposure.

The staff finds that the applicant has adequately addressed COL Information Item 9.1-6 which would ensure that an operating portable radiation monitor is mounted on any fuel handling machine in the LLHS when it is handling fuel.

Resolution of Standard Content Open Item 9.1-2

*To resolve **Open Item 9.1-2**, in a letter dated December 30, 2009, the applicant proposed a change to VEGP COL FSAR Section 9.1.4.4 in response to this open item instead of a revision to Table 1.8-202. The applicant proposed a revision to FSAR Section 9.1.4.4 to clarify that the LLHS, including system inspections, is implemented prior to receipt of fuel onsite. The staff finds this acceptable since the commitment provided will ensure that these procedures will be in place prior to fuel movement. Therefore, **Open Item 9.1-2** is resolved. Incorporation of the proposed revision in the VEGP COL FSAR is being tracked as **Confirmatory Item 9.1-2**.*

Resolution of Standard Content Confirmatory Item 9.1-2

Confirmatory Item 9.1-2 is an applicant commitment to revise its FSAR Section 9.1.4.4 to include an inspection of the LLHS prior to receipt of fuel. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 9.1-2 is now closed.

Correction of Error in the Standard Content Evaluation Text

The NRC staff identified an error in the text reproduced above from Section 9.1.4.4 of the BLN SER that requires correction. The BLN SER provides quoted material for COL Action Item 9.1.6-5, citing Appendix F of NUREG-1793 as the source. The source of the quoted material for COL Action Item 9.1.6-5 is in fact from Chapter 9 (Section 9.1.6) of NUREG-1793.

9.1.4.5 *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:

- The light-load handling program, including system inspections, will be implemented prior to receipt of fuel onsite.

9.1.4.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the LLHS and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.1.4 of NUREG-0800. The staff based its conclusion on the following:

- STD COL 9.1-5 is acceptable because the staff finds that the relevant information in the VCSNS COL FSAR provided clarification that ISI of the LLHS is part of the plant inspection program for the LLHS, which is implemented through procedures.

- STD COL 9.1-6 is acceptable because the staff finds that the relevant information in the VCSNS COL FSAR meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 61.

9.1.5 Overhead Heavy Load Handling Systems (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.1.5, "Overhead Load Handling System")

9.1.5.1 *Introduction*

The overhead heavy-load handling system (OHLHS) is used to lift loads whose weight is greater than the combined weight of a single spent fuel assembly and its handling device. The principal equipment is the containment polar crane, equipment hatch hoist, maintenance hatch hoist, and the cask handling crane. The OHLHS is designed to ensure that inadvertent operations or equipment malfunctions, separately or in combination, will not cause a release of radioactivity, a criticality accident, an inability to cool fuel within the reactor vessel or SFP, or prevent safe shutdown of the reactor.

9.1.5.2 *Summary of Application*

Section 9.1 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 19. Section 9.1 of the AP1000 DCD includes Section 9.1.5.

In addition, in VCSNS COL FSAR Section 9.1.5, the applicant provided the following:

Supplemental Information

- STD SUP 9.1-1

The applicant provided supplemental (SUP) information in Section 9.1.5.3, "Safety Evaluation," describing heavy-load lifts outside those already described in the AP1000 DCD.

- STD SUP 9.1-2

The applicant provided supplemental information in Section 9.1.5, "Overhead Heavy Load Handling Systems," describing key elements of the heavy-loads handling program and a quality assurance (QA) program.

- STD SUP 9.1-3

The applicant provided supplemental information in Section 9.1.5.5, "Load Handling Procedures," describing load handling operations for heavy loads in the vicinity of irradiated fuel and safe shutdown equipment.

AP1000 COL Information Items

- STD COL 9.1-5

The applicant provided additional information in STD COL 9.1-5 to address COL Information Item 9.1-5 (COL Action Item 9.1.6-5).

- STD COL 9.1-6

The applicant provided additional information in STD COL 9.1-6 to address COL Information Item 9.1-6 (COL Action Item 9.1.6-6).

9.1.5.3 *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 OHLHS are given in Section 9.1.5 of NUREG-0800.

The regulatory basis for acceptance of STD SUP 9.1-1, STD SUP 9.1-2 and STD SUP 9.1-3 addressing planned heavy-load lift programs include the following:

- GDC 4
- GDC 61
- NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants"

The regulatory basis for acceptance of STD COL 9.1-5, addressing the ISI program for the OHLHS is based on GDC 4 and the guidelines of NUREG-0612, which references ANSI B30.2, "Overhead and Gantry Cranes"; ANSI N14.6, "Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds or More," ASME NOG-1, "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)"; and ANSI B30.9, "Slings."

The regulatory basis for acceptance of STD COL 9.1-6, addressing operating radiation monitor on any crane handling fuel is based on the requirements of GDC 61.

9.1.5.4 *Technical Evaluation*

The NRC staff reviewed Section 9.1.5 of the VCSNS 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 OHLHS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS 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 VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS 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 VCSNS 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) includes 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 9.1.5.4 of the VEGP SER:

Supplemental Information

- *STD SUP 9.1-1, STD SUP 9.1-2, and STD SUP 9.1-3*

The staff reviewed the information provided by the applicant for STD SUP 9.1-1. The applicant stated that it did not provide an itemized list of heavy load lifts outside the scope of heavy loads described in the AP1000 DCD because no such heavy load lifts are currently planned. The applicant provided a general description for addressing heavy load movements outside the planned scope if needed in the future. However, the applicant did not address all the program elements and detail listed in NUREG-0612 Section 5.1.1 and NUREG-0800 Section 9.1.5, nor did it provide a schedule for implementation of the heavy load handling program. A heavy load handling program that meets the guidelines of NUREG-0612 and NUREG-0800 Section 9.1.5, needs to be in place at a time before there is a possibility that a load drop could cause a release of radioactivity, a criticality accident, inability to cool fuel within the reactor vessel or spent fuel pool, or prevent safe shutdown of the reactor. The staff asked the applicant in RAI 9.1.5-1 to provide the program elements specified in NUREG-0612 Section 5.1.1 and NUREG-0800 Section 9.1.5, and a schedule for implementation.

In BLN COL FSAR, Revision 1, the applicant provided the missing and necessary information specified in NUREG-0612 Section 5.1.1 and NUREG-0800 Section 9.1.5. The applicant provided a description of the key elements of the heavy load handling system program in BLN COL FSAR Section 9.1.5. The key elements are: 1) Listing of heavy loads; 2) Listing of handling equipment; 3) Safe load paths definition, location and evaluation; 4) Procedures and maintenance manuals; 5) Inspection and testing; 6) Personnel qualification and training; and 7) Quality Assurance (QA) program to monitor and

implement the heavy loads program. Also, the BLN COL FSAR, Revision 1 Section 9.1.5 describes the heavy loads handling system procedures. Because Section 9.1.5 of the BLN COL FSAR includes the key elements identified in NUREG-0612, the staff finds the aspects of RAI 9.1.5-1 regarding the key elements of the heavy loads program resolved. Therefore, the staff finds the applicant meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 4.

In its response to RAI 9.1.5-1, the applicant stated that details of the implementation milestones for the development of heavy load handling procedures and related engineering documents are not currently available, nor are the implementation milestones expected to be available until after a detailed construction schedule has been developed. The applicant stated that appropriate scheduling information will be provided, when available, to the NRC as necessary to support timely completion of inspection and audit functions. The applicant did not provide any schedule for when the heavy load handling program will be completed for the implementation of an approved heavy load handling program (including OHLHS procedures). The applicant is asked to revise BLN COL FSAR Table 1.8-202 to commit in the BLN COL FSAR to implementing the heavy load handling program before receipt of fuel. This is ***Open Item 9.1-3****.*

AP1000 COL Information Items

- *STD COL 9.1-5*

The applicant provided additional information in STD COL 9.1-5 to address COL Information Item 9.1-5. COL Information Item 9.1-5 states:

> *The Combined License applicant is responsible for a program for inservice inspection of the light load handling system as specified in subsection 9.1.4.4 and the overhead heavy load handling system in accordance with ANSI B30.2, ANSI B30.9, ANSI N14.6, and ASME NOG-1 as specified in subsection 9.1.5.4.*

The commitment was also captured as COL Action Item 9.1.6-5 in Chapter 9 of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The Combined License applicant is responsible for a program for inservice inspection of the light load handling system as specified in DCD Tier 2, Section 9.1.4.4 and the overhead heavy load handling system in accordance with ANSI B30.2, ANSI B30.9, ANSI N14.6, and ASME NOG-1 as specified in DCD Tier 2, Section 9.1.5.4.*

The staff reviewed STD COL 9.1-5, which addresses COL Information Item 9.1-5 on the plant inspection program for the OHLHS. The applicant stated that the inspection program for the OHLHS is implemented through procedures and reflect the manufacturer's recommendations and the recommendations of NUREG-0612. The staff asked the applicant in RAI 9.1.5-2 to provide a copy of the procedures for verification by the staff.

In its response to RAI 9.1.5-2, the applicant stated that a plant inspection program for the OHLHS will be created using the manufacturer's recommendations and will meet the requirements outlined in applicable industry standards. The staff confirmed that BLN COL FSAR Section 9.1.5.4 was revised to provide additional information related to the description of implementing procedures. On the basis of its review, the staff finds the applicant adequately addressed that the OHLHS plant inspection program procedures will follow the equipment manufacturer's recommendations and will meet the requirements in applicable industry standards. With the addition to BLN COL FSAR Section 9.1.5.4 of a descriptive list of the minimum elements required to be addressed in the overhead heavy load handling equipment plant inspection program procedures, in addition to the other guidelines specified in Section 9.1.5 of NUREG-0800, the staff finds the applicant meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 4.

In the RAI response, the applicant stated that the schedule for issuing the procedures that implement the plant inspection program for the OHLHS are not yet available. The applicant also stated that implementation milestones are not expected to be available until after a detailed construction schedule has been developed, but will be provided to the NRC when available to support timely completion of inspection and audit functions. Although the response to RAI 9.1.5-2 states that the plant inspection program schedule information will be provided when available, BLN COL FSAR Table 1.8-202 lists STD COL 9.1-5 as having been completed by the applicant. The staff notes that STD COL 9.1-5 has not been fully addressed. The applicant is asked to revise BLN COL FSAR Table 1.8-202 to commit in the BLN COL FSAR to implementing the plant inspection program for the OHLHS before receipt of fuel. This is ***Open Item 9.1-4****.*

- *STD COL 9.1-6*

The applicant provided additional information in STD COL 9.1-6 to address COL Information Item 9.1-6. COL Information Item 9.1-6 states:

> *The Combined License applicant is responsible to ensure an operating radiation monitor is mounted on any crane or fuel handling machine when it is handling fuel.*

The commitment was also captured as COL Action Item 9.1.6-6 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant/holder will ensure that an operating radiation monitor is mounted on any crane or fuel handling machine when it is handling fuel.*

The NRC staff reviewed STD COL 9.1-6, which addresses COL Information Item 9.1-6 related to radiation monitoring included under Section 9.1.5 of the BLN COL FSAR. The proposed mounting of an operating radiation monitor on any crane or fuel handling machine during fuel handling is included under Section 9.1.5.3 of the BLN COL FSAR. The applicant committed to develop plant procedures that will specify that an operating radiation monitor be mounted

on any fuel handling machine when it is handling fuel. DCD Section 11.5.6.4 specifies the need to augment area radiation monitoring during fuel handling operations by a portable radiation monitor on the machine handling fuel. The staff finds that with the addition of the portable radiation monitor to any fuel handling machine when it is handling fuel, the BLN COL FSAR meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 61 for the prevention of unacceptable radiation exposure.

The staff finds that the applicant has adequately addressed COL Information Item 9.1-6 which would ensure that an operating portable radiation monitor is mounted on any crane when it is handling fuel.

Resolution of Standard Content Open Items 9.1-3 and 9.1-4

The VEGP applicant responded to ***Open Items 9.1-3 and 9.1-4*** *in a letter dated December 30, 2009. The letter proposed a change to VEGP COL FSAR Section 9.1.5.4 in response to these open items instead of revising Table 1.8-202. The applicant proposed a revision to FSAR Section 9.1.5.4 to clarify that the OHLHS, including system inspections, will be implemented prior to receipt of fuel onsite. The staff finds this acceptable since the commitment provided will ensure that the procedures will be in place and the plant inspection program will be implemented for the OHLHS prior to fuel movement. Therefore,* ***Open Items 9.1-3 and 9.1-4*** *are resolved. Incorporation of the proposed revision in the FSAR is being tracked as* ***Confirmatory Item 9.1-3****.*

Resolution of Standard Content Confirmatory Item 9.1-3

Confirmatory Item 9.1-3 is an applicant commitment to revise its FSAR Section 9.1.5.4 to include an inspection of the OHLHS prior to receipt of fuel. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 9.1-3 is now closed.

9.1.5.5 *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:

- The overhead heavy-load handling program, including system inspections, will be implemented prior to receipt of fuel onsite.

9.1.5.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to OHLHS and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.1.5 of NUREG-0800. The staff based its conclusion on the following:

- STD SUP 9.1-1, STD SUP 9.1-2, and STD SUP 9.1-3 are acceptable because the staff finds that the applicant provided supplemental information in accordance with NUREG-0612, NUREG-0800 Section 9.1.5, and Regulatory Guide (RG) 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," Section C.I.9.1.5 guidance to describe the program and schedule for the implementation of the program governing heavy-load handling.

- STD COL 9.1-5 is acceptable because the staff finds that the relevant information in the VCSNS COL FSAR provided clarification that ISI of the OHLHS is part of the plant inspection program for the OHLHS, which is implemented through procedures.

- STD COL 9.1-6 is acceptable because the staff finds that the relevant information in the VCSNS COL FSAR meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 61.

9.2 Water Systems

9.2.1 Service Water System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.2.1, "Station Service Water System (Open, Raw Water Cooling Systems)")

9.2.1.1 *Introduction*

The service water system (SWS) is a nonsafety-related system that supplies cooling water to remove heat from the nonsafety-related CCS heat exchangers in the turbine building. The SWS is arranged into two trains of components and piping. Each train includes one service water pump, one strainer, and a cooling tower cell as its heat sink. The heat sink for both trains is provided by a single cooling tower with two cells and a divided basin. Each train is capable of providing 100-percent of the required SWS flow for normal full power operation.

9.2.1.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the DCD includes Section 9.2.1.

In addition, in VCSNS COL FSAR Section 9.2.1, the applicant provided the following:

Supplemental Information

- VCS SUP 9.2-3

The applicant provided supplemental information in Section 9.2.1.2.2, "Component Description," by adding additional text to address the SWS cooling tower potential interactions.

9.2.1.3 *Regulatory Basis*

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

Although the SWS (including heat sink) is not safety-related, it supports the normal (defense-in-depth) capability of removing reactor and spent fuel decay heat, it is part of the first line of defense for reducing challenges to passive safety systems in the event of transients and plant upsets, and its cooling function is important for reducing shutdown risk when the reactor coolant system (RCS) is open (e.g., during mid-loop conditions). The risk importance of the SWS makes it subject to regulatory treatment of nonsafety-related systems (RTNSS) in accordance with the Commission's policy for passive reactor plant designs in SECY-94-084, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plant Designs."

The NRC staff's evaluation of the SWS focuses primarily on confirming that the SWS is capable of performing its defense-in-depth and RTNSS functions; that it will not adversely impact safety-related structures, systems and components (SSCs); and that inspections, tests, analyses, and acceptance criteria (ITAAC), test program specifications, and RTNSS availability controls for the SWS are appropriate.

The regulatory basis for acceptance of VCS SUP 9.2-3, addressing the SWS cooling tower is the acceptance criteria in Sections 9.2.1 and 9.2.5 of NUREG-0800.

9.2.1.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the SWS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Supplemental Information

- VCS SUP 9.2-3

The applicant provided supplemental information in VCSNS COL FSAR Section 9.2.1.2.2 by adding additional text to address the SWS cooling tower potential interactions.

The cooling capability of the SWS mechanical draft cooling towers for the VCSNS units can be adversely affected by interactions that exist between the two SWS mechanical draft cooling towers between units. In addition, interactions between cooling towers (circulating water system (CWS) verses SWS) may adversely affect the cooling capacity of the SWS. Since VCSNS is utilizing mechanical induced-draft towers for the CWS verses natural draft cooling towers as submitted by other COL applicants, interactions between the SWS cooling towers is now more likely due to the difference in height of the discharge plume. Adverse interactions can occur due to localized atmospheric influences caused by siting considerations, the locations of major structures, the locations of the mechanical draft cooling towers, mechanical draft cooling tower fan speed, and wind effects. Because the AP1000 utilizes only one SWS mechanical draft cooling tower in its design, interaction effects between the mechanical draft cooling towers of multi-unit sites was not evaluated by the staff for AP1000. Therefore, the staff requested in

RAI 9.2.1-1 that the applicant revise VCSNS COL FSAR Section 9.2.1 to address potential adverse interactions between the VCSNS mechanical draft SWS cooling towers and the mechanical draft CWS cooling towers for the two VCSNS units. Based on its response dated February 18, 2009, the applicant addressed cooling tower interaction considerations. The applicant indicated that greater than 800 feet of separation will exist between the SWS cooling towers of adjacent units and that the large turbine building structure is located between these two cooling towers. The applicant also indicated that greater than 1300 feet of separation will exist between the units' SWS cooling towers and the two mechanical induced-draft cooling towers for the CWS. In addition, based on the buoyant effects of the warm stack exhaust air with a velocity of greater than 16 miles per hour, dispersing of the plume from the CWS cooling towers at elevations greater than the intakes of the SWS cooling tower, and winds from the east-southeast to south-southeast only occurring 1 percent of the time, significant interactions are unlikely to occur.

The applicant stated that the VCSNS COL FSAR will be revised to state that the SWS cooling towers were evaluated for potential impacts from interference and air restriction effect due to yard equipment layout and tower operation in an adjacent unit and no adverse impacts were determined. The staff confirmed that the FSAR was updated to include this statement. Based on this FSAR change and the information that was provided in the response to RAI 9.2.1-1, the staff finds the applicant's resolution of this issue to be acceptable since the SWS cooling tower interactions have been adequately addressed by at least 800 feet of building separation and the large structure, the turbine building, being placed between the two SWS cooling towers. There is a minimal probability that a cooling tower plume will interact such that a significant degradation in performance would occur.

9.2.1.5 *Post Combined License Activities*

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

9.2.1.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to SWS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Sections 9.2.1 and 9.2.5 of NUREG-0800. The staff based its conclusion on the following:

- VCS SUP 9.2-3 is acceptable because the design of the SWS cooling towers meets the guidance in Sections 9.2.1 and 9.2.5 of NUREG-0800, regarding adverse interactions between the SWS cooling towers on the VCSNS site.

9.2.2 Component Cooling Water System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.2.2, "Cooling System for Reactor Auxiliaries (Closed Cooling Water Systems")

9.2.2.1 *Introduction*

The CCS is a nonsafety-related, closed loop cooling system that transfers heat from various plant components to the SWS during normal phases of operation. It removes heat from various components needed for plant operation and removes core decay heat and sensible heat for normal reactor shutdown and cooldown.

