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 Vogtle Electric Generating Plant (VEGP) combined license (COL) Final Safety Analysis Report (FSAR), Revision 2, incorporates by reference, with no departures or supplements, Section 9.1.1, "New Fuel Storage," of Revision 17 of the AP1000 Design Control Document (DCD). The Nuclear Regulatory Commission (NRC) staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793, "Final Safety Evaluation Report [FSER] 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.

[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).

9.1.2.2 Summary of Application

Section 9.1 of the VEGP COL FSAR, Revision 2, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 17. Section 9.1 of the DCD includes Section 9.1.2.

In addition, in VEGP 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, in a letter dated April 23, 2010, a license condition to provide a schedule to support the NRC's inspection of operational programs and proposes to add the Metamic monitoring program to this list.

9.1.2.3 Regulatory Basis

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

In addition, the 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 [SRP] for the Review of Safety Analysis Reports for Nuclear Power Plants."

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, Appendix A, 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 VEGP 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 VEGP 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 with open items issued for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs) and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was one open item (Open Item 9.1-1) related to the standard content in the BLN SER. Its resolution is addressed in this SER.

The following portion of this technical evaluation section is reproduced from Section 9.1.2.4 of the BLN 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.*

Resolution of Standard Content Open Item 9.1-1

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 Revision 17, 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 Revision 17.

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.
>
> Metamic Monitoring Acceptance Criteria:
>
> - 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**.

9.1.2.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff proposes to include the following license condition associated with spent fuel storage:

- License Condition (9-X) - The licensee shall submit to the appropriate Director of the NRC a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of NRC inspections of the spent fuel rack metamic coupon monitoring program implementation The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the spent fuel rack metamic coupon monitoring program has been fully implemented or the plant has been placed in commercial service, whichever comes first. This schedule shall address the spent fuel rack Metamic coupon monitoring program implementation.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes, pending closure of **Confirmatory Item 9.1-1,** that the relevant information presented in the VEGP 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 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")

The spent fuel pool cooling system is designed to remove decay heat, which is generated by stored fuel assemblies from the water in the spent fuel pool. This is done by pumping the high temperature water from within the fuel pool through a heat exchanger, and then returning the water to the pool. A secondary function of the spent fuel pool cooling system is clarification and purification of the refueling water and the spent fuel pool.

Section 9.1.3 of the VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.1.3, "Spent Fuel Pool Cooling System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 spent fuel pool, 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 VEGP COL FSAR, Revision 2, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 17. Section 9.1 of the DCD includes Section 9.1.4.

In addition, in VEGP 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 the FSER related to the DCD.

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, "Fuel Storage and Handling and Radioactivity Control"
- American National Standards Institute/American Nuclear Society (ANSI/ANS) 57.1-1992, "Design Requirements for LWR [Light-Water Reactor] Fuel Handling Systems"

9.1.4.4 Technical Evaluation

The NRC staff reviewed Section 9.1.4 of the VEGP 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 VEGP COL application are documented in NUREG-1793 and its supplements.

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

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was one open item (Open Item 9.1-2) related to the standard content in the BLN SER. Its resolution is addressed in this SER.

The following portion of this technical evaluation section is reproduced from Section 9.1.4.4 of the BLN 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**.

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 LLHS and there is no outstanding information expected to be addressed in the VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes, pending closure of **Confirmatory Item 9.1-2,** that the relevant information presented in the VEGP 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 VEGP 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 VEGP 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, inability to cool fuel within the reactor vessel or spent fuel pool, or prevent safe shutdown of the reactor.

9.1.5.2 Summary of Application

Section 9.1 of the VEGP COL FSAR, Revision 2, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 17. Section 9.1 of the AP1000 DCD includes Section 9.1.5.

In addition, in VEGP 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 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 the FSER related to the DCD.

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, “Environmental and Dynamic Effects Design Bases”
- GDC 61, “Fuel Storage and Handling and Radioactivity Control”
- 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 VEGP 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 VEGP COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff’s findings on standard content that were documented in the SER with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were two open items (Open Item 9.1-3 and 9.1-4) related to the standard content in the BLN SER. Their resolutions are addressed in this SER.