The CCS is arranged into two trains of components and piping. Each train includes one component cooling water pump and one component cooling water heat exchanger with the two trains taking suction from a single return header. The CCS includes a single surge tank, which accommodates thermal expansion and contraction. Component cooling water is distributed to the components by a single supply/return header with components being grouped in branch lines according to plant arrangement, with one branch line cooling the components inside containment. Loads inside containment are remotely isolated in response to a safety injection signal, which also trips the reactor coolant pumps (RCPs).

The CCS pumps are within the scope of AP1000 Design Reliability Assurance Program (D-RAP) as described in AP1000 DCD Table 17.4-1, "Risk Significant SSCs within the Scope of D-RAP," since these pumps provide cooling for the normal residual heat removal system (RNS) and SFP heat exchangers. In addition, CCS is discussed in AP1000 DCD Table 16.3-2, "Investment Protection Short-Term Availability Controls," for Modes 5 and 6 to support RNS cooling with the RCS open (SER Section 2.3).

9.2.2.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the DCD includes Section 9.2.2. The ASE with confirmatory items for Section 9.2.2 was based on VCSNS COL FSAR, Revision 2 and DCD, Revision 17. After submitting VCSNS COL FSAR, Revision 2, the applicant revised a COL information item (COL VCS DEP 2.0-2) that affected this section. This revised COL information item has been incorporated into VCSNS COL FSAR, Revision 4 and the resolution of the confirmatory item associated with this revision is discussed below.

In addition, in VCSNS COL FSAR Section 9.2.2, and in VCSNS COL Part 7, "Departures and Exemptions, the applicant provided the following:

Tier 1 and Tier 2 Departure

The applicant proposed the following Tier 1 and Tier 2 departure from the AP1000 DCD:

- VCS DEP 2.0-2

The Tier 1 departure request is from a site parameter value provided in AP1000 DCD Tier 1, Table 5.0-1 for the maximum safety wet-bulb (noncoincident) air temperature, which is 30.06°C (86.1°F). The Tier 2 departure request is because this site parameter value is also listed as the maximum safety wet-bulb (noncoincident) air temperature in AP1000 DCD Tier 2, Table 2-1.

In VCSNS COL FSAR Section 9.2.2.1, the applicant stated that the first bulleted item in the criteria for normal operation in AP1000 DCD Section 9.2.2.1.2.1 would be replaced with the following information:

> The component cooling water supply temperature to plant components is not more than 100°F assuming a 100-year return estimate of 2-hour duration wet bulb temperature of 87.3°F for service water cooling (per Table 2.0-201).

In addition, the applicant proposed to add the following to VCSNS COL FSAR Section 9.2.2.1 in a letter dated June 30, 2010:

> The most limiting component cooled by the CCS, the RCP motor cooling system, has been designed to operate for at least 6 hours continually with cooling water supplied at temperatures up to 100°F.
>
> The performance of the standard AP1000 CCS and SWS for single cooling water train, full power operation at a maximum safety wet bulb temperature of 87.4°F has demonstrated the highest CCS temperature achieved at these conditions is 97.4°F, for a period of less than 2 hours. As ambient wet bulb temperature decreases, the CCS temperature follows and will return to below 95°F with ambient wet bulb temperature slightly lower than 84°F, assuming nominal performance of both the CCS and SWS. Since the definition of the maximum normal wet bulb temperature value is the seasonal 1% exceedance value observed at the site, the annual total operating time for which CCS temperatures could exceed 95°F is less than 30 hours per year, for periods of a few hours at most. The maximum CCS temperature of 97.3°F is bounded by the maximum allowable cooling water temperature for Reactor Coolant Pumps (the most limiting component) and the increase in maximum safety wet bulb temperature is therefore acceptable on this basis.

The exemption request related to the AP1000 DCD maximum safety wet-bulb (noncoincident) air temperature involves an exemption to 10 CFR Part 52, Appendix D, Section IV.A.2.d. Specifically, the VCSNS 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 2.0.4 of this SER.

9.2.2.3 *Regulatory Basis*

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

While the CCS is a nonsafety-related system, it supports the normal (defense-in-depth) capability of removing reactor and spent fuel decay heat, it is part of the first line of defense for reducing challenges to passive safety systems in the event of transients and plant upsets, and its cooling function is important for reducing shutdown risk when the RCS is open (e.g., mid-loop condition). The risk importance of the CCS makes it subject to RTNSS controls in accordance with the Commission's policy for passive reactor plant designs.

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; the capability of the CCS to perform its defense-in-depth and RTNSS functions; and

the adequacy of ITAAC, test program specifications, and availability controls that have been established for the CCS.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the CCS are given in Section 9.2.2 of NUREG-0800.

9.2.2.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the CCS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Tier 1 and Tier 2 Departure

- VCS DEP 2.0-2

The applicant stated that the maximum safety wet-bulb (noncoincident) air temperature for the VCSNS site was recently reevaluated and increased from the standard AP1000 DCD value of 30.06 °C (86.1 °F) to 30.72 °C (87.3 °F) to reflect expected site maximum temperature conditions. This change requires an evaluation of the various plant performance requirements and commitments affected by this parameter to confirm that the performance of the plant's safety systems remains within the bounds described in the AP1000 DCD. The CCS is one system affected; therefore, the departure was reflected in Revision 2 of the VCSNS COL FSAR and in VCSNS COL Part 7. The staff's evaluation of this proposed change is also discussed in Sections 2.0, 2.3.1, 5.4, 6.2, 6.4, 9.1.3, and 9.2.7 of this SER.

The staff evaluated this departure and determined there was a lack of information to support this change to the CCS bounding temperature of 37.78 °C (100 °F). Therefore, the staff in RAI 9.2.2-1 requested additional information related to this change in the maximum safety wet-bulb (noncoincident) temperature and the overall effects to various systems including CCS and SWS.

The applicant's response to this RAI included details related to all possible system effects, which included CCS and SWS with the increase to maximum safety wet-bulb (noncoincident) air temperature. The applicant in its response stated the following:

- The calculations performed to determine the effects of the maximum safety noncoincident wet bulb temperature are bounded by calculations for the AP1000 site, Turkey Point. The applicant's maximum safety noncoincident wet bulb temperature 30.72 °C (87.3 °F) has been determined using available historical records from the site by applying standard statistical methods to compute the 100 year return temperature. The same approach was also used to determine the value of this parameter for the Turkey Point site 30.78 °C (87.4 °F). Therefore, comparisons of the results of calculations using the two values as input data are valid. Conclusions regarding the acceptability of the AP1000 design and performance areas affected by changes in

maximum safety noncoincident wet bulb temperature for the Turkey Point site also apply to this applicant.

- The limiting temperature performance for the CCS and SWS occurs during normal power operation, with the site ambient wet bulb temperature at its maximum safety value. The AP1000 DCD maximum safety wet bulb temperature is defined as the annual "0% exceedence" value measured at or calculated for the site. It is based on the maximum observed wet bulb temperature value reached at the site, excluding periods less than 2 hours duration. The original AP1000 design criterion for CCS and SWS performance was that the maximum CCS supply temperature should not exceed 35 °C (95 °F) for normal plant power operation with a single train of cooling water systems in service and wet bulb temperature at the maximum safety noncoincident value. Increases in the value of the standard site maximum safety wet bulb temperature from 27.22 °C to 29.72 °C (81 °F to 85.5 °F) and finally to 30.06 °C (86.1 °F) have been made to include a larger number of candidate sites within the standard site temperature envelope for AP1000 and are reflected in the current revision of the AP1000 DCD. The most limiting component cooled by the CCS, the RCP motor cooling system, has been designed to operate for at least 6 hours continuously with cooling water supplied at temperatures up to 37.78 °C (100 °F), as a result of the increases in CCS temperature above 35 °C (95 °F) associated with the previous increases in wet bulb temperature. Each RCP is provided with four safety-related temperature sensors to monitor the stator cooling water temperature. These sensors generate a high temperature alarm when stator cooling water temperature rises above the normally expected operating range, and produce a reactor trip and RCP trip to protect the pumps if stator water temperature continues to rise beyond the trip setpoint. Operators monitor the cooling water temperature to verify that the RCPs are operating within normal temperature bounds at high ambient wet bulb conditions. Calculations for Turkey Point document the performance of the standard AP1000 CCS and SWS for single cooling water train, full power operation at the higher maximum safety wet bulb temperature of 30.78 °C (87.4 °F). The highest CCS temperature achieved at these conditions is 36.33 °C (97.4 °F), for a period of less than 2 hours, consistent with the duration of the highest ambient wet bulb temperature. The expected maximum CCS temperature will be slightly lower for this applicant, which is approximately 30.72 °C (87.3 °F) since the controlling wet bulb temperature is 30.78 °C minus 30.72 °C = 0.06 °C (87.4 °F minus 87.3 °F = 0.1 °F) lower than the comparable Turkey Point site value. As ambient wet bulb temperature decreases, the CCS temperature follows and will return to below 35 °C (95 °F) with ambient wet bulb temperature slightly lower than 28.89 °C (84 °F), assuming nominal performance of both the CCS and SWS. Since the definition of the maximum normal wet bulb temperature value is the seasonal 1 percent exceedence value observed at the site, the annual total operating time for which CCS temperatures could exceed 35 °C (95 °F) is less than 30 hours per year, for periods of a few hours at most. The maximum CCS temperature of 36.28 °C (97.3 °F) expected for this applicant is well below the maximum allowable cooling water temperature for RCPs (the most limiting component) and the increase in maximum safety wet bulb temperature for this applicant is, therefore, acceptable on this basis.

- The RTNSS function of the CCS and SWS is to remove decay heat during Mode 5 (cold shutdown) and Mode 6 (refueling) with reduced RCS inventory operations. Heat removal performance is reduced by increases in ambient wet bulb temperature that cause increases in SWS cold water temperature and CCS supply temperature. However, the total heat duty of the CCS and SWS is significantly lower during this mode

of operation, as compared to the normal power or cooldown modes, because there is essentially no sensible heat to remove from the RCS and the core decay heat level is low. Primary plant component heat loads are also very small because no RCPs are in operation. Any slight increase in ambient wet bulb temperature will not compromise the heat removal capability of the systems. The impact of an increase in the applicant's maximum safety wet bulb temperature from 30.06 °C (86.1 °F) to 30.72 °C (87.3 °F) on the RTNSS performance of the CCS and SWS is, therefore, acceptable. No changes are needed to the Investment Protection Short Term Availability Control (IPSAC) requirements for this applicant as a result of the increased value of maximum safety ambient wet bulb temperature.

- Cooldown from 176.67 °C to 51.67 °C (350 °F to 125 °F) must be accomplished within 96 hours after reactor shutdown, using both trains of RNS, CCS, and SWS. This evolution produces the peak heat duty on the cooling water systems. The wet bulb temperature for plant cooldown performance is the maximum normal noncoincident wet bulb temperature. Since the maximum normal ambient wet bulb temperature for this applicant has not changed from the standard AP1000 value 26.72 °C (80.1 °F), there is no impact on cooldown performance caused by the change, compared to the performance predicted for the AP1000 standard plant at the design maximum normal ambient wet bulb temperature.

The staff's review of the applicant's response to RAI 9.2.2-1 finds it to be acceptable. The increase of maximum safety wet-bulb (noncoincident) air temperature from 30.06 °C to 30.72 °C (86.1 °F to 87.3 °F) is seasonal and affects the CCS only during normal operations. This results in the highest CCS temperature of 36.33 °C (97.4 °F), for a period of less than 2 hours and at the most estimated to occur 30 hours per year In addition, as ambient wet bulb temperature decreases, the CCS temperature follows and will return to below 35 °C (95 °F), which is well below the normal operational temperature of the CCS in AP1000 DCD, Section 9.2.2.1.2.1, which states that the normal CCS supply temperature to plant components is not more than 37.78 °C (100 °F). Also, the most limited components cooled by CCS are the RCPs motor coolers and they have been designed to operate for at least 6 hours continually with cooling water supplied at temperatures up to 37.78 °C (100 °F). In addition, the main control room (MCR) operators monitor associated RCP motor stator temperatures and equipment protection sensors will automatically trip the RCP if temperatures exceed their trip setpoints.

Related to CCS and its ability to support defense-in-depth, RTNSS, and cooldown of the reactor using RNS, the change to the maximum safety wet-bulb (noncoincident) air temperature only affects normal operations (at power). RNS cooldown does not utilize the maximum safety wet bulb temperature but uses maximum normal wet bulb air temperature. Modes 5 and 6 heat loads are significantly lower during these modes as compared to power operations since the core decay heat level is low; therefore, any small increase in the maximum safety wet-bulb (noncoincident) air temperature of 30.06 °C to 30.72 °C (86.1 °F to 87.3 °F) will not negatively affect or compromise the heat removal capability of the CCS. In addition, Modes 5 and 6 are normally spring and fall outages, so they are not likely to occur during peak maximum safety wet bulb conditions.

In summary, the staff's evaluation determined that the change in the maximum safety wet-bulb (noncoincident) air temperature from 30.06 °C to 30.72 °C (86.1 °F to 87.3 °F) is acceptable; therefore, RAI 9.2.2-1 as it relates to CCS and SWS is considered closed. The response to this RAI includes new VCSNS COL FSAR departure text; therefore, this is being tracked as

Confirmatory Item 9.2-1 pending the applicant's issuance of a future revision to the VCSNS COL application.

Resolution of Confirmatory Item VCSNS 9.2-1

Confirmatory Item VCSNS 9.2-1 is an applicant commitment to revise its FSAR Section 9.2.2 to reflect the impact of the change in the maximum safety wet-bulb (noncoincident) air temperature. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item VCSNS 9.2-1 is now closed.

9.2.2.5 *Post Combined License Activities*

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

9.2.2.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to CCS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR meets the relevant acceptance criteria provided in Section 9.2.2 of NUREG-0800. The staff based its conclusion on the following:

- VCS DEP 2.0-2 is acceptable because the staff determined that the applicant's RAI response related to the increase in maximum safety wet-bulb (noncoincident) air temperature has been adequately resolved. Therefore, the staff concludes that the VCSNS CCS, as described in Section 9.2.2 of the VCSNS COL FSAR, is acceptable. In addition, the staff concludes that the exemption meets the requirements in 10 CFR Part 52 Appendix D, VIII.A.4 and is, therefore, acceptable.

9.2.3 Demineralized Water Treatment System

The demineralized water treatment system provides the required supply of reactor coolant purity water to the demineralized water transfer and storage system. This system does not perform any safety-related function or accident mitigation, and its failure would not reduce the safety of the plant.

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.2.3, "Demineralized Water Treatment System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.2.4 Demineralized Water Transfer and Storage System

The demineralized water transfer and storage system supplies demineralized water to fill the condensate storage tank and to the plant systems that demand a demineralized water supply. This system has no safety-related function other than containment isolation, and its failure does not affect the ability of safety-related systems to perform their safety-related functions.

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.2.4, "Demineralized Water Transfer and Storage System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.2.5 Potable Water System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.2.4, "Potable and Sanitary Water Systems")

9.2.5.1 *Introduction*

The potable water system (PWS) supplies clean water from the raw water system (RWS) for domestic use and human consumption. This is a nonsafety-related system, which includes design provisions for controlling the release of water containing radioactive material and preventing contamination of the PWS.

9.2.5.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the AP1000 DCD includes Section 9.2.5, "Potable Water System," which addresses Section 9.2.4, "Potable and Sanitary Water Systems," of NUREG-0800.

In addition, in VCSNS COL FSAR Section 9.2.5, the applicant provided the following:

AP1000 COL Information Item

- VCS COL 9.2-1

The applicant provided additional information in VCS COL 9.2-1 to address COL Information Item 9.2-1 in VCSNS COL FSAR Sections 9.2.5.2.1, "General Description," and 9.2.5.3, "System Operation," by providing information concerning the source of water for the PWS.

9.2.5.3 *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 PWS are given in Section 9.2.4 of NUREG-0800.

The regulatory basis for the review of the COL information item is established in 10 CFR Part 50, Appendix A, GDC 60, "Control of Releases of Radioactive Materials to the Environment."

9.2.5.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2.5 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the PWS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Item

- VCS COL 9.2-1

The applicant provided additional information in VCS COL 9.2-1 to resolve COL Information Item 9.2-1. COL Information Item 9.2-1 states:

> The Combined License applicant will address the components of the potable water system outside of the power block, including supply source required to meet design pressure and capacity requirements, specific chemical selected for use as a biocide, and any storage requirements deemed necessary. A biocide such as sodium hypochlorite is recommended. Toxic gases such as chlorine are not recommended. The impact of toxic gases on the main control room habitability is addressed in Section 6.4.

The NRC staff reviewed the information provided by the applicant to address COL Information Item 9.2-1 on the source of water for the PWS included under Sections 9.2.5.2.1, 9.2.5.3, and 9.2.12.1 of the VCSNS COL FSAR. In these sections the applicant proposes to use filtered and disinfected water from the Monticello Reservoir as the source of potable water. The applicant proposes the use of sodium hypochlorite as the biocide for the PWS, as recommended in the AP1000 DCD. The impact of toxic gases on the MCR habitability is evaluated in Section 6.4 of this SER. Equipment is provided to meet design pressure and capacity requirements of the PWS as stated in the AP1000 DCD. The staff finds this an acceptable resolution of COL Information Item 9.2-1 because the applicant has addressed the potable water supply source and the pressure and capacity requirements from the AP1000 DCD are met.

In VCSNS COL FSAR Section 9.2.5.3, the applicant states that no interconnections exist between the PWS and any potentially radioactive system or any system using water for purposes other than domestic water service. However, upon review of VCSNS COL FSAR Figure 9.2-201, "Raw Water System Flow Diagram," it appears that interconnections to other systems could exist. The staff prepared RAI 9.2.4-1 to clarify this inconsistency. The applicant provided a response to RAI 9.2.4-1 indicating that the only association the PWS has with the ancillary RWS is the offsite water treatment facility and further stated that the possibility for the PWS to become contaminated does not exist. Section 9.2.5.3 of the VCSNS COL FSAR,

Revision 0, defined the source for both filtered and disinfected water to be supplied from the waste treatment facility for potable water. However, the response to RAI 9.2.4-1 defines the source of disinfected water but does not clearly address the source of the site-specific filtered water. Therefore, the staff issued RAI 9.2.4-2 to confirm GDC 60 is met with regards to the potential for the site-specific source of filtered water to be potentially interconnected with any system using water for purposes other than domestic water service including any potentially radioactive system. The applicant responded to RAI 9.2.4-2 in a letter dated August 6, 2009. In the response the applicant confirmed that the site-specific source of filtered water is not connected to any potentially radioactive system. The applicant has updated the VCSNS COL FSAR with additional information confirming that the PWS will not become contaminated. The staff considers this RAI closed because the PWS supply is not interconnected with any potentially radioactive system and, therefore, will not become contaminated by radioactive water. Therefore, the staff finds that GDC 60 is satisfied with respect to preventing contamination of the PWS by radioactive water.