The following portion of this technical evaluation section is reproduced from Section 9.1.5.4 of the BLN 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**.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes, pending closure of **Confirmatory Item 9.1-3,** that the relevant information presented in the VEGP 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 VEGP 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 VEGP 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 component cooling water system (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 VEGP COL FSAR, Revision 2, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 17. Section 9.2 of the DCD includes Section 9.2.1.

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

Supplemental Information

- VEGP SUP 9.2-5

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 the FSER related to the DCD.

Although the SWS (including heat sink) is not safety-related, it is considered to be important to safety because 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 systems (RTNSS) in accordance with the Commission's policy for passive reactor plant designs in SECY 94-084.

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 VEGP SUP 9.2-5, addressing the SWS cooling tower are the guidelines of the associated acceptance criteria given 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 VEGP 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 VEGP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VEGP COL FSAR:

Supplemental Information

- VEGP SUP 9.2-5

The cooling capability of the SWS cooling towers for the VEGP units can be adversely affected by interactions that exist between the two cooling towers. Adverse interactions can occur due to localized atmospheric influences caused by siting and relative proximity considerations. Because this is not a factor for single cooling towers, it is not addressed by the AP1000 DCD. In RAI 9.2.5-1, the NRC staff requested that the applicant address potential adverse interactions between the cooling towers for the two units and to describe in the VEGP COL FSAR any additional design provisions that are necessary, as appropriate.

In its response dated November 4, 2008, the applicant stated that VEGP Units 3 and 4 are located on the same property as the existing and operating VEGP Units 1 and 2. VEGP Units 1 and 2 are pressurized-water reactor (PWR) nuclear power plants that are also equipped with mechanical draft cooling towers. The shortest distance between the existing mechanical draft cooling towers and the AP1000 mechanical draft cooling towers is between the Unit 3 and Unit 2 cooling towers. The VEGP Unit 3 SWS mechanical draft cooling tower is located approximately 488 meters (1600 feet) from the westernmost Unit 2 mechanical draft cooling tower. The large Unit 3 turbine building structure, as well as other plant support buildings, is located between these units. The distance and obstructing buildings will disperse the plume and minimize interference effects.

In addition, the applicant stated that each AP1000 unit at VEGP conforms to the standard AP1000 plant design, which locates the SWS cooling towers immediately adjacent to the turbine

building just west of the associated unit. VEGP Units 3 and 4 are separated by approximately 244 meters (800 feet), with the Unit 4 turbine building located between the Units 3 and 4 SWS cooling towers. To create a cross-unit interference condition, an SWS cooling tower plume would not only be required to travel the 244 meters (800 feet) separating the cooling towers, but also would be required to circumvent the large turbine building structure separating the towers of both units. The applicant stated that the distance and obstructing buildings will disperse the plume and minimize interference effects. Unit separation also minimizes any effects from air restriction on a two-unit site. The standard plant yard layout for a single unit locates the SWS cooling tower much closer to the associated unit's building than the distances separating the tower from the buildings on the adjacent unit. It also should be noted that air restriction conditions between an SWS cooling tower and the buildings on its own unit lie within the scope of the standard design.

The staff's review of this RAI response, which has been incorporated into the VEGP COL FSAR, found this acceptable. The applicant adequately addressed the interactions between the existing cooling towers and the proposed cooling towers when one unit is in Mode 4 cooldown and the adjacent affected unit is operating in Mode 5 or 6 under the conditions described in AP1000 DCD, Chapter 16 availability controls. There is a minimal probability that an SWS cooling tower plume could travel to the vicinity of an SWS cooling tower on an adjacent unit. The staff concludes, based on cooling tower location, distances and spacing, yard layout, and design margins that there are no adverse impacts; therefore, RAI 9.2.5-1 is closed.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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:

- VEGP SUP 9.2-5 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, with respect to consideration of adverse interactions between the SWS cooling towers on the VEGP 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")

The CCS provides a closed loop of cooling water for reactor system components, reactor shutdown equipment, ventilation equipment, and components of the emergency core cooling system.

Section 9.2 of the VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.2.2, "Component Cooling Water System (CCS)," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.2.3, "Demineralized Water Treatment System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.2.4, "Demineralized Water Transfer and Storage System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 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 VEGP COL FSAR, Revision 2, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 17. 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 VEGP COL FSAR Section 9.2.5, the applicant provided the following:

Tier 2 Departure

- VEGP DEP 9.2-1

The applicant addressed the proposed departure in Section 9.2.5.3 of the VEGP COL FSAR and in Part 7 of the VEGP COL application. The AP1000 DCD states that filtered water is supplied from a site-specific water source for the PWS. For VEGP, the PWS is supplied by the well water subsystem of the RWS. The applicant states that filtration of the PWS source is not required.

AP1000 COL Information Items

- VEGP COL 9.2-1

The applicant provided additional information in VEGP COL 9.2-1 to address COL Information Item 9.2-1 in VEGP COL FSAR Sections 9.2.5.2.1, "General Description," 9.2.5.2.2, "Component Description," 9.2.5.3, "System Operation," 9.2.5.6, "Instrumentation Applications," and 9.2.12.1, "Potable Water," by providing information concerning the source of water for the PWS.

- VEGP COL 10.4-3

The applicant provided additional information in VEGP COL 10.4-3 to address COL Information Item 10.4-3 in VEGP COL FSAR Section 9.2.5.3, by providing information concerning the PWS.

9.2.5.3 Regulatory Basis

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the PWS are given in Section 9.2.4 of NUREG-0800.

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

The regulatory basis for the review of VEGP DEP 9.2-1 is established in 10 CFR Part 52, Appendix D, Section VIII.B.5.

9.2.5.4 Technical Evaluation

The NRC staff reviewed Section 9.2.5 of the VEGP 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 VEGP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VEGP COL FSAR:

Tier 2 Departure

- VEGP DEP 9.2-1

The NRC staff reviewed VEGP DEP 9.2-1 included under Section 9.2.5.3 of the VEGP COL FSAR and in Part 7 of the VEGP COL application.

In VEGP DEP 9.2-1, the applicant proposes the source of water for the PWS as unfiltered water from the site well water subsystem of the RWS. The AP1000 DCD states that filtered water is supplied from a site-specific water source for the PWS. The unfiltered PWS source meets applicable Georgia Environmental Protection Division standards for safe drinking water; therefore, filtration of the PWS source is not necessary.

The applicant's evaluation in accordance with 10 CFR Part 52, Appendix D, Section VIII.B.5 determined that this departure did not require prior NRC approval. The NRC staff concludes that the criteria specified in Section VIII.B.5 have been satisfied and that this departure does not require prior NRC approval.

AP1000 COL Information Items

- VEGP COL 9.2-1

The applicant provided additional information in VEGP 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 resolution to COL Information Item 9.2-1 on the source of water for the PWS included under Sections 9.2.5.2.1, 9.2.5.2.2, 9.2.5.3, 9.2.5.6 and 9.2.12.1 of the VEGP COL FSAR. In these sections, the applicant proposes to use unfiltered water from the site well water subsystem of the RWS as the source of potable water. The PWS meets or exceeds the pressure, capacity, and quality requirements of the AP1000 DCD. A discussion of the biocide used to treat the potable water is found in VEGP COL 10.4-3 and is discussed below. The staff

finds this an acceptable resolution of COL Information Item 9.2-1 because the applicant has ensured the potable water supply source and the pressure requirements from the AP1000 DCD are met. The AP1000 DCD 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. The site-specific information provided in VEGP COL 9.2-1 is outside the power block and not potentially contaminated by radioactive water. Therefore, the staff finds that GDC 60 is satisfied with respect to preventing contamination by radioactive water.

The staff's evaluation of control room habitability is addressed in Section 6.4 of this SER.

- VEGP COL 10.4-3

The NRC staff reviewed VEGP COL 10.4-3 related to COL Information Item 10.4-3 included under Section 9.2.5.3 of the VEGP COL FSAR, by providing information concerning the PWS. COL Information Item 10.4-3 states:

> The Combined License applicant will address the chemistry requirements for the source of potable water. A biocide such as sodium hypochlorite is recommended. In addition, if a municipal site-specific source is not utilized, toxic gases such as chlorine are not recommended. The impact of toxic gases on the main control room compatibility is addressed in [AP1000 DCD] Section 6.4.