9.2.5.5 *Post Combined License Activities*

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

9.2.5.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to PWS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidance in Section 9.2.4 of NUREG-0800. The staff based its conclusion on the following:

- VCS COL 9.2-1 is acceptable because the applicant has provided sufficient information on the source of water for the PWS to satisfy GDC 60, with respect to preventing contamination by radioactive water.

9.2.6 Sanitary Drains (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.2.4, "Potable and Sanitary Water Systems")

9.2.6.1 *Introduction*

The sanitary drain is a nonsafety-related system that collects sanitary wastes from plant restrooms and locker room facilities. The system design ensures that there is no possibility for radioactive contamination of the sanitary drains.

9.2.6.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the AP1000 DCD includes Section 9.2.6, "Sanitary Drains," which addresses Section 9.2.4, "Potable and Sanitary Water Systems," of NUREG-0800.

In addition, in VCSNS COL FSAR Section 9.2.6, the applicant provided the following:

Supplemental Information

- VCS SUP 9.2-1

The applicant provided supplemental information by adding text to the end of Section 9.2.6.2.1, "General Description," to state that sanitary waste, once treated, is combined with other plant discharge streams for discharge to the Parr Reservoir.

9.2.6.3 *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 VCS SUP 9.2-1 are given in Section 9.2.4 of NUREG-0800.

The regulatory basis for acceptance of the supplementary information is established in:

- GDC 60

9.2.6.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2.6 of the VCSNS 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 sanitary drains. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Supplemental Information

- VCS SUP 9.2-1

The NRC staff reviewed the location of the waste treatment plant included under Section 9.2.6.2.1 of the VCSNS COL FSAR. In Section 9.2.6.2.1 of the VCSNS COL FSAR, the applicant proposes an onsite sewage treatment plant for the treatment of sanitary waste. Treated effluent from the sanitary waste system is discharged to the blowdown sump and eventually discharged to the Parr Reservoir. The AP1000 DCD states that there are no interconnections between the sanitary drainage system and systems having the potential for containing radioactive material, and the sanitary drainage system does not service facilities in radiologically controlled areas. Therefore, the staff finds the proposed location of the waste treatment plant acceptable as it does not affect compliance with GDC 60, with respect to preventing contamination by radioactive water.

9.2.6.5 *Post Combined License Activities*

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

9.2.6.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to sanitary drains, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the requirements of NRC regulations, and the acceptance criteria in NUREG-0800, Section 9.2.4. The staff based its conclusion on the following:

- VCS SUP 9.2-1 is acceptable because the applicant has provided sufficient information on the location of the waste treatment plant to satisfy GDC 60, with respect to preventing contamination by radioactive water.

9.2.7 Central Chilled Water System (Related to RG 1.206 Section C.III.1, Chapter 9, C.I.9.2.2, "Cooling System for Reactor Auxiliaries (Closed Cooling Water Systems)")

9.2.7.1 *Introduction*

The plant HVAC systems require chilled water as a cooling medium to satisfy the ambient air temperature requirements for the plant. The central chilled water system (VWS) supplies chilled water to the HVAC systems and is functional during reactor full-power and shutdown operation. The VWS provides chilled water to the cooling coils of the supply air handling units and unit coolers of the plant HVAC systems. It also supplies chilled water to the liquid radwaste system, gaseous radwaste system, secondary sampling system, and the temporary air supply units of the containment leak rate test system. The VWS is nonsafety-related (except that the containment isolation interface is safety-related).

The system consists of two closed loop subsystems: a high cooling capacity subsystem and a low cooling capacity subsystem. The high capacity chilled water subsystem (HCCWS) is the primary system used to provide chilled water to the majority of plant HVAC systems and other plant equipment requiring chilled water cooling. The low capacity chilled water subsystem (LCCWS) is dedicated to the nuclear island nonradioactive ventilation system (VBS), which includes the MCR, and the chemical and volume control system (CVS) makeup pump and normal residual heat removal pump compartment unit coolers.

The HCCWS consists of two 85-percent capacity chilled water pumps, two 15-percent capacity chilled water pumps, two 85-percent capacity water-cooled chillers, two 15-percent air-cooled chillers, a chemical feed tank, an expansion tank, and associated valves, piping, and instrumentation. The LCCWS consists of two 100-percent capacity chilled water loops. Each loop consists of a chilled water pump, an air-cooled chiller, an expansion tank, and associated valves, piping, and instrumentation.

The VWS pumps and chillers for the low capacity subsystem are within the scope of the AP1000 D-RAP as described in AP1000 DCD Table 17.4-1, "Risk Significant SSCs within the Scope of D-RAP," since these pumps and chillers provide cooling to the CVS makeup pump room. The pumps and chillers are important components of the VWS.

9.2.7.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the DCD includes Section 9.2.7. The ASE with confirmatory items for Section 9.2.7 was based on VCSNS COL FSAR, Revision 2 and DCD, Revision 17. After submitting VCSNS COL FSAR, Revision 2, the applicant revised a COL information item (COL VCS DEP 2.0-2) that affected this section. This revised COL information item has been incorporated into VCSNS COL FSAR, Revision 4 and the resolution of the confirmatory item associated with this revision is discussed below.

In addition, in VCSNS COL FSAR Section 9.2, and in Part 7 of the VCSNS COL application, the applicant provided the following:

Tier 1 and Tier 2 Departure

The applicant proposed the following Tier 1 and Tier 2 departure from the AP1000 DCD:

- VCS DEP 2.0-2

The Tier 1 departure request is from a site parameter value provided in AP1000 DCD Tier 1, Table 5.0-1 for the maximum safety wet-bulb (noncoincident) air temperature, which is 30.06 °C (86.1 °F). The Tier 2 departure request is because this site parameter value is also listed as the maximum safety wet-bulb (noncoincident) air temperature in AP1000 DCD Tier 2, Table 2-1.

For Section 9.2.7, no departures and/or supplements were identified in Revision 2 of the VCSNS COL FSAR; however, based on a letter dated June 30, 2010, additional information was added by the applicant as part of VCS DEP 2.0-2, as described below:

> Add the following information at the end of the first paragraph under "Normal Operation" in DCD Subsection 9.2.7.2.4.
>
> > The increased heat load produced by operation at the higher VCSNS maximum safety ambient wet bulb temperature of 87.3°F can be accommodated within the available capacity margin of the chiller units, without impacting the LCCWS or supporting systems' design or plant operation. Cooling coil design calculations indicate that during operation at the standard plant design temperatures (115°F dry bulb, 86.1°F wet bulb), the VBS air handling unit has cooling coil and system margin.

The exemption request related to the AP1000 DCD maximum safety wet-bulb (noncoincident) air temperature involves an exemption to 10 CFR Part 52, Appendix D, Section IV.A.2.d. Specifically, the VCSNS 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 2.0.4 of this SER.

9.2.7.3 *Regulatory Basis*

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

Although the VWS is nonsafety-related, the low-capacity subsystem provides chilled water for cooling safety-related and defense-in-depth equipment rooms. 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, the capability of the VWS to perform its RTNSS and defense-in-depth cooling functions, and the adequacy of ITAAC, test program specifications, and RTNSS availability controls that have been established for the VWS.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the CCS are given in Section 9.2.2 of NUREG-0800.

9.2.7.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the CCS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Tier 1 and Tier 2 Departure

- VCS DEP 2.0-2

The applicant stated that the maximum safety wet-bulb (noncoincident) air temperature for the VCSNS site was recently reevaluated and increased from the standard AP1000 DCD value of 30.06 °C (86.1 °F) to 30.72 °C (87.3 °F) 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 safety systems remains within the bounds described in the AP1000 DCD. The CCS was one of those systems that were affected; therefore, the departure was reflected in Revision 2 of the VCSNS COL FSAR. The staff's evaluation of this proposed change is also discussed in Sections 2.0, 2.3.1, 5.4, 6.2, 6.4, 9.1.3, and 9.2.2 of this SER.

The staff evaluated this departure for the CCS and determined there was a lack of information to support this change to the CCS bounding temperature of 37.78 °C (100 °F). Therefore, in RAI 9.2.2-1 the staff requested additional information related to this change in the maximum safety wet-bulb (noncoincident) air temperature and the overall effects to various systems including the CCS, SWS and VWS.

The applicant's response to this RAI included details related to all possible system effects, which include the CCS, SWS, and VWS, with the increase to maximum safety wet-bulb

(noncoincident) air temperature. In its response, the applicant stated the following related to VWS.

> The nuclear island non-radioactive ventilation system (VBS) is the only HVAC system that is designed to accommodate the maximum safety temperature limits. The LCCWS also uses the maximum safety temperature limits (dry and wet bulb) as its design basis temperatures. The remainder of the HVAC systems are designed to accommodate the maximum normal temperature limits (1% exceedance values), including the HCCWS.
>
> The VBS maintains the safety-related heat sink temperatures and is designed with two 100% capacity subsystems. The VBS is served by the LCCWS exclusively. The LCCWS also serves the RNS and CVS pump room coolers. The nominal refrigeration capacity of each of the air-cooled chillers used in the LCCWS is 322 tons (3.864 Mbtu/hr) at an ambient dry bulb temperature of 46.11°C (115°F).
>
> Calculation assesses the impact of changes in both maximum safety and maximum normal ambient wet bulb temperature on the design and performance of the HCCWS and LCCWS. The calculation note was prepared to evaluate the impacts of increases in both maximum safety and maximum normal non-coincident ambient wet bulb temperature values for the Turkey Point site. It assumes that maximum ambient wet bulb temperature increases to 30.78°C (87.4°F) and maximum normal ambient wet bulb temperature increases to 27.5°C (81.5°F). The VC Summer maximum safety wet bulb temperature increase to 30.72°C (87.3°F) is bounded by the value assumed for Turkey Point; therefore, the results documented bound the effects of this change on the VC Summer plants.
>
> The increased heat load produced by operation at the higher VC Summer maximum safety ambient wet bulb temperature of 30.72°C (87.3°F) can be accommodated within the available capacity margin of the chiller units, without impacting the LCCWS or supporting systems' design or plant operation. Cooling coil design calculations indicate that during operation at the standard plant design temperatures 46.11°C (115°F) dry bulb, 30.06°C (86.1°F) wet bulb, the VBS air handling unit has cooling coil and system margin.
>
> At the VC Summer site design temperatures of 44.44°C (112°F) dry bulb, 30.72°C (87.3°F) wet bulb, the off coil temperatures for VBS do not change, based on the results of supplier coil performance calculations. Therefore, the MCR temperature and humidity at the higher VC Summer site outside air wet bulb temperature will remain at or below their desired design points during normal operation.
>
> The VC Summer site maximum normal temperature has not been increased from the AP1000 standard value of 26.72°C (80.1°F). Therefore, any conclusions regarding changes needed as a result of increasing the maximum normal ambient wet bulb value do not apply to VC Summer.
>
> No changes are needed in the AP1000 LCCWS design. Since these chillers are also air-cooled, their performance is not affected by changes in wet bulb

temperature. Therefore, the existing, standard air-cooled chillers and the associated VBS both perform acceptably at the increased VC Summer site maximum safety ambient wet bulb temperature of 30.72°C (87.3°F).

The staff finds the applicant's response to RAI 9.2.2-1 acceptable. The increase of maximum safety wet-bulb (noncoincident) air temperature from 30.06 °C to 30.72 °C (86.1 °F to 87.3 °F) is seasonal (short duration per year) and only affects the LCCWS air cooled chillers. Based on an audit of HVAC calculations, the original chiller size based on the previous design wet bulb air temperature resulted in a required rating of 164 tons (1.97 million British thermal units/hour (Mbtu/hr)). The revised calculated value including the revised wet bulb air temperature resulted in a required rating of 182 tons (2.184 Mbtu/hr). Based on calculations, no modifications are required to the exiting specified chiller tonnage since the nominal refrigeration capacity of each of the LCCWS is 322 tons (3.864 Mbtu/hr) at an ambient dry bulb air temperature of 46.11 °C (115 °F); therefore, adequate margin is still maintained. Also, the MCR temperature and humidity at the higher VCSNS site outside air wet bulb temperature will remain at or below their desired design points during normal operation. In addition, the VBS air handling unit has a cooling coil and system margin.

As previously stated, the LCCWS is within the scope of the AP1000 D-RAP since these pumps and chillers provide cooling to the CVS makeup pump room. The pumps and chillers are important components of the VWS. The increase in the maximum safety wet-bulb (noncoincident) air temperature of 30.06 °C to 30.72 °C (86.1 °F to 87.3 °F) will not negatively affect or compromise the heat removal capability of the VWS since adequate margin remains between the capacity of each chiller and the calculated heat load.

In summary, the staff's evaluation determined that the change in the maximum safety wet-bulb (noncoincident) air temperature from 30.06 °C to 30.72 °C (86.1 °F to 87.3 °F) is acceptable; therefore, RAI 9.2.2-1 as it relates to VWS is considered closed. The response to this RAI includes new VCSNS COL FSAR departure text; therefore, this is being tracked as **Confirmatory Item 9.2-2** pending the applicant's issuance of a future revision to the VCSNS COL FSAR.

Resolution of Confirmatory Item VCSNS 9.2-2

Confirmatory Item VCSNS 9.2-2 is an applicant commitment to revise FSAR Section 9.2.7 to reflect the impact of the change in the maximum safety wet-bulb (noncoincident) air temperature. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item VCSNS 9.2-2 is now closed.

9.2.7.5 *Post Combined License Activities*

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

9.2.7.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the VWS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the acceptance criteria in NUREG-0800, Section 9.2.2. The staff based its conclusion on the following:

- VCS DEP 2.0-2 is acceptable because the staff determined that the applicant's RAI response related to the increase in maximum safety wet-bulb (noncoincident) air temperature has been adequately resolved. Therefore, the staff concludes that the VCSNS VWS is acceptable.

9.2.8 Turbine Building Closed Cooling Water System

9.2.8.1 *Introduction*

The turbine building closed cooling water system (TCS) is a nonsafety-related system that provides closed-loop cooling for the removal of heat from heat exchangers in the turbine building and rejects the heat to either the CWS or the RWS. The system consists of two 100-percent capacity pumps, three 50-percent capacity heat exchangers (connected in parallel), one surge tank, one chemical addition tank, and associated piping, valves, controls, and instrumentation. Backwashable strainers are provided upstream of each TCS heat exchanger. System piping is made of carbon steel, except that nonmetallic piping may be used in accordance with ASME B31.1 if justified by evaluation.

9.2.8.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the DCD includes Section 9.2.8.

In addition, in VCSNS COL FSAR Section 9.2.8, the applicant provided the following:

Site-Specific Information Replacing Conceptual Design Information

- VCS CDI

The applicant provided additional information to replace conceptual design information (CDI) in the AP1000 DCD with information indentifying the source of cooling water for the VCSNS TCS heat exchangers.

9.2.8.3 *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 TCS are given in Section 9.2.2 of NUREG-0800.

9.2.8.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2.8 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed

that the information in the application and incorporated by reference addresses the required information relating to the TCS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Site-Specific Information Replacing Conceptual Design Information

- VCS CDI

The AP1000 standard plant allows the use of either circulating water or raw water for removing heat from the TCS heat exchangers. The AP1000 DCD leaves it up to the COL applicant to specify a specific source of cooling water for plant-specific applications. The VCSNS design specifies the use of both circulating water and raw water for this purpose. This arrangement was reviewed and approved by the NRC during its evaluation of the AP1000 DCD. Consequently, the VCSNS design is consistent with the AP1000 licensing basis as approved by the staff, which includes conformance with NUREG-0800 Section 9.2.2 (as applicable). Therefore, the supplementary design information that was provided for the VCSNS TCS is acceptable.

9.2.8.5 *Post Combined License Activities*

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

9.2.8.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to TCS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the acceptance criteria given in Section 9.2.2 of NUREG-0800. The staff based its conclusion on the following:

- VCS CDI is acceptable because the design of the TCS meets the guidance in Section 9.2.2 of NUREG-0800, with respect to the source of cooling water for the removing heat from the TCS heat exchangers.

9.2.9 Waste Water System (Related to RG 1.206 Section C.III.1, Chapter 9, C.I.9.3.3, "Equipment and Floor Drainage System"

9.2.9.1 *Introduction*

The waste water system (WWS) is a nonsafety-related system that collects and processes the waste water from the equipment and floor drains in the nonradioactive building areas during plant operations and outages. The waste water from the turbine building sumps flows to a waste water retention basin, if required, for settling of suspended solids and treatment before

discharge. The waste water retention basin transfer pumps discharge the basin effluent to the blowdown sump prior to discharge to the Parr Reservoir via the plant outfall piping. The design of the system precludes inadvertent discharge of radioactively contaminated drainage.

9.2.9.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the AP1000 DCD includes Section 9.2.9, "Waste Water System," which addresses Section 9.3.3, "Equipment and Floor Drainage System," of NUREG-0800.

In addition, in VCSNS COL FSAR Section 9.2, the applicant provided the following:

AP1000 COL Information Item

- VCS COL 9.2-2

The applicant provided additional information in VCS COL 9.2-2 to address COL Information Item 9.2-2, by including additional design information to the waste water retention basin portion of AP1000 DCD Section 9.2.9.2.2.

9.2.9.3 *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 WWS are given in Section 9.3.3 of NUREG-0800.

The regulatory basis for acceptance of the COL information item is established in:

- GDC 4
- GDC 60

9.2.9.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2.9 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the WWS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Item

- VCS COL 9.2-2

The applicant provided additional information in VCS COL 9.2-2 to resolve COL Information Item 9.2-2. COL Information Item 9.2-2 states:

> The Combined License applicant will address the final design and configuration of the plant waste water retention basins and associated discharge piping, including piping design pressure, basin transfer pump size, basin size, and location of the retention basins.

The NRC staff reviewed the resolution to VCS COL 9.2-2 with respect to the design of the plant waste water retention basin (WWRB) and associated components included under Section 9.2.9.2.2, "Component Description" of the VCSNS COL FSAR. To address VCS COL 9.2-2, details were provided for the location of the WWRB and routing configuration.

The waste water from the WWRB is discharged to the Parr Reservoir through a blowdown sump with inputs from the WWRB, CWS cooling tower blowdown and sanitary waste effluent. The method for forwarding the waste water from the basin to the blowdown sump is by use of two transfer pumps.

In order to meet GDC 60, the applicant must demonstrate suitable control of the release of radioactive materials in liquid effluent. Upon review of VCS COL 9.2-2, the staff requested the applicant, in RAI 9.3.3-1, to provide a discussion on whether all site-specific potentially radioactive fluid draining into and downstream of the water basin will be monitored prior to disposition or provide a justification for not providing radiation monitoring. The staff also requested that the applicant provide the additional details of the associated components (i.e., transfer pumps, size of basin, etc.) as requested in the COL item.