Well water from the RWS is disinfected at the potable water storage tank using sodium hypochlorite as recommended in the AP1000 DCD. A minimum residual chlorine level of 0.2 parts per million (ppm) is maintained in the system in accordance with Georgia Safe Drinking Water standards. The AP1000 DCD 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. The information provided in VEGP COL 10.4-3 is not related to, and does not affect the PWS regarding prevention of contamination by radioactive water. Therefore, the staff finds that compliance with GDC 60 is satisfied with respect to preventing contamination 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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

- VEGP 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.

- VEGP COL 10.4-3 is acceptable because it is not related to, and does not affect the prevention of PWS contamination by radioactive water and compliance with GDC 60.

- VEGP DEP 9.2-1 is acceptable because the staff concurs that this departure does not require prior NRC approval.

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 VEGP COL FSAR, Revision 2, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 17. 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 VEGP COL FSAR Section 9.2.6, the applicant provided the following:

Supplemental Information

- VEGP SUP 9.2-1

The applicant provided supplemental information by adding text to the end of Sections 9.2.6, "Sanitary Drainage System," 9.2.6.2.1, "General Description," and 9.2.6.5, "Instrumentation Application," to address the waste treatment plant being the VEGP Units 1 and 2 sewage treatment plant.

9.2.6.3 Regulatory Basis

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for VEGP 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 VEGP 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 VEGP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VEGP COL FSAR:

Supplemental Information

- VEGP SUP 9.2-1

The NRC staff reviewed the location of the waste treatment plant included under Sections 9.2.6, 9.2.6.2.1, and 9.2.6.5 of the VEGP COL FSAR. In Sections 9.2.6.2.1 and 9.2.6.5 of the VEGP COL FSAR, the applicant proposes to treat sanitary waste onsite at the existing VEGP Units 1 and 2 sewage treatment plant. It is stated that the sewage treatment plant has sufficient capacity to treat waste from VEGP Units 3 and 4. The AP1000 DCD, Revision 17 states that there are no interconnections between the sanitary drainage system and systems having the potential for containing radioactive material, and that 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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:

- VEGP 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)")

The central chilled water system is a nonsafety system that provides chilled water to the cooling coils of the supply air handling units and unit coolers of several radiologically controlled areas of the plant.

Section 9.2 of the VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.2.7, "Central Chilled Water System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 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 circulating water system (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. Back-washable strainers are provided upstream of each TCS heat exchanger.

9.2.8.2 Summary of Application

Section 9.2 of the VEGP COL FSAR, Revision 2, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 17. Section 9.2 of the DCD includes Section 9.2.8.

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

Site-Specific Information Replacing Conceptual Design Information

- VEGP 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 VEGP TCS heat exchangers.

9.2.8.3 Regulatory Basis

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for 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 VEGP 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 VEGP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VEGP COL FSAR:

Site-Specific Information Replacing Conceptual Design Information

The AP1000 DCD states that the applicant is to provide a source of cooling water, such as circulating water, for the 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 VEGP design specifies use of the CWS for this purpose. This arrangement was reviewed and approved by the NRC during its evaluation of the AP1000 standard plant. The VEGP 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 VEGP TCS is acceptable.

Revision 0 of VEGP COL FSAR Section 9.2.8.2.3, "System Operations," stated that the TCS is placed in operation during the plant startup sequence prior to the operation of systems that required TCS water flow. AP1000 DCD Section 9.2.8.2.3 states that the TCS is placed in operation during the plant startup sequence [after the CWS is in operation but] prior to the operation of systems that require TCS cooling water flow. Since the VEGP deviated from the AP1000 DCD, the staff generated RAI 9.2.2-1 to address this issue.

In its response dated December 2, 2008, the applicant stated that the VEGP COL FSAR would be changed back to reflect the AP1000 DCD bracketed information related to the CWS. A COL markup was provided.