The applicant responded to RAI 9.3.3-1 in a letter dated April 27, 2010. The response provided detailed information on radiation monitoring, level instrumentation and components for the WWS. Each unit's WWRB is divided into two separate compartments, which allows one compartment to be out of service while the other compartment is available. Each WWRB is constructed using formed concrete and is a lined basin constructed such that its contents, dissolved or suspended, do not penetrate the liner and leach into the ground. The configuration and sizing of the WWRB is to allow settling of solids larger than 10 microns that may be suspended in the waste water stream. The applicant confirmed that the potentially contaminated fluids entering the WWRB from the turbine building sumps are monitored with a radiation monitor on the common discharge piping. As indicated in the RAI response, there are several effluent lines within the scope of the certified design that bypass this radiation monitor. These include the diesel fuel area sumps, SWS cooling tower blowdown, SWS strainer blowdown, and CWS strainer backwash. The RAI response clarifies that these lines do not come in contact with radioactive sources or contain radiation monitoring prior to discharge into the WWRB. The applicant indicated that for VCSNS Units 2 and 3, there are no site–specific systems that deliver influent streams to the WWRB outside of those associated with the certified design. Waste water can also be sampled prior to discharge from the WWRB.

Two 100 percent capacity transfer pumps send waste water from the WWRB to a blowdown sump. The transfer pumps are sized to meet the maximum expected influent flow. The normal pump discharge flowpath is to the blowdown sump, but flow can also be directed to the alternate unit's WWRB.

The blowdown sump is a concrete structure and is open to the atmosphere. The blowdown sump, common to both VCSNS Units 2 and 3, receives input from the WWRB and mixes with high volume CWS stream. The RWS provides water for dilution of liquid radwaste when the CWS blowdown is not sufficient or available for that purpose. As discussed in VCSNS COL FSAR Section 9.2.11.4, the RWS does not have the potential to be a flow path for radioactive fluids. The blowdown sump also receives sanitary waste effluent from the sanitary drainage system (SDS) and there are no interconnections between this system and systems with the potential for containing radioactive material.

The effluent then flows from the blowdown sump to the outfall structure, and then finally to the Parr Reservoir. A branch line from the liquid radwaste system (WLS) discharges to plant outfall piping downstream of the blowdown sump at a dilution point. The liquid radwaste is monitored and sampled for radiation and is addressed in detail in FSAR Section 11.2.

Based on the content in VCSNS COL FSAR Section 9.2.9 and the RAI 9.3.3-1 response, the staff concludes that the design of the WWS complies with GDC 60, with respect to control of radiation release to environment because as discussed above, the WWS does not normally interact with any potential radioactive sources and any influent streams with the potential to become contaminated are monitored.

To protect against flooding, level instrumentation is provided at the WWRB and controls are provided for automatic or manual operation of the transfer pumps based on the level of the WWRB. A level transmitter located in each WWRB pump sump provides an alarm signal in the MCR when the sump level(s) reach predetermined set points. Each unit's WWRB is located in the yard area outside of each unit's respective Turbine Building.

Waste water and blowdown effluent from the blowdown sump drains by gravity to the Parr Reservoir via the plant outfall piping. The outfall pipe is sized with adequate capacity to gravity drain the blowdown sump at the highest anticipated influent flow rate. Therefore, no level instrumentation is provided at the blowdown sump. Based on the content in VCSNS COL FSAR Section 9.2.9 and the RAI 9.3.3-1 response, the staff concludes that the design of the WWS complies with GDC 4, with respect to flood protection because the WWRB are designed with two 100-percent pumps controlling level by use of WWRB level instrumentation.

Based on the information provided in VCSNS COL FSAR Section 9.2.9 and in the response to RAI 9.3.3-1, the staff finds that the applicant has adequately addressed COL information item VCS COL 9.2-2. The staff finds that GDC 4 is met based on the WWS arrangement to prevent flooding that could affect safety-related SSCs adversely and GDC 60 is met based on the requirements for controlling the release of radioactive materials by preventing the inadvertent transfer of contaminated fluids to system portions for noncontaminated drainage. Therefore, RAI 9.3.3-1 is closed and incorporation of the proposed markup into a future revision of the VCSNS COL FSAR is identified as **Confirmatory Item 9.2-3**.

Resolution of Confirmatory Item VCSNS 9.2-3

Confirmatory Item VCSNS 9.2-3 is an applicant commitment to revise FSAR Section 9.2.9.2.2 to provide additional detail regarding the WWRB. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item VCSNS 9.2-3 is now closed.

9.2.9.5 *Post Combined License Activities*

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

9.2.9.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the WWS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.3.3 of NUREG-0800. The staff based its conclusion on the following:

- VCS COL 9.2-2 is acceptable because the staff finds that the relevant information in the VCSNS COL FSAR meets the applicable requirements of GDC 4 and GDC 60.

9.2.10 Hot Water Heating System

The hot water heating system is a nonsafety-related system that supplies heated water to selected nonsafety-related air handling units and unit heater in the plant during cold weather operation, and to the containment recirculation fan coil units during plant outages in cold weather.

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.2.10 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.2.11 Raw Water System

9.2.11.1 *Introduction*

The RWS is a nonsafety-related system that pumps water from the Monticello Reservoir for use by the VCSNS units. The SWS cooling tower basins rely upon makeup from the RWS in order to achieve and maintain cold shutdown conditions.

The RWS supplies raw (untreated) water for makeup to the CWS mechanical draft cooling tower basins. In addition, the untreated water is used for an alternate makeup for the SWS cooling

tower basins via a cross tie, cooling for the TCS and condenser vacuum pump seal water heat exchangers, and is utilized for diluting radwaste. In addition, the ancillary RWS provides filtered water from the water treatment facility for normal makeup to the SWS cooling tower basins, the demineralizer water treatment system (DTS), and the fire protection system (FPS). The RWS is shared by the two VCSNS units.

9.2.11.2 *Summary of Application*

Section 9.2.11 of the VCSNS COL FSAR, Revision 5, provides information concerning the RWS design basis, system description, system operation, safety evaluation, tests and inspections, and instrumentation. The RWS was referred to in the AP1000 DCD in relation to the CWS, SWS, DTS, and FPS, but an RWS section was not included in the AP1000 DCD for the NRC staff to evaluate.

In addition, AP1000 DCD Table 1.7-2, "AP1000 System Designators and System Diagrams," indicates that the RWS is "wholly out of scope." The RWS is needed in order to operate the VCSNS units and consequently, the applicant has provided a complete description of this system in the VCSNS COL FSAR for the VCSNS units.

In VCSNS COL FSAR Section 9.2.11, the applicant provided the following:

Interface Requirements

The plant interfaces for the RWS are identified in Table 1.8-203 of the VCSNS COL FSAR as Item 9.4, "Plant makeup water quality limits," and Item 9.5, "Requirements for location and arrangement of raw and sanitary water systems." These items are identified as "non-nuclear safety (NNS)" interfaces.

Supplemental Information

- VCS SUP 9.2-2

The applicant provided supplemental information by adding the new Section 9.2.11 after AP1000 DCD Section 9.2.10.

9.2.11.3 *Regulatory Basis*

Because the RWS was not considered within the scope of the AP1000 DCD, a regulatory basis for this system was not established for the standard plant design. The regulatory basis of the RWS for the VCSNS units is provided in this section.

The acceptance criteria that pertain to CWS and RWS evaluations are given in NUREG-0800, Sections 10.4.5, "Circulating Water System"; 9.2.1, "Station Service Water System"; 9.2.5, "Ultimate Heat Sink"; 3.4.1, "Flood Protection"; and 3.5, "Barrier Design for Missile Protection."

The regulatory bases and guidance for acceptance of the supplemental information and interface items are established in:

- GDC 2, "Design Basis for Protection Against Natural Phenomena"
- GDC 4

- 10 CFR 20.1406, “Minimization of Contamination”
- RG 1.29, “Seismic Design Classification,” Position C2

9.2.11.4 *Technical Evaluation*

The staff reviewed the information provided in Section 9.2.11 of the VCSNS COL FSAR that describes the RWS for the VCSNS units, including the information provided by Figure 9.2-201, “Raw Water System Flow Diagram.” The staff’s evaluation in this section focuses primarily on RWS failure considerations and on the capability and reliability of the RWS to perform its cooldown function. The results of the NRC staff’s evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The remainder of this SER section evaluates both VCS SUP 9.2-2 and Interface Items 9.4 and 9.5.

A. GDC 2, GDC 4, and RG 1.29

The staff reviewed the information in VCSNS COL FSAR Section 9.2.11 to confirm that RWS failures will not adversely affect SSCs that are safety-related or designated for RTNSS, impact the control room, or result in excessive radiological releases to the environment. Although VCSNS COL FSAR Section 9.2.11.1.1, “Safety Design Basis,” states that failures of the RWS or its components will not affect the ability of safety-related systems to perform their intended functions, it did not include sufficient information to adequately describe the consequences of RWS failures and to explain why safety-related SSCs are not affected. Likewise, it did not include sufficient information to explain why a failure of the RWS will not adversely affect RTNSS systems and components or impact the control room, or result in an unacceptable release of radioactive material to the environment. Because the applicant did not identify and address these considerations, the staff was unable to confirm compliance with GDC 2, GDC 4, and passive plant policy considerations, as described in SECY-94-084. Consequently, the staff requested in RAI 9.2.1-2 that the applicant revise VCSNS COL FSAR Section 9.2.11 to address the impact of RWS failures, including development of plant-specific ITAAC and test program specifications, as appropriate.

In a letter dated March 4, 2009, the applicant provided a detailed response to the GDC 2, GDC 4, and ITAAC and testing questions. In its response, the applicant stated that the potential failures of the RWS and the corresponding impact on SSCs that are safety-related or AP1000 equipment Class D were considered. A summary of the applicant’s response is described below.

- The RWS does not directly interface with any safety-related system as described in VCSNS COL FSAR Section 9.2.11 and shown on VCSNS COL FSAR Figure 9.2-201. The piping is routed underground from the RWS intake structure to the points of interface for RWS. The significant above ground portions of the RWS are at the RWS intake structure and at the CWS cooling tower basins. Underground branch lines provide alternate dilution flow to the CWS blowdown piping. This piping is not routed in close proximity to any safety-related SSCs. The only RTNSS system that RWS is in close proximity to is the SWS. A potential flooding from a break in the RWS piping is bounded by the analysis for a break in the CWS piping. AP1000 DCD Section 3.4.1.1.1, “Protection from External Flooding,” indicates that a failure of the CWS cooling tower, the SWS piping, or the CWS piping could result in a potential flood source. However, these potential sources are not located in close proximity to safety-related structures and

the consequences of a failure in the yard would be enveloped by the analysis described in DCD Section 10.4.5, "Circulating Water System," for failure of the CWS. Site grading will carry water away from safety-related or AP1000 Class D SSCs.

- Short runs of RWS piping are routed outside in the yard area and inside the turbine building to the RWS interface points. The primary source of flooding would be from the RWS water that discharges through the break prior to securing the RWS pumps. A break in the RWS is bounded by a break in the CWS piping. As discussed in AP1000 DCD Section 3.4.1.2.2.3, "Adjacent Structures Flooding Event," the bounding flooding source inside the Turbine Building is a break in the CWS piping. Flow from any postulated pipe failures above DCD elevation 100'-0" (VCSNS Units 2 and 3 equivalent plant NAVD88 elevation is 400'-0") would travel down to DCD elevation 100'-0" via floor gratings and stairwells. There is no safety-related equipment in the turbine building. The CCS and SWS components on DCD elevation 100'-0", which provide RTNSS support for the normal RNS are expected to remain functional following a flooding event in the turbine building since the pump motors and valve operators are above the expected flood level. Therefore, failures of the RWS piping within the turbine building will not adversely impact any safety-related or RTNSS SSCs.

- The RWS-to-SWS interface is at the SWS makeup control valve V009, as shown in AP1000 DCD Figure 9.2.1-1, "Service Water System Piping and Instrumentation Diagram." The SWS piping is routed from the control valve V009 to the top of the SWS cooling tower basin. There is an air gap between the SWS cooling tower basin water level and the discharge into the basin. The air gap ensures any break upstream of the raw water makeup control valve will not result in the draining of the SWS cooling tower basin.

- The RWS is not safety-related and its failure does not lead to the failure of any safety-related systems.

The applicant's response to RAI 9.2.1-2 provided adequate details for most of the information requested. However, the staff could not determine if the flooding discussion in the RAI response included the ancillary RWS and water treatment facility. In RAI 9.2.1-6, the staff requested clarifications to what is inside the "black box" of Figure 9.2-201. Specifically, major equipment such as tanks, strainers, screens and pumps, piping arrangement and flow distribution needed to be shown and described in VCSNS COL FSAR Section 9.2.11.

In its response, the applicant stated that the "black box" is an offsite water treatment facility that will provide pretreated (filtered) and domestic (drinking) water. The applicant stated that the offsite water facility is shown on VCSNS COL FSAR Figure 1.1-202, "VCSNS Site Plan," and Figure 9.2-201 for the purpose of information only and this will be revised in a future revision of the FSAR with a note stating that the offsite water treatment facility is not within the scope of the COL application. The applicant also stated that portions of the RWS referred to as "ancillary RWS" are normally supplied with filtered water from the offsite water treatment facility. In addition, the offsite water treatment facility does not present flooding concerns to VCSNS Units 2 and 3, since the facility is located more than a mile away from these units, and based on site drainage characteristics, flooding is not a concern.

The staff finds the applicant's response to RAI 9.2.1-6 addressed the staff's concerns since it clarifies the ancillary RWS as portions of the RWS that is supplied from the offsite water treatment facility. The staff verified the VCSNS COL FSAR changes discussed in the RAI

response have been incorporated into the FSAR. In addition, the staff determined that the plant flooding from the water treatment facility is not an issue since this facility is more than a mile away from the power plant.

In summary, the staff determined that failure of the RWS will not affect the ability of any safety-related system to perform its intended safety function nor will it adversely affect any RTNSS systems. Postulated breaks in the RWS piping will not impact safety-related components because the RWS is not located in the vicinity of any safety-related equipment, and water from a postulated pipe break will not reach any safety-related equipment or result in injury to occupants of the control room nor will it result in a release of radioactivity to the environment. A break in the RWS is bounded by a break in the CWS piping as discussed in AP1000 DCD Section 3.4.1.2.2.3, which is the flooding source of concern inside the turbine building. Testing of the RWS has been properly addressed. Since the RWS is not safety-related and its failure does not lead to the failure of any safety-related systems, the staff has concluded that the requirements of GDC 2, GDC 4 and RG 1.29 have been satisfied; therefore, RAI 9.2.1-2 and RAI 9.2.1-6 are closed. The staff confirmed that the VCSNS COL FSAR has been updated to include the FSAR revisions proposed in the applicant's responses to RAI 9.2.1-2 and RAI 9.2.1-6.

The staff has evaluated the RWS intake structure described in VCSNS COL FSAR Section 9.2.11.2.2, “Component Description,” and concluded that the failure of the intake structure would not impact the ability of safety-related systems to perform their intended functions.

B. Cold Shutdown

The RWS is relied upon for achieving and maintaining cold shutdown conditions, which is necessary for satisfying the technical specifications. In particular, the RWS is relied upon for cooling the RCS from Mode 4 to Mode 5 conditions within 36 hours. The staff found that VCSNS COL FSAR Section 9.2.11 did not provide a clearly defined design basis with respect to the RWS cooldown function, and the reliability and capability of the RWS to perform this function for the most limiting situations were not described and addressed in this regard. For example, the minimum RWS flow rate, water inventory, temperature limitations, and corresponding bases for providing SWS makeup for the two VCSNS units were not described. Also, the suitability of RWS materials for the plant-specific application and measures being implemented to resolve vulnerabilities and degradation mechanisms to assure RWS functionality over time were not addressed. Because the applicant did not adequately define and address RWS design-bases considerations with respect to its cooldown function, the staff was unable to confirm that the cooldown and policy considerations that apply to passive plant designs, as discussed in SECY-94-084, were satisfied. Consequently, the staff requested in RAI 9.2.1-3 that the applicant revise VCSNS COL FSAR Section 9.2.11 accordingly, and to address the design basis regarding the reliability and capability of the RWS cooldown function.

In its response, the applicant stated that the following was related to achieving and maintaining cold shutdown conditions:

- As described in VCSNS COL FSAR Section 9.1.11, and shown on VCSNS COL FSAR Figure 9.2-201, the RWS interfaces with the SWS. As noted in the response to RAI 9.2.1-2, the other functions performed by the RWS do not have a direct interface with any system, other than the SWS, identified in the AP1000 DCD, which is safety-related, designated for RTNSS, or designated as AP1000 Class D.

- The RWS provides a water fill/makeup function for the SWS. The SWS has investment protection short-term availability controls as described in AP1000 DCD Table 16.3-2, which are applicable in Mode 5 with the RCS pressure boundary open and in Mode 6 with the upper internals in place or cavity level less than full. Under these conditions, the SWS is directly providing active core cooling and was evaluated by Westinghouse and determined to meet the RTNSS criteria as documented in NUREG-1793 and in Westinghouse Commercial Atomic Power (WCAP)-15985, "AP1000 Implementation of the Regulatory Treatment of Non-safety-Related System Process." Unlike the SWS, the RWS does not directly provide core cooling and was evaluated in WCAP-15985. It was determined to not meet the RTNSS criteria and does not require investment protection short-term availability controls.

- It is unlikely that a failure of the RWS to provide adequate makeup flow to the SWS cooling tower basins would occur during the short time period in which SWS is performing an RTNSS function as described above. However, if a failure were to occur in the RWS, the remaining available inventory in the service water cooling tower basins and the stored water, which is available in the additional excess volume of the secondary fire water tank would provide ample time (more than 24 hours) to restore the RWS makeup flow or take the procedural actions necessary to exit the conditions for RTNSS applicability. Therefore, the RWS is not required to be an RTNSS system or subject to investment protection short-term availability controls. The RWS is designed to be a highly reliable system capable of operating during a loss of normal alternating current (ac) power to provide the RWS makeup flow under normal and abnormal conditions. Procedural controls, which provide for continued operation of the RWS or reestablishment of operations under off-normal conditions, will be included in operating procedures, where appropriate.

- As described in AP1000 DCD Section 5.4.7.1.2.1, "Shutdown Heat Removal," the RNS in conjunction with its associated support systems, the RCS and SWS (as a support system for CCS), are used for shutdown heat removal. The RWS provides indirect support for this function by providing a source of makeup water to the SWS cooling tower basins to compensate for evaporation, drift, and blowdown.

- The RWS provides this makeup water to support the cooling requirements for the SWS. During a normal plant cooldown, the RNS and CCS reduce the temperature of the RCS from approximately 177 °C (350 °F) to approximately 52 °C (125 °F) within 96 hours after shutdown. Each unit's RWS is designed to provide ample makeup flow to the SWS during these conditions using the RWS pumps.

- If cooldown to cold shutdown (Mode 5) is required within 36 hours to comply with a limiting condition for operation (LCO) in accordance with the Technical Specifications, heat will be transferred from the RCS via the steam generators to the main steam system for a longer period of time, allowing the RNS to be placed in service at a lower temperature with lower decay heat levels. Because of the reduced RNS heat removal requirements associated with this cold shutdown sequence, the required RWS makeup flow to the SWS cooling towers is less than normal cooldown requirements.

- An ample inventory of raw water is available to provide makeup to the SWS cooling tower basins. As noted in VCSNS COL FSAR Section 2.4.1.2.2, "Lakes and Reservoirs," the Monticello Reservoir (the source for the RWS) has a useable storage

volume of over 4.93 E8 cubic meters (400,000 acre-feet), and has sufficient capacity to support cooldown to cold shutdown conditions and maintain the station in Mode 5 for greater than 7 days.

- It was stated that the RWS piping and structures are designed and constructed in accordance with nationally recognized Codes and standards (such as ASME/ANSI B31.1, "Power Piping," and the America Water Works Association (AWWA). Design features have been included such as the use of buried piping made of material not susceptible to corrosion, heat tracing, redundant pumps and alternate power supplies to ensure that the RWS is reliable and will be available to support normal plant operation and shutdown functions. The underground RWS piping will be high-density polyethylene (HDPE), which is not susceptible to corrosion. Therefore, periodic inspections of the underground RWS piping are not required.

- The RWS is highly reliable based on its design, and a single failure of a structure or component in the RWS would not affect normal plant cooldown. Each RWS pump can deliver makeup flow to the SWS cooling tower basins to meet demand during all modes of operation. Failure of an operating pump, discharge valve or traveling screen would not prevent the RWS from providing makeup to the SWS cooling towers. In the event of a loss of normal ac power, two of the three 50 percent capacity RWS pumps may be manually loaded onto the appropriate diesel bus and may be manually started by the operator. The RWS continues to maintain the capability to provide makeup water to the SWS cooling tower basins during the loss of normal ac power events.

- In the unlikely event that all RWS flow to the SWS cooling towers is lost, there is ample time to identify and correct the situation or to align alternate sources of water to provide that makeup flow, and the RWS is shown to not be an RTNSS system nor subject to investment protection short-term availability controls. It is also important to note that not any of the RNS, CCS, SWS, or RWS is required to establish and maintain the AP1000 plant in a safe shutdown condition, since passive safety-related systems perform that function. This is explicitly recognized throughout the AP1000 DCD and NUREG-1793.

- As noted in VCSNS COL FSAR Section 14.3.2.3.3, "Other Site-Specific Systems," this site-specific RWS does not meet the ITAAC selection criteria. ITAAC screening was performed for the RWS using the screening criteria of VCSNS COL FSAR Section 14.3.2.3, which concluded that ITAAC is not applicable as indicated in VCSNS COL FSAR Table 14.3-201.

- No specific Technical Specifications are required for the RWS and none are applicable. Technical Specifications for the AP1000 are discussed in VCSNS COL FSAR Chapter 16 and AP1000 DCD Chapter 16, and were evaluated by the NRC in Chapter 16 of NUREG-1793.

- There are no availability controls for the RWS and they are not required based on the RTNSS evaluation discussed in Chapter 22 of NUREG-1793 and WCAP-15985, Revision 2. Also, VCSNS COL FSAR Chapter 16 and AP1000 DCD Chapter 16 do not identify any availability requirements for the RWS.

The staff reviewed the RAI 9.2.1-3 response and determined that the response was partially acceptable. The staff determined that the RWS is designed with the provision of single failure since many of the RWS components can be supplied with backup power from the onsite diesel

generators as necessary. During a loss of station power, the RWS make-up to the SWS is not required for 12 hours due to existing cooling tower basin inventory. After 12 hours, onsite make-up capacity from the fire protection storage tank is available for more than an additional 12 hours. In addition, the RWS is considered highly reliable and able to supply required water for the SWS for greater than 7 days due to the volume of water available in the reservoir. However, the response did not adequately answer the questions related to the ancillary RWS, testing of the water treatment facility, and piping Codes. In RAI 9.2.1-7, the staff requested that the applicant provide more details concerning the ancillary RWS to be included in the VCSNS COL FSAR, a description of the type of testing planned for the water treatment facility, and information in the VCSNS COL FSAR concerning Codes and standards (i.e., ASME B31.1, AWWA, and International Building Code (IBC)) for the RWS. RAI 9.2.1-3 is considered partially resolved (see RAI 9.2.1-7).

In its response to RAI 9.2.1-7, the applicant stated that ancillary RWS loads are each under 3785 liters/min (1000 gallons per minute (gpm)) with piping sized accordingly, consisting only of the piping intended to supply water from the offsite facility to various loads, in accordance with VCSNS COL FSAR Figure 9.2-201. Related to testing, the applicant stated that AP1000 DCD Section 14.2.9.2.6, "Service Water System Testing," includes testing of the SWS cooling tower water level and controls. The SWS testing will verify the capability of the level control system, and thus the availability of water from the RWS; therefore, no additional testing description is required in the AP1000 DCD and VCSNS COL FSAR. Concerning Codes and standards compliance, the applicant responded that AP1000 DCD Table 3.2-3, "AP1000 Classification of Mechanical and Fluid System, Components, and Equipment," indicates that the RWS is a Class E system. AP1000 DCD Section 3.2.2.7, "Other Equipment Classes," indicates that Class E is used for nonsafety-related SSCs that do not have specialized industry standards or classification. Therefore, it is consistent to not include the standards used for the RWS design and construction within the scope of the FSAR.

The staff finds the applicant's response to RAI 9.2.1-7 partly acceptable since the response explained the 'ancillary' RWS and provided acceptable pump flow rates and testing requirements, which includes the level control system and ensures proper operations of the RWS; however, the applicant did not fully address all of the staff's concerns and did not provide an FSAR markup of the materials and piping Codes to be utilized consistent with the RAI response.

The applicant provided a follow-up RAI response dated October 16, 2009, to address the staff's concerns and provided information that will be added to a future revision of the VCSNS COL FSAR that will state that the RWS piping is designed to ASME Standard B31.1. The staff reviewed the applicant's more recent response and finds that the response to RAI 9.2.1-7 (along with RAI 9.2.1-3) are acceptable since the referenced correct piping Code for this system has been defined in VCSNS COL FSAR Section 9.2.11.2.2. The staff confirmed that the VEGP COL FSAR has been updated to include the FSAR revisions proposed in the applicant's responses to RAI 9.2.1-3 and RAI 9.2.1-7.

RWS is designed to be a highly reliable system capable of operating during a loss of normal ac power to provide RWS makeup flow under normal and abnormal conditions to support cold shutdown conditions for up to 7 days. However the staff was unable to determine how the components perform during a loss of offsite power (LOOP) event. Therefore, in RAI 9.2.1-8, the staff requested that the applicant provide a description of backup electrical power to the water treatment facility, screenwash, and traveling screens to demonstrate that the RWS is highly

reliable. The staff also requested that the applicant provide a detailed description on the effects of the water treatment facility during a LOOP.

In its response to RAI 9.2.1-8, the applicant stated that the offsite water treatment facility is not designed to function during a LOOP. The two raw water pumps are provided with diesel backed power in accordance with VCSNS COL FSAR Section 9.2.11.3. The pump discharge valves are powered from the same source as the pumps, and the SWS cooling tower level can be manually controlled, independent of instrument air or electric power. The applicant noted that no additional powered components are necessary to provide the RWS flow to the SWS for cooling tower makeup. Each of the three raw water intakes are designed for supplying half of the makeup required for the circulating water cooling towers and have through-trash-rack and through-screen-mesh velocity less than 0.5 feet per second at minimum reservoir water level. The SWS makeup requirements are less than 10 percent of the RWS design flow rate. These extremely low velocities (less than 0.05 feet per second) would not draw and retain trash on the screens and trash rack. However, traveling screens and screen wash equipment are powered from an associated diesel-backed bus even though not required for the SWS cooling tower makeup.

The staff finds that the applicant's response to RAI 9.2.1-8 is acceptable since it adequately addresses backup power, which was available to key components permitting the RWS to operate during a LOOP to support the SWS for cold shutdown. The staff finds that the RWS is designed with the provision of a single failure since two of the RWS pumps can be supplied with backup power from the onsite diesel generators to provide adequate makeup flow to the SWS cooling tower basins. It was noted that each RWS pump can deliver makeup flow to the SWS cooling tower basins to meet demand during all modes of operation. Further, without the RWS makeup to the SWS cooling tower basins, adequate inventory in the SWS cooling tower basins exists along with the stored water in the secondary fire water tanks that would provide more than 24 hours to restore RWS makeup flow. In addition, the RWS is considered highly reliable based on its design, and a single failure of a structure or component in the RWS would not affect normal plant cooldown.

C. Regulatory Treatment of Non-Safety-Related System

The RWS supports the SWS cooling function by providing makeup water to the SWS cooling tower basins. The staff noted that while the SWS is designated for RTNSS during reduced reactor inventory conditions, the RWS is not needed to support the SWS cooling function when the reactor water inventory is reduced because the RWS is not designated for RTNSS. However, there is no explanation in VCSNS COL FSAR Section 9.2.11 as to why the RWS is not considered RTNSS. Also, because the SWS cooling tower basins are very limited in their capacity, it is not clear why the RWS makeup is not required for this situation. Consequently, in RAI 9.2.1-4, the staff requested that the applicant revise VCSNS COL FSAR Section 9.2.11 to explain why the RWS makeup is not needed during reduced reactor inventory conditions and, in particular, describe the controls that will be implemented to ensure that assumptions remain valid.

In its response dated March 4, 2009, the applicant stated that a detailed response was provided in RAI 9.2.1-3, explaining why the RWS is not designated as RTNSS and makeup from the RWS to the SWS cooling tower basins is not required during reduced reactor inventory conditions. The referenced RAI response also discusses that procedural control will be established to take the required actions to exit the conditions for applicability of the SWS as a RTNSS system, in the unlikely event of a failure to reestablish the RWS makeup capability.

Plant documentation, in the form of the system description for the RWS, will include the information addressed in these RAI responses.

The staff finds the applicant's response to RAI 9.2.1-4 acceptable since: 1) the RWS was previously evaluated in WCAP-15985 in Table 1-1, "Nonsafety-related system evaluation in AP1000 RTNSS Process," which was previously approved by the staff; 2) the RWS does not directly provide core cooling; and 3) the RWS has adequate stored water within the SWS cooling towers and the fire water tank for more than 24 hours to support the SWS RTNSS functions, plus the 24 hours stored onsite water supply provides ample time to restore the RWS makeup flow or take the procedural actions necessary to exit the condition of applicability for the SWS and its RTNSS function. Therefore, RAI 9.2.1-4 is closed.

D. System Design Consideration

As specified by 10 CFR 20.1406, COL applicants are required to describe how facility design and procedures for operation will minimize the generation of radioactive waste and contamination of the facility and environment, and facilitate eventual plant decommissioning. Although the RWS has no interconnections with any systems that contain radioactive fluids, industry experience has shown that this alone may not be sufficient to prevent the RWS from becoming contaminated. For example, unplanned leaks or release of contaminated fluids as a result of component failures or transport, drainage problems in contaminated areas, and the migration of contamination through soils and other porous barriers over time have caused systems and areas of the plant that are not directly connected with contaminated systems to become contaminated. Therefore, in RAI 9.2.1-5, the staff requested that the applicant provide additional information to describe design provisions and other measures that will be implemented to satisfy the requirements specified by 10 CFR 20.1406, including measures that will be implemented to monitor the RWS for contamination and corrective actions that will be taken to eliminate any radioactive contamination that is identified. In its response, dated March 4, 2009, and from information in the response to RAI 9.2.1-2, it was noted that although the RWS provides an alternate dilution source for liquid radwaste discharge when the CWS cooling tower blowdown source is not available, the RWS does not have the potential to be a flow path for radioactive fluids via their system interfaces. This is because the WLS effluent discharges by gravity, to a point in the CWS blowdown piping (which leads to the plant outfall) at a lower elevation than the RWS interface with the CWS. Therefore, the staff finds it unlikely that liquid radwaste would be able to travel up the CWS piping to the RWS interface. In addition, the applicant indicated that the groundwater monitoring program should minimize the possibility of contaminating the RWS from external subsurface sources. The applicant noted that the groundwater monitoring program is described in VCSNS COL FSAR Section 12AA.5.4.13, "Ground Monitoring Program." The staff's evaluation of the groundwater monitoring program is provided in Chapter 12 of this SER. Because there is no interconnection with any system that contains potentially radioactive fluids as indicated in VCSNS COL FSAR Section 9.2.11.1.1, the staff concludes that the requirements of 10 CFR 20.1406 are satisfied and considers this aspect of RAI 9.2.1-5 closed.

Related to fire protection system interface, an offsite water treatment facility located near the Monticello Reservoir supplies filtered and chemically treated raw water to the fire water storage tanks via the ancillary RWS subsystem. Water quality is further ensured by the applicant in VCSNS COL FSAR Section 9.2.11.2.1, "General Description," which states that provisions are included to inject chemicals into the raw water pump discharge piping to maintain a noncorrosive, nonscale-forming condition and limit biological fouling. The above provisions satisfy RG 1.189, "Fire Protection for Nuclear Power Plants," Revision 1, related to the

prevention and control of biofouling or microbiologically induced corrosion in the fire water piping system.

Based on the above technical evaluation, the NRC staff finds acceptable the information added to the VCSNS COL FSAR to address VCS SUP 9.2-2 and Interface Items 9.4 and 9.5.

9.2.11.5 *Post Combined License Activities*

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

9.2.11.6 *Conclusion*

The NRC staff has evaluated the RWS as described in VCSNS COL FSAR Section 9.2.11. The staff's evaluation focused primarily on confirming that: (a) the design of the RWS complies with the requirements of GDC 2 and GDC 4 and conforms with the guidance in RG 1.29; (b) the RWS reliance for the support of SWS for achieving and maintaining cold shutdown conditions and RTNSS considerations is consistent with the guidance in SECY-94-084; (c) the RWS is not considered RTNSS; (d) other system design considerations meet the requirements of 10 CFR 20.1406; and (e) the interaction with the FPS has been properly evaluated.

Based upon the results of this evaluation, the staff concludes that the VCSNS RWS, as described under VCS SUP 9.2-2 in Section 9.2.11 of the VCSNS COL FSAR, is acceptable.

9.3 Process Auxiliaries

9.3.1 Compressed and Instrument Air System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.3.1, "Compressed Air Systems")

9.3.1.1 *Introduction*

The compressed and instrument air system delivers instrument air, service air, and high-pressure air. The instrument air subsystem provides high quality instrument air for plant use. The service air subsystem supplies plant breathing air. The high-pressure air subsystem produces air for high-pressure applications.

9.3.1.2 *Summary of Application*

Section 9.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.3 of the AP1000 DCD, Revision 19. Section 9.3 of the AP1000 DCD includes Section 9.3.1.

In addition, in VCSNS COL FSAR Section 9.3, the applicant provided the following:

AP1000 COL Information Item

- STD COL 9.3-1

The applicant provided additional information in STD COL 9.3-1 to address COL Information Item 9.3-1 (COL Action Item 9.3.1-1).

9.3.1.3 *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 compressed and instrument air system are given in Section 9.3.1 of NUREG-0800.

The regulatory basis for STD COL 9.3-1 addressing Generic Safety Issue (GSI) 43, "Reliability of Air Systems," as part of training and procedures include the following:

- GDC 1, "Quality Standards and Records," as it relates to the reliability of safety-related equipment actuated or controlled by compressed air.

9.3.1.4 *Technical Evaluation*

The NRC staff reviewed Section 9.3.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the compressed and instrument air system. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS 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 of 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 VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS 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 VCSNS 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) includes 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 9.3.1.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 9.3-1 (COL Action Item 9.3.1-1), involving air systems (NUREG-0933, "Resolution of Generic Safety Issues," Issue 43)*

The NRC staff reviewed STD COL 9.3-1 related to COL Information Item 9.3-1. COL Information Item 9.3-1 states:

> *The Combined License applicant will address DCD 1.9.4.2.3, Issue 43 as part of training and procedures identified in section 13.5.*

The commitment was also captured as COL Action Item 9.3.1-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will address NUREG-0933, Issue 43 as part of training and procedures.*

The applicant proposed to resolve STD COL 9.3-1 by providing training and procedures for operations and maintenance of the instrument air subsystem and air operated valves. The methodology to develop system operating procedures, abnormal operating procedures, and alarm response procedures is reviewed in Section 13.5 of this SER. The training program for operators and maintenance personnel is reviewed in Section 13.2 of this SER. The applicant also stated that the compressed and instrument air system will be maintained and tested in accordance with the manufacturers' recommendations and procedures and that the system will be periodically tested to demonstrate conformance with the quality requirements of ANSI/ISA-7.3-1981.

NUREG-0933, Issue 43 discusses that possible solutions for this issue, include better operator training, operator awareness of the importance of compress air systems, and periodic testing and inspection of the compressed air systems. The NRC staff reviewed the applicant's proposed resolution to STD COL 9.3-1 and determined that the BLN COL FSAR meets the guidance in NUREG-0933, Issue 43; therefore, the staff finds STD COL 9.3-1 resolved.

9.3.1.5 *Post Combined License Activities*

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

9.3.1.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to compressed and instrument air system, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.3.1 of NUREG-0800.

- STD COL 9.3-1, the staff evaluated Issue 43, "Reliability of Air Systems," as part of the training and procedures in accordance with the requirements of GDC 1, as it relates to the impact of a failure of the compressed and instrument air system on safety-related SSCs. Based on the results of this evaluation, the VCSNS COL FSAR meets the guidance in NUREG-0933, Issue 43 and is acceptable.

9.3.2 Plant Gas System (Related to RG 1.206 Section C.III.1, Chapter 9, C.I.9.3.1, "Compressed Air Systems")

The plant gas system is a nonsafety-related system that supplies hydrogen, carbon dioxide, and nitrogen gasses to plant systems as required. Failure of the system does not compromise any safety-related system nor does it prevent safe reactor shutdown.

Section 9.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.3.2, "Plant Gas System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.3.3 Primary Sampling System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.3.2, "Process and Postaccident Sampling Systems")

The primary sampling system is used to collect samples during normal operations and following an accident. The system collects for analysis samples from the reactor coolant, auxiliary primary process streams, and containment atmosphere. Both the normal operation and post accident requirements are carried out by this single system.

Section 9.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.3.3, "Primary Sampling System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.3.4 Secondary Sampling System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.3.2, "Process and Postaccident Sampling Systems")

The secondary sampling system delivers representative samples of fluids from secondary systems to sample analyzer packages. Continuous online secondary chemistry monitoring detects impurity ingress and provides early diagnosis of system chemistry excursions in the plant.

Section 9.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.3.4, "Secondary Sampling System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.3.5 Equipment and Floor Drainage Systems (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.3.3, "Equipment and Floor Drainage System")

The equipment and floor drainage system collects liquid wastes from equipment and floor drains during normal operation, startup, shutdown, and refueling. The equipment and floor drainage system consists of two subsystems, radioactive waste drains and nonradioactive waste drains.