The staff's review of this change determined it is acceptable since the AP1000 DCD and the COL application are consistent. The change has been correctly incorporated in Revision 2 of the VEGP COL FSAR; therefore, RAI 9.2.2-1 is closed.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information

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

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

- VEGP 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 wastewater retention basin transfer pumps discharge the basin effluent to the blowdown sump prior to discharge to the Savannah River via the 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 VEGP COL FSAR, Revision 2, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 17. 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 VEGP COL FSAR Section 9.2, the applicant provided the following:

AP1000 COL Information Item

- VEGP COL 9.2-2

The applicant provided additional information in VEGP 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 Sections 9.2.5, 9.2.9.2.1, 9.2.9.2.2 and 9.2.11.2.

Supplemental Information

- VEGP SUP 9.2-2

The applicant provided a cross-reference in Section 9.2.9.2.1 to supplemental information regarding the design and routing of the condenser waterbox drains in Section 10.4.5.2.2 of the VEGP COL FSAR.

- VEGP SUP 9.2-3

The applicant added supplemental information regarding the blowdown sump in 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 the FSER related to the DCD.

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 VEGP 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 VEGP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VEGP COL FSAR:

AP1000 COL Information Item

- VEGP COL 9.2-2

The applicant provided additional information in VEGP 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 VEGP COL 9.2-2 with respect to the design of the plant waste water retention basin (WWRB) and associated components included under Section 9.2.9.2.1, "General Description" and Section 9.2.9.2.2, "Component Description" of the VEGP COL FSAR. To address VEGP COL 9.2-2, details were provided for the location of the waste water retention basin and routing configuration.

The wastewater from the WWRB is discharged to the Savannah River through a blowdown sump with inputs from the wastewater basin and CWS cooling tower blowdown. The method for forwarding the wastewater from the basin to the blowdown sump is by use of two submersible-type basin transfer pumps. In the event of oily waste leakage into the retention basin, a recirculation line is provided to recycle the oil/water waste from the basin to the oil separator. In the event of radioactive contamination, this same line can be used to send the contents of the basin to the liquid radioactive waste system (WLS).

In order to meet GDC 60, the applicant needs to demonstrate suitable control of the release of radioactive materials in liquid effluent. Upon review of VEGP 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 the applicant to provide the additional details of the associated components (i.e., transfer pumps, size of basin, etc.) as requested in the COL item.

In a letter dated April 15, 2010, the applicant provided detailed information on radiation monitoring, level instrumentation and components for the WWS. The WWRB is a lined basin with two compartments and is constructed such that its contents, dissolved or suspended, do not penetrate the liner and leach into the ground. 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. The RAI response clarifies that these lines do not come in contact with radioactive sources or contain radiation monitoring prior to discharge into WWRB. Wastewater can also be sampled prior to discharge from the WWRB. The applicant indicated that for VEGP Units 3 and 4, there are no additional “site–specific” influent streams to the WWRB outside of those associated with the certified design.

Two 100 percent capacity submersible-type pumps send waste water from the WWRB to a blowdown sump. Each pump is sized to meet the maximum expected influent flow to prevent overflow of the basin.

The blowdown sump, common to both VEGP Units 3 and 4, receives input from the WWRB and the CWS cooling tower blowdown and is located to the northeast of VEGP Units 3 and 4, outside of the protected area. A connection with the river water subsystem of the RWS provides an alternate dilution source to the blowdown sump.

The effluent then flows from the blowdown sump to the outfall structure, and then finally to the Savannah River. Effluent from the blowdown sump mixes downstream with a small waste stream from the liquid radioactive waste system monitor tanks and is discharged eastward to the Savannah River. The liquid radwaste is monitored for radiation and is addressed in detail in Section 11.2. To prevent radioactive contamination of the blowdown sump, the location of the tie-in between the liquid radwaste and the outfall is downstream and below the bottom elevation of the blowdown sump. Therefore, there is no potential for contamination of the blowdown sump via the WLS piping. Based on the content in VEGP 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.

To protect against flooding, level instrumentation is provided at the WWRB and controls are provided for automatic or manual operation of the pumps based on the level of the retention basin. Each WWRB is located northwest of the associated power block and the normal WWRB water level is at or below grade. In response to RAI 9.3.3-1, the applicant indicated that site grading ensures that there will be no adverse impact on safety-related or RTNSS SSCs in the unlikely event of an overflow of the WWRB.