Section 9.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.3.5, "Equipment and Floor Drainage Systems," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.3.6 Chemical and Volume Control System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.3.4, "Chemical and Volume Control System (PWR) Including Boron Recovery System")

The CVS maintains the required water inventory and quality in the RCS, provides pressurizer auxiliary spray, controls the boron neutron absorber concentration in the reactor coolant, provides a means for filling and pressure testing the RCS, controls the primary water chemistry and reduces coolant radioactivity level. Further, the system provides recycled coolant for demineralized water makeup for normal operation and provides borated makeup flow to the RCS in the event of some accidents, such as a small break loss-of-coolant accident.

Section 9.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.3.6, "Chemical and Volume Control System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4 Air-Conditioning, Heating, Cooling, and Ventilation Systems

9.4.1 Nuclear Island Nonradioactive Ventilation System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.4.1, "Control Room Area Ventilation System")

9.4.1.1 *Introduction*

The VBS, in conjunction with the MCR emergency habitability system described in Section 6.4, provides a controlled environment for the comfort and safety of control room personnel and assures the operability of control room and nearby components during normal operating, anticipated operational transient, and design-basis accident conditions.

9.4.1.2 *Summary of Application*

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.4 of the AP1000 DCD, Revision 19. Section 9.4 of the DCD includes Section 9.4.1, describing the VBS.

In addition, in VCSNS COL FSAR Sections 9.4.1.4 and 9.4.12, the applicant provided the following:

AP1000 COL Information Items

- STD COL 9.4-1a

The applicant provided additional information in STD COL 9.4-1a to address the first part of COL Information Item 9.4-1 (COL Action Item 9.4.1-1), related to a program for inspections and testing applicable to the VBS.

In addition, in VCSNS COL FSAR Section 9.4.12, the applicant provided the following:

- VCS COL 9.4-1b

The applicant provided additional information in VCS COL 9.4-1b to address the second part of COL Information Item 9.4-1 (COL Action Item 6.4-3). The local toxic gas services are evaluated to determine the need for monitoring for control room habitability.

9.4.1.3 *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 VBS are given in Section 9.4.1 of NUREG-0800.

The applicable regulatory guidance for the VBS is as follows:

- RG 1.140, "Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants," Revision 2

9.4.1.4 *Technical Evaluation*

The NRC staff reviewed Section 9.4.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the VBS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS 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 VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS 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 VCSNS 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) includes 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 9.4.1.4 of the VEGP SER:

AP1000 COL Information Items

- *STD COL 9.4-1a*

The applicant provided additional information in STD COL 9.4-1a to resolve COL Information Item 9.4-1. COL Information Item 9.4-1a states:

> *The Combined License applicants referencing the AP1000 certified design will implement a program to maintain compliance with ASME AG-1, ASME N509, ASME N510 and Regulatory Guide 1.140 for portions of the nuclear island nonradioactive ventilation system and the containment air filtration system identified in subsection 9.4.1 and 9.4.7.*

The commitment was also captured as COL Action Item 9.4.1-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will develop a program to maintain operability of the nuclear island nonradioactive ventilation system and the containment air filtration system.*

The NRC staff reviewed STD COL 9.4-1a related to COL Action Item 9.4-1 included under Section 9.4.1.4 of the BLN COL FSAR. The NRC staff reviewed the resolution to STD COL 9.4-1a on the proposed implementation of a program to maintain compliance with industry standards and RGs for the VBS included under Section 9.4.1.4 and Section 9.4.12 of the BLN COL FSAR, and concludes

that this item has been resolved for the VBS because the applicant has referenced the applicable regulatory guide and industry standards.

Correction of Error in the Standard Content Evaluation Text

The NRC staff identified an error in the text reproduced above from Section 9.4.1.4 of the BLN SER that requires correction. The BLN SER includes the following statement: "The NRC staff reviewed STD COL 9.4-1a related to COL Action Item 9.4-1 included under Section 9.4.1.4 of the BLN COL FSAR." COL Action Item 9.4-1 does not exist and should be replaced with COL Information Item 9.4-1.

- VCS COL 9.4-1b

The applicant provided additional information in VCS COL 9.4-1b to resolve the second part of COL Information Item 9.4-1. The second part of COL Information Item 9.4-1 states:

> The Combined License applicant will also provide a description of the [Main Control Room/Technical Support Center] MCR/TSC HVAC subsystem's recirculation mode during toxic emergencies, and how the subsystem equipment isolates and operates, as applicable, consistent with the toxic issues, including conformance with Regulatory Guide 1.78 to be addressed by the Combined License applicant as discussed in DCD subsection 6.4.7.

The commitment was also captured as COL Action Item 6.4-3 in Appendix F of NUREG-1793, which states:

> The COL applicant will determine the amount and location of possible sources of toxic chemicals in or near the plant and for seismic Category I Class 1E toxic gas monitoring, using methods discussed in RG 1.78.

The commitment was also captured as COL Action Item 9.4.1-1 in Appendix F of NUREG-1793, which states:

> The COL applicant will develop a program to maintain operability of the nuclear island nonradioactive ventilation system and the containment air filtration system.

The NRC staff review of VCS COL 9.4-1b is addressed in Section 6.4 of this SER.

9.4.1.5 *Post Combined License Activities*

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

9.4.1.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the VBS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The applicant has provided sufficient information for satisfying Section 9.4.1 of NUREG-0800 and RG 1.140 related to the applicable inspection and testing standards. This addresses STD COL 9.4-1a for VBS.

Conclusions regarding VCS COL 9.4-1b are discussed in Section 6.4 of this SER.

9.4.2 Annex/Auxiliary Buildings Nonradioactive HVAC System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.4.3, "Auxiliary and Radwaste Area Ventilation System")

The annex/auxiliary building nonradioactive HVAC system maintains ventilation, permits personnel access, and controls the concentration of airborne radioactive material in the nonradioactive personnel and equipment areas, electrical equipment rooms, clean corridors, the ancillary diesel generator room and demineralized water deoxygenating room in the annex building, and the main steam isolation valve compartments, reactor trip switchgear rooms, and piping and electrical penetration areas.

Section 9.4.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.2, "Annex/Auxiliary Buildings Nonradioactive HVAC System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4.3 Radiologically Controlled Area Ventilation System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.4.2, "Spent Fuel Pool Area Ventilation System," and C.I.9.4.3, "Auxiliary and Radwaste Area Ventilation System")

The radiologically controlled area ventilation system maintains ventilation, permits personnel access, and controls the concentration of airborne radioactive material in the fuel handling area, the radiologically controlled areas of the auxiliary and annex buildings.

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.3, "Radiologically Controlled Area Ventilation System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4.4 Balance-of-Plant Interface

This section is not applicable to AP1000.

9.4.5 Engineered Safety Features Ventilation System

This section is not applicable to AP1000.

9.4.6 Containment Recirculation Cooling System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.4.5, "Engineered Safety Feature Ventilation System")

The containment recirculation cooling system provides a suitable and controlled environment for the containment building during normal plant operation and shutdown.

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.6, "Containment Recirculation Cooling System", 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4.7 Containment Air Filtration System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.4.5, "Engineered Safety Feature Ventilation System")

9.4.7.1 *Introduction*

The containment air filtration system (VFS) serves no safety function, except containment isolation. The system conditions and filters outside air for the containment, the fuel handling area and the other radiologically controlled areas of the auxiliary and annex buildings, except for the hot machine shop and health physics areas, which are served by a separate ventilation system.

9.4.7.2 *Summary of Application*

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.4 of the AP1000 DCD, Revision 19. Section 9.4 of the DCD includes Section 9.4.7, "Containment Air Filtration System," which addresses Section 9.4.5, "Engineered Safety Feature Ventilation System," of NUREG-0800.

In addition, in VCSNS COL FSAR Section 9.4.7.4, the applicant provided the following:

AP1000 COL Information Item

- STD COL 9.4-1a

The applicant provided additional information in STD COL 9.4-1a to address COL Information Item 9.4-1 related to a program for inspections and testing applicable to the VFS included under Section 9.4.7.4 of the VCSNS COL FSAR.

9.4.7.3 *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 VFS are given in Section 9.4.5 of NUREG-0800.

The applicable regulatory guidance for the VFS is as follows:

- RG 1.140

9.4.7.4 *Technical Evaluation*

The NRC staff reviewed Section 9.4.7 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the VFS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS 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 VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS 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 VCSNS 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) includes 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 9.4.7.4 of the VEGP SER:

> *AP1000 COL Information Item*
>
> - *STD COL 9.4-1a*
>
> *The applicant provided additional information in STD COL 9.4-1a to resolve COL Information Item 9.4-1. COL Information Item 9.4-1 states:*
>
> > *The Combined License applicants referencing the AP1000 certified design will implement a program to maintain compliance with ASME AG-1, ASME N509, ASME N510, and Regulatory Guide 1.140 for portions of the nuclear island nonradioactive*

ventilation system and the containment air filtration system identified in subsection 9.4.1 and 9.4.7. The Combined License applicant will also provide a description of the MCR/TSC HVAC subsystem's recirculation mode during toxic emergencies, and how the subsystem equipment isolates and operates, as applicable, consistent with the toxic issues, including conformance with Regulatory Guide 1.78, to be addressed by the Combined License applicant as discussed in DCD subsection 6.4.7.

The commitment was also captured as COL Action Item 9.4.1-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

The COL applicant will develop a program to maintain operability of the nuclear island nonradioactive ventilation system and the containment air filtration system.

The NRC staff reviewed STD COL 9.4-1a related to COL Action Item 9.4-1 included under Section 9.4.7.4 of the BLN COL FSAR.

The NRC staff reviewed the resolution to STD COL 9.4-1a on the proposed implementation of a program to maintain compliance with industry standards and RGs for the VFS included under Section 9.4.7.4 of the BLN COL FSAR, and concludes that this item has been resolved for the VFS because the applicant has appropriately referenced the applicable regulatory guide and industry standards.

Correction of Error in the Standard Content Evaluation Text

The NRC staff identified an error in the text reproduced above from Section 9.4.7.4 of the BLN SER that requires correction. The BLN SER includes the following statement: "The NRC staff reviewed STD COL 9.4-1a related to COL Action Item 9.4-1 included under Section 9.4.7.4 of the BLN COL FSAR." COL Action Item 9.4-1 does not exist and should be replaced with COL Information Item 9.4-1.

9.4.7.5 *Post Combined License Activities*

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

9.4.7.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the VFS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In conclusion, the applicant has provided sufficient information for satisfying Section 9.4.7 of NUREG-0800 and RG 1.140 related to the applicable inspection and testing standards. This addresses STD COL 9.4-1a for the VFS.

9.4.8 Radwaste Building HVAC System

The radwaste building HVAC system serves the radwaste building, which includes the clean electrical/mechanical equipment room and the potentially contaminated HVAC equipment room, the packaged waste storage room, the waste accumulation room, and the mobile systems facility.

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.8, "Radwaste Building HVAC System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4.9 Turbine Building Ventilation System

The turbine building ventilation system operates during startup, shutdown, and normal plant operations. The system maintains acceptable air temperatures in the turbine building for equipment operation and for personnel working in the building.

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.9, "Turbine Building Ventilation System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4.10 Diesel Generator Building Heating and Ventilation System

The diesel generator building heating and ventilation system serves the standby diesel generator rooms, electrical equipment service modules, and diesel fuel oil day tank vaults in the diesel generator building and the two diesel oil transfer modules located in the yard near the fuel oil storage tanks. Local area heating and ventilation equipment is used to condition the air to the stairwell and security room.

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.10, "Diesel Generator Building Heating and Ventilation System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4.11 Health Physics and Hot Machine Shop HVAC System

The health physics and hot machine shop HVAC system serves the annex building stairwell, S02; the personnel decontamination area, frisking and monitoring facilities, containment access

corridor, and health physics facilities on the 100′-0″ elevation of the annex building and the hot machine shop on the 107′-2″ elevation of the annex building.

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.11, "Health Physics and Hot Machine Shop HVAC System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.5 Other Auxiliary Systems

9.5.1 Fire Protection System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.1, Fire Protection Program)

9.5.1.1 *Introduction*

The FPS provides assurance, through a defense-in-depth philosophy, that the Commission's fire protection objectives are satisfied. These objectives are: 1) to prevent fires from starting; 2) to detect rapidly, control, and extinguish promptly those fires that do occur; and 3) to provide protection for SSCs important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant. In addition, FPSs must be designed such that their failure or inadvertent operation does not adversely impact the ability of the SSCs important to safety to perform their safety functions. These objectives are stated in NUREG-0800, Section 9.5.1, "Fire Protection Program," and are indentified as the Fire Protection Program goals and objectives in RG 1.189.

9.5.1.2 *Summary of Application*

Section 9.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.5 of the AP1000 DCD, Revision 19. Section 9.5 of the AP1000 DCD includes Section 9.5.1.

In addition, in VCSNS COL FSAR Section 9.5.1, the applicant provided the following:

Tier 2 Departure

- VCS DEP 18.8-1

The applicant provided this departure from the AP1000 DCD to address the relocation of the Operations Support Center (OSC). This departure is evaluated in this SER section and in Section 13.3 of this SER.

AP1000 COL Information Items

- STD COL 9.5-1 and STD COL 9.5-3

The applicant provided additional information in STD COL 9.5-1 and STD COL 9.5-3 to resolve COL Information Items 9.5-1 and 9.5-3 (COL Action Item 9.5.1-1(a) through 9.5.1-1(o)) by establishing the site-specific implementation of the fire protection program, including the organization, responsibility, qualification, and training for fire protection program personnel and

fire brigade members in Section 9.1.5.8, “Fire Protection Program,” and in Appendix 9A of the VCSNS COL FSAR.

- STD COL 9.5-4

The applicant provided additional information in STD COL 9.5-4 to resolve COL Information Item 9.5-4 (COL Action Item 9.5.1-5) by establishing Table 9.5-201, “AP1000 Fire Protection Program Compliance with BTP CMEB 9.5-1,” and Table 9.5-202, “Exceptions to NFPA Standard Requirements,” of the VCSNS COL FSAR.

- STD COL 9.5-8

The applicant provided additional information in STD COL 9.5-8 to resolve COL Information Item 9.5-8 (COL Action Item 9.5.1-3) by establishing an administrative control procedure to address fire barrier breaches.

- STD COL 9.5-6

The applicant provided additional information in STD COL 9.5-6 to resolve COL Information Item 9.5-6 (COL Action Item 9.5.1-6) by specifying a preoperational testing program to verify field installed fire barriers are as tested, and to provide disposition for any deviation.

- VCS COL 9.5-1

The applicant provided additional information in VCS COL 9.5-1 to resolve COL Information Item 9.5-1 regarding applicant-specific aspects for the qualification requirements for the fire protection program.

- VCS COL 9.5-2

The applicant provided additional information in VCS COL 9.5-2 to resolve COL Information Item 9.5-2 (COL Action Item 9.5.1-2) by providing site-specific fire hazard analysis of the yard areas and outlying buildings in VCSNS COL FSAR Appendix 9A, Section 9A.3.3.

Supplemental Information

- STD SUP 9.5-1

The applicant provided supplemental information in Section 9.5.1.2.1.3, “Fire Water Supply System,” by adding additional text to address the piping threads compatibility requirement between onsite hydrants, hose couplings, and standpipe risers and equipment used by the offsite fire department.

License Conditions

- Part 10, License Condition 3, Items C.2, D.1 and G.6

The applicant proposed a license condition in Part 10 of the VCSNS COL application addressing the Fire Protection Program implementation milestones.

- Part 10, License Condition 6

The applicant proposed a license condition in Part 10 of the VCSNS COL application to provide a schedule to support the NRC's inspection of operational programs, including the Fire Protection Program.

9.5.1.3 *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 FPS are given in Section 9.5.1 of NUREG-0800.

The regulatory basis and guidance documents for acceptance of STD COL 9.5-1, STD COL 9.5-3, STD COL 9.5-4, STD COL 9.5-6, STD COL 9.5-8, VCS COL 9.5-1, and VCS COL 9.5-2 includes the following:

- RG 1.189
- Branch Technical Position (BTP) CMEB 9.5-1, in NUREG-0800, Revision 3
- 10 CFR 50.48, "Fire Protection"

The regulatory basis for acceptance of STD SUP 9.5-1 includes the following:

- RG 1.189

9.5.1.4 *Technical Evaluation*

The NRC staff reviewed Section 9.5.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the fire protection system. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS 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 VCSNS Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS 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 VCSNS 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) includes evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced[2] from Section 9.5.1.4 of the VEGP SER:

Supplemental Information

- *STD SUP 9.5-1 provided supplemental information within Section 9.5.1.2.1.3, "Fire Water Supply System," addressing compatibility of piping threads with equipment used by the off-site fire department.*

The NRC staff reviewed the information on the compatibility of piping threads with off-site equipment included under Section 9.5.1.2.1.3 of the BLN COL, and determined that the applicant conforms to the guidance of RG 1.189. In accordance with the applicant's response to RAI 14.2-9, the requirement to verify fire equipment hose thread compatibility, or alternatively, an adequate supply of readily available thread adapters will be verified. This was added to the Initial Test Program outlined in Section 14.2 of the BLN COL FSAR.

AP1000 COL Information Items

- *STD COL 9.5-1 (COL Action Item 9.5-1(a)), involving qualification requirements for the fire protection program*

The applicant provided additional information in STD COL 9.5-1 to resolve COL Information Item 9.5-1. COL Information Item 9.5-1 states:

> *The Combined License applicant will address qualification requirements for individuals responsible for development of the fire protection program, training of firefighting personnel, administrative procedures and controls governing the fire protection program during plant operation, and fire protection system maintenance.*

The commitment was also captured as COL Action Item 9.5-1(a) in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will establish a fire protection program at the facility for the protection of structures, systems, and components (SSCs) important to safety. The COL applicant will also establish*

[2] Only the BLN SER text relevant to VCSNS is reproduced here. For example, the BLN SER included a discussion of BLN SUP 9.5-2 after the discussion of STD SUP 9.5-1. Since BLN SUP 9.5-2 does not apply to VCSNS, it was not reproduced here. Also, the discussion of VCS COL 9.5-2 (corresponds to BLN COL 9.5-2) was moved to the end of this technical evaluation section.

the procedures, equipment, and personnel needed to implement the program.

The NRC staff reviewed the resolution to STD COL 9.5-1 on the qualification requirements for the Fire Protection Program included under Section 9.5.1.6, Section 9.5.1.8, and Section 9.5.1.9 of the BLN COL application, and determined that the above sections provided adequate details to ensure conformance with the regulatory positions contained in RG 1.189 regarding the implementation of the BLN Fire Protection Program. Such details include personnel qualifications and training, organization and responsibilities, fire brigade training, etc.

- *STD COL 9.5-4 (COL Action Item 9.5.1-5), involving NFPA exceptions*

The applicant provided additional information in STD COL 9.5-4 to resolve COL Information Item 9.5-4. COL Information Item 9.5-4 states:

> *The Combined License applicant will address updating the list of NFPA exceptions in the plant-specific DCD, if necessary.*

The commitment was also captured as COL Action Item 9.5.1-5 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant is responsible for ensuring that any deviations from the applicable National Fire Protection Association (NFPA) codes and standards in addition to those in the DCD are incorporated into the final safety analysis report (FSAR) with appropriate technical justification.*

The NRC staff reviewed the resolution to STD COL 9.5-4 under Section 9.5.1.8.1.1 and Section 9.5.1.9.4 of the BLN COL. The applicant provided for BLN COL FSAR Table 9.5-202, Exceptions to NFPA Standard Requirement, to document and justify deviations from applicable NFPA codes and standards in addition to those identified in the DCD. This provision satisfies FSER Action Item 9.5.1-5. The staff also reviewed the exception to NFPA 804 related to the intake structure as documented in Table 9.5-202 although NFPA 804 is not formally endorsed by the NRC as a regulatory guidance document. Since the exception and the provided justification are consistent with the guidance of RG 1.189, the staff finds it acceptable. Based on the above, the staff concludes that FSER Action Item 9.5.1-5 is resolved.

- *STD COL 9.5-8 (COL Action Item 9.5.1-3), establishing procedures to minimize risk for fire areas breached during maintenance*

The applicant provided additional information in STD COL 9.5-8 to resolve COL Information Item 9.5-7. COL Information Item 9.5-7 states:

> *The Combined License applicant will establish procedures to minimize risk when fire areas are breached during maintenance. These procedures will address a fire watch for fire areas breached during maintenance.*

The commitment was also captured as COL Action Item 9.5.1-3 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will establish procedures to address a fire watch for fire areas breached during maintenance.*

The NRC staff reviewed the resolution to STD COL 9.5-8 on the establishment of procedures to minimize risk for fire areas breached during maintenance included under Section 9.5.1.8.1.2 and Section 9.5.1.9.7 of the BLN COL, and determined that the applicant has adequately included a provision to have procedures and administrative controls in place, including fire watches, when fire barriers are breached.

- *STD COL 9.5-6 (COL Action Item 9.5.1-6), involving verification of field installed fire barriers, also designated as a COL information item*

The applicant provided additional information in STD COL 9.5-6 to resolve COL Information Item 9.5-6. COL Information Item 9.5-6 states:

> *The Combined License applicant will address the process for identifying deviations between the as-built installation of fire barriers and their tested configurations.*

The commitment was also captured as COL Action Item 9.5.1-6 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will establish the process for identifying deviations between the as-built installation of fire barriers and their tested configurations.*

The NRC staff reviewed the resolution to STD COL 9.5-6 under Section 9.5.1.8.6 and Section 9.5.1.9.6. The applicant provided that new installation or modification of fire barriers not part of the AP1000 DCD will be controlled through administrative procedures. These procedures impose inspection and testing requirements to ensure that the as-built fire barrier configurations match tested configurations. These procedures also describe the process for identifying and dispositioning deviations. Based on the above, the staff concluded that FSER Action Item 9.5.1-6 is resolved.

- *STD COL 9.5-3 (COL Action Items 9.5.1-1(b) through 9.5.1-1(o)), addressing regulatory conformance*

The applicant provided additional information in STD COL 9.5-3 to resolve COL Information Item 9.5-3. COL Information Item 9.5-3 states:

> *The Combined License applicant will address BTP CMEB 9.5-1 issues. The acronym 'WA' is the identifier in Table 9.5.1-1 for "will address."*

The commitment was also captured as COL Action Items 9.5.1-1(b) through 9.5.1-1(o) in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *9.5.1-1(b) – The COL applicant will implement the fire protection program prior to receiving fuel onsite for fuel storage areas, and for the entire unit prior to reactor startup.*
>
> *9.5.1-1(c) – The COL applicant will establish administrative controls to maintain the performance of the fire protection system and personnel.*
>
> *9.5.1-1(d) – The COL applicant will establish a site fire brigade that is trained and equipped for fire fighting to ensure adequate manual fire fighting capability for all plant areas containing SSCs important to safety.*
>
> *9.5.1-1(e) – The COL applicant will establish a quality assurance (QA) program to ensure that the guidelines for the design, procurement, installation, and testing, as well as the administrative controls for fire protection systems are satisfied.*
>
> *9.5.1-1(f) – The COL applicant is responsible for the inspection and maintenance of fire doors, access to keys for the fire brigade, and the marking of exit routes.*
>
> *9.5.1-1(g) – The COL applicant is responsible for the collection and sampling of water drainage from areas that may contain radioactivity.*
>
> *9.5.1-1(h) – The COL applicant is responsible for controlling the use of compressed gases inside structures.*
>
> *9.5.1-1(i) – The COL applicant is responsible for the use of portable radio communication by the plant fire brigade.*
>
> *9.5.1-1(j) – The COL applicant is responsible for fire protection inside containment during refueling and maintenance.*
>
> *9.5.1-1(k) – The COL applicant is responsible for controlling combustible materials in the remote shutdown workstation.*
>
> *9.5.1-1(l) – The COL applicant is responsible for fire protection for cooling towers.*
>
> *9.5.1-1(m) – The COL applicant is responsible for the proper storage of welding gas cylinders.*

9.5.1-1(n) – The COL applicant is responsible for the proper storage of ion exchange resins.

9.5.1-1(o) – The COL applicant is responsible for the proper storage of hazardous chemicals.

The NRC staff reviewed the resolution to STD COL 9.5-3 provided in Section 9.5.1.8, Fire Protection Program, and Table 9.5-201 of the BLN COL application. The staff determined that the applicant has incorporated the appropriate portions of RG 1.189 into the BLN Fire Protection Program, pending some changes to be included in Revision 2 to the BLN COL FSAR. The applicant provided the following clarifications related to the BLN Fire Protection Program:

(1) The applicant confirmed that no operator manual actions outside of the Main Control Room are credited or required for post-fire safe shutdown.

(2) The applicant stated that the wireless telephone system is credited as the portable communication system used by the fire brigade. In the applicant's response to RAI 9.5.1-12, the wireless telephone system was confirmed to be designed with multiple antennas (repeaters) throughout the plant to maintain communication capability if individual repeater(s) are damaged from fire. Also, preoperational and periodic testing during fire drills will be performed to verify that the fire brigade portable communication system operates without excessive interference at different locations inside and outside the plant.

(3) In its response to RAI 9.5.1-9, the applicant stated that a housekeeping program is provided in order to maintain cleanliness and minimize fire hazards in the Main Control Room areas.

(4) In its response to RAI 9.5.1-14, the applicant stated that no probabilistic risk assessment (PRA) or fire modeling results will be credited to demonstrate acceptable fire hazards or post-fire safe shutdown capability for specific fire areas or scenarios.

(5) In its response to RAI 9.5.1-15, the applicant confirmed that the supply of reserve air is sufficient to provide at least 6 hours of additional breathing air for "each" of the 10 self-contained breathing apparatus (SCBA) units.

(6) In its response to RAI 9.5.1-16, the applicant proposed a change to BLN COL FSAR Section 9.5.1.8.6 to clarify that testing and inspection of fire protection systems are to be performed per NFPA 25 and NFPA 72 as appropriate. This is ***Confirmatory Item 9.5-1****.*

(7) In its response to RAI 9.5.1-17, the applicant confirmed that the design pressure of the High Pressure Air Subsystem that is used to recharge fire brigade's SCBAs is 4000 psig, and that 2216 psig SCBAs are used to ensure that the cylinders are adequately charged to provide an operating life of at least 30 minutes.

License Conditions

- *License Condition 3, addressing the Fire Protection Program implementation milestones*

- *License Condition 6, addressing the Fire Protection Program implementation schedule*

In Part 10 of the BLN COL FSAR, License Condition 3, "Operational Program Implementation," the applicant proposed a license condition for the implementation of operational programs as described in Table 13.4-201 of the FSAR. This license condition included implementation milestones for the Fire Protection Program, namely D.1 and G.6. Specifically:

- *Milestone D.1 states that the applicable portions of the Fire Protection Program will be implemented prior to initial receipt of fuel onsite.*

- *Milestone G.6 states that the Fire Protection Program will be implemented prior to initial fuel load.*

In Part 10 of the BLN COL FSAR, proposed License Condition 6, "Operational Program Readiness," the 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.*

Based on the above, the staff concludes that the applicant satisfied the documentation and implementation requirements for the Fire Protection Program in accordance with RG 1.189 by identifying and providing the implementation schedule for each of the operational program aspects of the Fire Protection Program.

Correction of Error in the Standard Content Evaluation Text

The NRC staff identified an error in the text reproduced above from Section 9.5.1.4 of the BLN SER that requires correction. The BLN SER includes the following statement: "The applicant provided additional information in STD COL 9.5-8 to resolve COL Information Item 9.5-7. COL Information Item 9.5-7 states:" The reference to COL Information Item 9.5-7 should be to COL Information Item 9.5-8.

Resolution of Standard Content Confirmatory Item 9.5-1

To resolve Confirmatory Item 9.5-1, the VEGP applicant revised FSAR Section 9.5.1.8.6 to clarify that procedures governing the inspection, testing, and maintenance of fire protection alarm and detection systems, and water-based suppression and supply systems, use the guidance of NFPA 72, "National Fire Alarm and Signaling Code," and NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," as appropriate. NFPA 25 standard is also added to VEGP COL FSAR Section 9.5.5. The staff determined that these documentation changes satisfy the requirement of standard content Confirmatory Item 9.5-1; therefore Confirmatory Item 9.5-1 is resolved.

The following portion of this technical evaluation section is reproduced from Section 9.5.1.4 of the VEGP SER:

Proposed License Condition 3, Item C.2

The VEGP applicant proposed to add another implementation milestone associated with the Fire Protection System to License Condition 3. Specifically, the applicant added Milestone C.2, which states that the applicable portions of the Fire Protection Program will be implemented prior to initial receipt of byproduct, source, or special nuclear materials onsite (excluding Exempt Quantities as described in 10 CFR 30.18). The staff concludes that the applicant satisfied the documentation and implementation requirements for the Fire Protection Program in accordance with RG 1.189 by identifying and providing the implementation schedule for each of the operational program aspects of the Fire Protection Program.

AP1000 COL Information Items

- VCS COL 9.5-1

The applicant provided additional information in VCS COL 9.5-1 to resolve COL Information Item 9.5-1 for plant-specific fire protection issues. These plant-specific issues include:

- The responsibilities of the engineer in charge of fire protection and his staff.
- The organization of the fire brigade.
- The on-duty shift supervisor's responsibility for taking certain actions based on an assessment of the magnitude of the fire emergency.
- Control actions to be taken by the control room operator, such as sounding fire alarms, and notifying the shift supervisor of the type, size and location of the fire.
- Operations requiring control room and shift supervisor coordination or authorization.
- The engineer in charge of fire protection is responsible for the formulation and implementation of the fire protection program and meets the qualification requirements listed in VCSNS COL FSAR Section 13.1.1.3.2.1.4.

The NRC staff compared the plant-specific fire protection issues under VCS COL 9.5-1 with the subject matter addressed by the standard content evaluation of STD COL 9.5-1, as detailed above. The staff concludes that the issues addressed by VCS COL 9.5-1 are included in the subject matter addressed by the staff in its evaluation of STD COL 9.5-1 and, therefore, concludes VCS COL 9.5-1 conforms to the regulatory positions in RG 1.189 regarding the implementation of the VCS Fire Protection Program.

- VCS COL 9.5-2

The applicant provided additional information in VCS COL 9.5-2 to resolve COL Information Item 9.5-2. COL Information Item 9.5-2 states:

> The Combined License applicant will provide site-specific fire protection analysis information for the yard area, the administration building, and for other outlying buildings consistent with Appendix 9A.

The commitment was also captured as COL Action Item 9.5.1-2 in Appendix F of NUREG-1793, which states:

> The COL applicant will provide site-specific fire protection analysis information for the yard area, the administration building, and other outlying buildings.

The NRC staff reviewed the resolution to VCS COL 9.5-2 on the site-specific fire protection analysis information included under Section 9.5.1.9.2 and Section 9A.3.3 of the VCSNS COL FSAR, and determined that the yard area, administration building and other outlying areas are adequately described in accordance with RG 1.189 in the fire hazard analysis, which is, therefore, acceptable.

Resolution of VCS DEP 18.8-1

The AP1000 Annex Building does not contain any system or equipment credited for achieving and maintaining post-fire safe shutdown. As such, the relocation of the OSC in the Annex Building as prescribed in VCS DEP 18.8-1 has no adverse impact on the post-fire safe shutdown capability. Therefore, the staff concludes that the proposed departure, relative to post-fire safe shutdown capability, is acceptable.

Resolution of Site-Specific RAIs

In addition to the review of the standard content, the staff also reviewed VEGP site-specific content and issued two site-specific RAIs, RAIs 9.5.1-1 and 9.5.1-2, related to the qualifications of the engineer in charge of fire protection and fire brigade training, respectively.

In its response to the site-specific RAI related to the qualifications of the engineer in charge of fire protection, the applicant revised FSAR Section 13.1.1.3.2.1.4 to state that the engineer in charge of fire protection is trained and experienced in nuclear safety or has available personnel who are trained and experienced in nuclear plant safety. In addition, this FSAR section states that in accordance with RG 1.189, the engineer in charge of fire protection is a graduate of an engineering curriculum of accepted standing and has completed not less than six years of engineering experience, three of which were in a responsible position in charge of fire protection

engineering work. Based on the above, the staff finds the description of the fire protection engineer qualifications is in accordance with RG 1.189 and, therefore, is acceptable.

In its response to the site-specific RAI related to fire brigade training, the applicant revised FSAR Section 13.1.1.3.2.2.1 to state that the functional manager in charge of nuclear training is responsible for training programs at the site, including fire brigade training. In addition, this FSAR section was revised to state that the functional manager in charge of training ensures individuals providing fire brigade training are qualified by knowledge, suitable training, and experience for such work, and that coordination with the engineer in charge of fire protection is maintained. Based on the above, the staff finds the description of the training program for the fire brigade is in accordance with RG 1.189 and, therefore, is acceptable.

9.5.1.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation section above, the staff finds the following license conditions proposed by the applicant acceptable:

- License Condition (9-2) - The licensee shall implement the Fire Protection Program or portions of the FP Program identified below on or before the associated milestones identified below.

    1. Applicable portions of the FP Program – prior to initial receipt of byproduct, source, or special nuclear materials onsite (excluding Exempt Quantities as described in 10 CFR 30.18).

    2. Applicable portions of the FP Program – prior to initial receipt of fuel onsite.

    3. FP Program – prior to initial fuel load.

- License Condition (9-3) – 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 Fire Protection Program. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the FP Program has been fully implemented.

9.5.1.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the fire protection system, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidance in Section 9.5.1 of NUREG-0800 and RG 1.189. The staff based its conclusion on the following:

- STD SUP 9.5-1, addressing compatibility of piping threads with equipment used by the offsite fire department, is adequately addressed by the applicant and is resolved.

- STD COL 9.5-1, addressing the qualification and training requirements for the fire protection program at VCSNS, is adequately addressed by the applicant and is resolved.

- STD COL 9.5-4, addressing the deviations from the applicable NFPA codes and standards and to those in the AP1000 DCD, is also adequately addressed by the applicant and is resolved.

- STD COL 9.5-6, addressing the establishment of a process for identifying deviations between the as-built installation of fire barriers and their tested configurations is adequately addressed by the applicant and is resolved.

- STD COL 9.5-8, addressing establishment of procedures to minimize risk for fire areas breached during maintenance is adequately addressed by the applicant and is resolved.

- STD COL 9.5-3, addressing the site-specific implementation of the Fire Protection Program is adequately addressed by the applicant and is resolved.

- VCS COL 9.5-1, addressing the plant-specific issues for the fire protection program at VCSNS, is adequately addressed by the applicant and is resolved.

- VCS COL 9.5-2, addressing the site-specific fire protection analysis information for the VCSNS yard areas and outlying buildings is adequately addressed by the applicant and is resolved.

- VCS DEP 18.8-1, addressing the relocation of the OSC relative to the post-fire safe shutdown capability, is adequately addressed by the applicant and is resolved.

9.5.2 Communication System

9.5.2.1 *Introduction*

The communication system provides intra-plant communications and plant-to-offsite communications during normal, maintenance, transient, fire, and accident conditions, including LOOP.

9.5.2.2 *Summary of Application*

Section 9.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.5 of the AP1000 DCD, Revision 19. Section 9.5 of the DCD includes Section 9.5.2.

In addition, in VCSNS COL FSAR Section 9.5.2, the applicant provided the following:

AP1000 COL Information Items

- VCS COL 9.5-9, involving offsite interfaces

The applicant provided additional information in VCS COL 9.5-9 to resolve COL Information Item 9.5-9 (COL Action Item 9.5.2-3).

- VCS COL 9.5-10, involving emergency offsite communications

The applicant provided additional information in VCS COL 9.5-10 to resolve COL Information Item 9.5-10 (COL Action Item 9.5.2-1).

- VCS COL 9.5-11, involving security communications

The applicant provided additional information in VCS COL 9.5-11 to resolve COL Information Item 9.5-11 (COL Action Item 9.5.2-2).

9.5.2.3 *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 communications system are given in Section 9.5.2 of NUREG-0800.

The regulatory basis for VCS COL 9.5-9, addressing interfaces to offsite locations, is based on:

- Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," to 10 CFR Part 50, Part IV.E(9), "Emergency Planning and Preparedness for Production and Utilization Facilities"

The regulatory basis for VCS COL 9.5-10, addressing the emergency offsite communication system, including the crisis management radio system, is based on:

- 10 CFR 50.47(b)(8), "Emergency plans"

The regulatory basis for VCS COL 9.5-11, addressing the description of the security communication system is based on:

- 10 CFR 73.45 (g)(4)(i), "Performance capabilities for fixed site physical protection systems-response"

- 10 CFR 73.46 (f), "Fixed site physical protection systems, subsystem, components, and procedures-communications subsystems"

- 10 CFR 73.55(e), "Requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage-physical barriers"

- 10 CFR 73.55(f), "Requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage-target sets"

9.5.2.4 *Technical Evaluation*

The NRC staff reviewed Section 9.5.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the communications system. The results of the NRC staff's evaluation of

the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, in VCSNS COL FSAR Section 9.5.2, the applicant provided the following:

AP1000 COL Information Items

- VCS COL 9.5-9

The applicant provided additional information in VCS COL 9.5-9 to resolve COL Information Item 9.5-9. COL Information Item 9.5-9 states:

> Combined License applicants referencing the AP1000 certified design will address interfaces to required offsite locations; this will include addressing the recommendations of BL-80-15 ([DCD] Reference 21) regarding loss of the emergency notification system due to a loss of offsite power.

The commitment was also captured as COL Action Item 9.5.2-3 in Appendix F of NUREG-1793, which states:

> The COL applicant will address interfaces to offsite locations; this will include addressing the recommendations of NRC Bulletin (BL) 80-15 regarding loss of the emergency notification system as a result of loss of offsite power.

The NRC staff reviewed VCS COL 9.5-9 involving offsite interfaces included under Section 9.5.2.5.1 of the VCSNS COL FSAR. Section 9.5.2.5.1 of the VCSNS COL FSAR states that VCS COL 9.5-9 is addressed in Part 2, Section F, "Emergency Communications," of the VCSNS Emergency Plan. Section F of the VCSNS Emergency Plan states that the primary system for providing onsite and offsite communications is the Electric Switch System Exchange (ESSX). The ESSX provides communications to county and state warning points and Emergency Operating Facilities (EOFs) from each Control Room, the TSC and the EOF. For VCSNS, the ESSX serves as the Emergency Notification System (ENS). The Emergency Plan (EP) states that backup communication methods include facsimile, commercial telephone lines, radios, and the internet. In the event of an emergency at the station, notification and activation of county and state emergency response facilities are established. This network requires communication interfaces between the site and the following offsite agencies:

- South Carolina State EOF
- Fairfield County Warning Point
- Lexington County Warning Point
- Newberry County Warning Point
- Richland County Warning Point

The following is a summation of the various communication methodologies used under the ESSX:

1. **Dedicated Phone Lines**: A dedicated phone link is established by limiting a phone line to one purpose, blocking its use for all other purposes. These dedicated lines are considered the ESSX. Several dedicated telephone links have been established for use by the Emergency Response Organization (ERO) to perform key communications tasks. Some of these tasks are listed below:

    - Communications between the affected unit's Control Room, the TSC, and the OSC to coordinate the dispatching of emergency damage control teams from the OSC.

    - Communications between the affected Unit Control Room, the TSC, and the EOF to monitor the activities of that Control Room staff and provide technical data to facilities outside that Control Room

    - Conferencing between the TSC and the EOF to communicate mitigating activities and priorities for the station to the EOF

    - Communications between Emergency Director (ED) in the EOF, the Control Room, and the TSC

    - Communications between EOF and State Warning Points

2. **Private Branch Exchange (PBX) Telephone System**: The PBX telephone system will provide communication capabilities between telephones located within the VCSNS facilities through direct dialing. The PBX is used to connect the affected unit's control room, TSC, OSC, and the EOF. The PBX telephone system also provides for outside communications through interconnections with the corporate telephone communications system and commercial telephone lines. The PBX telephone system serves as a backup to the ESSX.

3. **Local Commercial Telephone System**: This system provides standard commercial telephone service through the public infrastructure, consisting of central offices and the wire line carrier. The commercial telephone system includes connections to PBX, emergency telephone system, dedicated lines to emergency facilities, and lines to the Joint Information Center (JIC). The commercial vendor provides primary and secondary power for their lines at their central office. The local lines also serve as a backup method of offsite communications to the ESSX.

4. **Emergency Response Data System (ERDS)**: As prescribed by 10 CFR Part 50, Appendix E, Section VI, ERDS will supply the NRC with selected plant data points on a near real time basis. ERDS is activated by the ERO as soon as possible but not later than one hour after declaration of an alert, site area emergency, or general emergency. The selected data points are transmitted via modem to the NRC at approximately 1-minute intervals. The ERO has backup methods available to provide required information to the NRC in the event that ERDS is inoperable during the declared emergency.

5. **Field Monitoring Team Communications**: A separate radio communications channel has been installed to allow coordinated environmental monitoring and assessment during an emergency. This system consists of the necessary hardware to allow radio communication between the affected unit's Control Room, EOF, and mobile units in VCSNS vehicles. Commercial cell phones, satellite phones, or other means are available as backup to the primary field team communications system.

6. **Satellite Telephones**: Satellite telephones are provided to each Control Room, the TSC, and the EOF providing a backup communication link in the event that the landlines are rendered inoperative. These units are equipped with outside antennae permitting the use of the communications device inside the facilities. Satellite telephones are considered a backup communications avenue in the case of a failure of ESSX.

7. **800 MHz Radio**: This radio is available as a backup notification device to the offsite authorities at selected county warning points and is separate from the Field Monitoring Team Communications radio channel. This system is the Crisis Management Radio System and serves as a backup to ESSX.

8. **NRC Communications**: Communications with the NRC Operations Center will be performed via the NRC ENS and the Health Physics Network (HPN) circuits or commercial and satellite telephone lines. Information is normally communicated from an approved NRC Event Notification Worksheet before establishing an open ENS and/or HPN line.

    8a. **ENS**: The applicant states that there is dedicated telephone equipment in place between each Control Room and the NRC, with an extension of that line in the TSC. A separate line is available in the EOF with the capability of being patched with the station through the NRC. This line is used for NRC event notifications and status updates. Backup power is provided for these lines.

    8b. **HPN**: A separate dedicated telephone between the NRC, the TSC, and the EOF for conveying health physics information to the NRC as requested or as an open communication line. Backup power is provided for these lines.

9. **Miscellaneous**: In addition, station communication links exist to ensure appropriate information transfer capabilities during an emergency. The station may also use its public address system, video conferencing systems, computer network connections and pagers to augment its emergency communications.

Appendix E to 10 CFR Part 50, Section IV.E (9) requires at least one onsite and one offsite communications system; each system shall have a backup power source. In addition, NRC Bulletin 80-15 states that the applicant should provide backup power sources for the ENS in case of LOOP. The staff requested additional clarification in RAI 9.5.2-8 on the primary and backup power supplies as well as information on the transfer method during a LOOP. In its April 1, 2010, response to the RAI, the applicant stated that the ENS and ERDS are both powered normally by the 120V-ac power system. Should a loss of the ac power system occur, the ENS and ERDS are automatically switched over to the diesel-backed, non-Class 1E dc and uninterruptible power supply systems. The use of an uninterruptible power supply and diesel generator to provide backup power to the ENS in case of LOOP adequately addresses NRC Bulletin 80-15.

The staff finds the design of the emergency communications system provides sufficient means for onsite and offsite communications, provides adequate backup communications methods, and provides adequate primary and backup power sources, to meet the requirements of Appendix E to 10 CFR Part 50, Section IV.E(9). Therefore, the staff concludes that COL Action Item 9.5.2-3 has been resolved pending incorporation of the proposed revision in the VCSNS COL FSAR which is being tracked as **Confirmatory Item VCSNS 9.5-1**.

Resolution of Confirmatory Item VCSNS 9.5-1

Confirmatory Item VCSNS 9.5-1 is an applicant commitment to revise FSAR Section 9.5.2 to make changes to the emergency communication description. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item VCSNS 9.5-1 is now closed.

- VCS COL 9.5-10

The applicant provided additional information in VCS COL 9.5-10 to resolve COL Information Item 9.5-10. COL Information Item 9.5-10 states:

> The emergency offsite communication system, including the crisis management radio system, will be addressed by the Combined License applicant.

The commitment was also captured as COL Action Item 9.5.2-1 in Appendix F of NUREG-1793, which states:

> The COL applicant will provide a description of the emergency offsite communication system, including the crisis management radio system.

The staff reviewed VCS COL 9.5-10 concerning the emergency offsite communication system including the crisis management radio system under Section 9.5.2.5.2 of the VCSNS COL FSAR. Section 9.5.2.5.2 of the VCSNS COL FSAR states that VCS COL 9.5-10 is addressed in Part 2, Section F, "Emergency Communications," of the VCSNS EP. The communication interfaces to offsite locations consist of the systems described in VCS COL 9.5-9 of this SER. This includes the following methods:

- PBX telephone system
- Local commercial telephone system
- Satellite telephones
- 800 MHz radio communications

The staff requested the applicant clarify whether the 800 MHz radio system is the crisis management radio system since this is not stated explicitly in either the VCSNS COL FSAR or the EP. The staff requested additional clarification in RAI 9.5.2-8 on the design of the 800 MHz radio system. In its April 1, 2010, response to the RAI, the applicant stated that the 800 MHz radio system serves as the Crisis Management Radio System. The system utilizes base stations and remote units in conjunction with associated cabling, repeaters and antennas to provide optimum coverage for continuous, two-way communications.

The applicant also stated that the radio system is divided into a "trunked system" used by corporate subsidiaries. The trunked system at VCSNS consists of channels specifically

designated for maintenance, operations, health physics, field monitoring teams, etc. The trunked system facilitates communications between site personnel for normal and emergency situations.

Trunked system designs for radio communications are commonly used by Federal and states authorities such as fire departments, police dispatch, etc. The trunked system design allows for multiple users (talk-groups), to use a small set of actual radio frequencies without hearing each other's conversations. With a trunked system, there is no 'dedicated' channel as in a conventional radio system so if a particular frequency channel is interrupted or there is a break in communications, a controlling computer will automatically rotate the affected talk-group to the next available frequency. The design allows two-way continuous communication between plant personnel and offsite authorities at county warning points.

10 CFR 50.47(b)(8) requires that adequate emergency facilities and equipment to support the emergency response be provided and maintained. Section N.2.a of the VCSNS EP states that the applicant will test the primary and alternative emergency communications systems as part of the EP drills on a monthly, quarterly and annual basis. The drills include verification of communication with onsite and offsite sources, including the NRC, TSC, JIC and EOFs. The staff finds the offsite communications systems described above, and in VCS COL 9.5-9 of this evaluation, are adequate in providing emergency communications equipment and facilities, and the proposed testing frequencies are adequate. In conclusion, the staff finds the 800 MHz radio system adequately serves as the Crisis Management Radio System and meets the requirements of 10 CFR 50.47(b)(8). Therefore, the staff concludes that COL Action Item 9.5.2-1 has been resolved pending incorporation of the proposed revision in the VCSNS COL FSAR which is being tacked as **Confirmatory Item VCSNS 9.5-2**.

Resolution of Confirmatory Item VCSNS 9.5-2

Confirmatory Item VCSNS 9.5-1 is an applicant commitment to revise FSAR Section 9.5.2 to update the description of the 800MHz radio system. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item VCSNS 9.5-2 is now closed.

- VCS COL 9.5-11

The applicant provided additional information in VCS COL 9.5-11 to resolve COL Information Item 9.5-11. COL Information Item 9.5-11 states:

> Specific details for the security communication system are as discussed in separate security documents referred to in Section 13.6.

The commitment was also captured as COL Action Item 9.5.2-2 in Appendix F of NUREG-1793, which states:

> The COL applicant will provide a description of the security communication system.

The staff's review of VCS COL 9.5-11 related to security communications is documented in Section 13.6 of this SER.

9.5.2.5 *Post Combined License Activities*

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

9.5.2.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the communication system, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.5.2 of NUREG-0800. The staff based its conclusion on the following:

- VCS COL 9.5-9 has been adequately addressed by the applicant in that the onsite and offsite communications interfaces meet the communications requirements of 10 CFR Part 50, Appendix E, Section IV.E(9). In addition, the staff finds the emergency diesel generator capable of providing backup power for the emergency notification system in case of LOOP, and thus meets the guidance in NRC Bulletin 80-15.

- VCS COL 9.5-10 has been adequately addressed by the applicant in that the VCSNS emergency offsite communications system is capable of providing for notification of personnel and implementation of evacuation procedures in case of emergency and meets the requirements of 10 CFR 50.47(b)(8).

- VCS COL 9.5-11, which involves security communications, is documented in Section 13.6 of this SER.

9.5.3 Plant Lighting System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.3, "Lighting Systems")

The plant lighting system provides normal, emergency, panel, and security lighting. The normal lighting provides normal illumination during plant operating, maintenance, and test conditions. The emergency lighting provides illumination in areas where emergency operations are performed upon loss of normal lighting. The panel and security lighting is designed to provide the minimum illumination required.

Section 9.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.5.3, "Plant Lighting System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.5.4 Diesel Generator Fuel Oil System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.4, "Diesel Generator Fuel Oil Storage and Transfer System)

9.5.4.1 *Introduction*

The standby diesel generator fuel oil system maintains the fuel oil system for the diesel engines that provide backup onsite power. This system includes all piping up to the connection to the engine interface, fuel oil storage tanks, fuel oil transfer pumps, day tanks, and the tank storage vaults.

9.5.4.2 *Summary of Application*

Section 9.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.5 of the AP1000 DCD, Revision 19. Section 9.5 of the AP1000 DCD includes Section 9.5.4.

In addition, in VCSNS COL FSAR Section 9.5.4.5.2, the applicant provided the following:

AP1000 COL Information Item

- STD COL 9.5-13

The applicant provided additional information in STD COL 9.5-13 to resolve fuel oil sampling and testing to protect against degradation.

9.5.4.3 *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 diesel generator fuel oil system are given in Section 9.5.4 of NUREG-0800.

9.5.4.4 *Technical Evaluation*

The NRC staff reviewed Section 9.5.4 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the diesel generator fuel oil system. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS 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 of 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 VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS 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 VCSNS 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) includes 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 9.5.4.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 9.5-13*

The applicant provided additional information in STD COL 9.5-13 to resolve COL Information Item 9.5-13. COL Information Item 9.5-13 states:

> *Address the diesel fuel specifications grade and the fuel properties consistent with manufacturers' recommendations and the measures to protect against fuel degradation by a program of fuel sampling and testing.*

The commitment was also captured as COL Action Item 9.5.9-2 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will develop site-specific factors in the fuel oil storage tank installation specification to reduce the effects of sun heat input into the stored fuel, as well as the diesel fuel specifications grade and fuel properties consistent with manufacturers' recommendations, and will develop a program of fuel sampling and testing to protect against fuel degradation.*

Revision 17 of the DCD addressed the requirement for limiting heat input by specifying a white epoxy-urethane coating system. Therefore, this information is no longer required from COL applicants.

The COL information in Revision 0 of the applicant's FSAR added Section 9.5.4.5.2, "Fuel Oil Quality." The new section addressed fuel quality as follows:

> *High fuel oil quality is provided by specification of the required grade and properties of the fuel oil for procurement, by testing of samples of new fuel oil prior to addition into the tanks, and by monitoring the fuel oil for contamination and degradation with periodic testing of samples from the storage tanks in accordance with manufacturer's recommendations.*
>
> *The fuel oil storage tanks are inspected at least once per 92 days to check for and remove accumulated water.*
>
> *The fuel oil quality is verified by sampling and testing from the storage tanks at least once per 92 days. New fuel oil is tested prior to its addition to the storage tanks to verify that the sample meets the following minimum requirements:*
>
> - *Water and sediment content of less than or equal to 0.05 volume percent.*
> - *Kinematic viscosity at 40°C of greater than or equal to 1.9 mm2/s (1.9 centistokes), but less than or equal to 4.1 mm2/s (4.1 centistokes).*
> - *Specific gravity as specified by the manufacturer at 16/16°C (60/60°F), or an API [American Petroleum Institute] gravity at 16°C (60°F), within limits established in accordance with manufacturer's recommendations.*
> - *Tested impurity level of less than 2 mg of insolubles per 100 ml. The analysis is completed within 7 days after obtaining the sample, but may be performed after the addition of new oil.*

As a result of the staff's review of BLN COL FSAR Section 9.5.4.5.2, the staff identified two questions that were submitted to the applicant in RAIs.

In RAI 9.5.4-1(a), the staff requested that the applicant identify the controls in place to ensure the fuel oil quality program is implemented according to BLN COL FSAR Section 9.5.4.5.2. In response, the applicant stated that implementation of the fuel oil program according to the FSAR is ensured by the Quality Assurance Program Description (QAPD) described in Chapter 17 and Part 11 of the COL application. The applicant stated QAPD Part III, Section 1, contains quality controls for non-safety-related SSCs that would require and verify implementation of the fuel oil program based on the FSAR description. The staff reviewed the information provided and concludes the proposed quality control requirements can ensure implementation of the fuel oil program in accordance with the BLN COL FSAR.

In RAI 9.5.4-1(b), the staff requested that the applicant provide quality requirements for the periodic testing of stored fuel oil. Section 9.5.4.5.2 of the BLN COL stated that diesel fuel oil from the storage tanks is sampled and tested, but no requirements were listed. The application listed quality requirements that appeared to apply only to new fuel oil. In its response, the applicant proposed the following revised BLN COL FSAR Section 9.5.4.5.2:

> *The diesel fuel oil testing program requires testing both new fuel oil and stored fuel oil. High fuel oil quality is provided by specifying the use of ASTM [American Society for Testing and Materials] Grade 2D fuel oil with a sulfur content as specified by the engine manufacturer.*
>
> *A fuel sample is analyzed prior to addition of ASTM Grade 2D fuel oil to the storage tanks. The sample moisture content and particulate or color is verified per ASTM 4176. In addition, kinetic [sic] viscosity is tested to be within the limits specified in Table 1 of ASTM D975. The remaining critical parameters per Table 1 of ASTM D975 are verified compliant within 7 days.*
>
> *Fuel oil quality is verified by sample every 92 days to meet ASTM Grade 2D fuel oil criteria. The addition of fuel stabilizers and other conditioners is based on sample results.*
>
> *The fuel oil storage tanks are inspected on a monthly basis for the presence of water. Any accumulated water is to be removed.*

The staff reviewed this revision and finds it acceptable because it addresses both the new and stored fuel oil and the requirements are the manufacturer's specifications and the same ASTM standards applied to safety-related diesel generators. The staff also confirmed that the revised fuel oil testing program was included as shown above in Revision 1 of the BLN COL FSAR.

Correction of Error in the Standard Content Evaluation Text

The NRC staff identified an error in the text reproduced above from Section 9.5.4.4 of the BLN SER that requires correction. The BLN SER includes the following statement: "In addition, kinetic [sic] viscosity is tested to be within the limits specified in Table 1 of the ASTM D975." The world "kinetic" should read as "kinematic." The staff thought this was a typographical error on the applicant's part because Table 1 of ASTM D975, "Standard Specification for Diesel Fuel Oils," *which is the appropriate reference, specifies "kinematic viscosity." Therefore, the staff concludes that STD COL 9.5-13 has been resolved pending incorporation of the proposed revision in the VEGP COL FSAR, which is being tracked as* ***Confirmatory Item 9.5-3****.*

Resolution of Standard Content Confirmatory Item 9.5-3

Confirmatory Item 9.5-3 is an applicant commitment to revise its FSAR Section 9.5.4.4 to correct a typographical error. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 9.5-3 is now closed.

9.5.4.5 *Post Combined License Activities*

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

9.5.4.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the standby diesel generator fuel oil system, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.5.4 of NUREG-0800. The staff based its conclusion on the following:

- STD COL 9.5-13 has been adequately addressed by the applicant in that it ensures that the manufacturers' recommendations using industry standards are met and provides a fuel sampling and testing program to protect against fuel degradation.

9.5.5 Standby Diesel Generator Cooling Water System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.5, "Diesel Generator Cooling Water System")

Section 9.5.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.5.5, "Standby Diesel Generator Cooling Water System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.5.6 Standby Diesel Generator Starting Air System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.6, "Diesel Generator Starting System")

Section 9.5.6 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.5.6, "Standby Diesel Generator Starting Air System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.5.7 Standby Diesel Generator Lubrication System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.7, "Diesel Generator Lubrication System")

Section 9.5.7 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.5.7, "Standby Diesel Generator Lubrication System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.

9.5.8 Standby Diesel Generator Combustion Air Intake and Exhaust System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.8, "Diesel Generator Combustion Air Intake and Exhaust System")

Section 9.5.8 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.5.8, "Standby Diesel Generator Combustion Air Intake and Exhaust System," 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 VCSNS COL application are documented in NUREG-1793 and its supplements.