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. As clarified in RAI 9.3.3-1 response, the blowdown sump is located well away from the power block (approximately 2500 feet) and site drainage features ensure that there will be no impact on safety-related or RTNSS SSCs in the unlikely event of an overflow of the sump. Based on the content in VEGP 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.

In regard to the location of the WWRB and associated plant outfall, the applicant provided a detailed description of the location of the WWS components in the RAI 9.3.3-1 response. The RAI response states, “Although not labeled, the WWRBs and the blowdown sump are shown in FSAR Figure 1.1-202. The Unit 3 WWRB is a rectangular structure centered at approximate coordinates E75+00, N82+00. The Unit 4 WWRB is a rectangular structure centered at approximate coordinates E67+00, N82+00. The blowdown sump is a small, square structure centered at approximate coordinates E87+00, N104+00. The full routing of the outfall piping, although not shown in the figure, roughly follows the road eastward from the blowdown sump to the river, where the outlet is shown and labeled as the ‘Discharge Line Units 3 & 4’."

Based on the information provided in VEGP COL FSAR Section 9.2.9 and the response to RAI 9.3.3-1, the staff finds that the VEGP COL FSAR adequately addresses COL information item VEGP 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. The staff also finds that the WWS meets GDC 60 requirements for controlling the release of radioactive materials by preventing the inadvertent transfer of contaminated fluids to system portions for non-contaminated drainage. Therefore, RAI 9.3.3-1 is closed and incorporation of the proposed markup into a future revision of the VEGP COL FSAR is identified as **Confirmatory Item 9.2-1**.

Supplemental Information

- VEGP SUP 9.2-2

The applicant provided a cross-reference in Section 9.2.9.2.1 to supplemental information regarding the design and routing of the condenser waterbox drains in Section 10.4.5.2.2 of the VEGP COL FSAR. The waterbox drain configuration is addressed as part of VEGP COL 10.4-1 in Section 10.4.5 of this SER.

- VEGP SUP 9.2-3

The applicant added supplemental information regarding the blowdown sump and plant outfall in AP1000 DCD Section 9.2.9.2.2. The additional content describes components in the final site design and configuration. This supplemental information is reviewed above in this SER section and does not affect the WWS function.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that, pending closure of **Confirmatory Item 9.2-1**, the relevant information presented in the VEGP 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:

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

- VEGP SUP 9.2-3 is acceptable because the staff finds that the relevant information in the VEGP 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 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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.2.10 of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

9.2.11 Raw Water System

9.2.11.1 Introduction

The RWS is a nonsafety-related system that consists of two subsystems: the RWS river water subsystem and the RWS well water subsystem.

The RWS river water subsystem draws water from the Savannah River for makeup to the CWS natural draft cooling tower basins for the VEGP units and provides dilution water for radwaste when the CWS is not available. Major components include an intake canal and intake structure, trash racks, traveling screens, screen wash pumps, river water pumps, piping and controls. The

intake canal and intake structure are shared between the two units. Each unit has three intake structure pump wells, three 50-percent capacity river water pumps, and associated supply piping. The RWS river water subsystem pump discharge piping can be cross-connected between the two VEGP units.

The RWS well water subsystem pumps water from two wells to supply water to the well water storage tank and is shared between the two VEGP units. Water from the well water storage tank is used to replenish the mechanical draft cooling tower basins for the SWS and to supply water to the demineralized water treatment system, the primary and secondary fire water storage tanks, and the PWS. Other miscellaneous uses include lubrication and cooling water for the CWS pumps.

9.2.11.2 Summary of Application

Section 9.2.11 of the VEGP COL FSAR, Revision 2, 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 fire protection system (FPS), but an RWS section was not included in the AP1000 DCD for the NRC staff to evaluate.

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

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

Interface Requirements

The plant interfaces for the RWS are identified in Table 1.8-205 of the VEGP COL FSAR as Item 9.4, “Plant makeup water quality,” and Item 9.5, “Requirements for location and arrangement of raw water system.” These items are identified as “non-nuclear safety (NNS)” interfaces.

Supplemental Information

- VEGP SUP 9.2-4

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 VEGP 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 for acceptance of the supplemental information and interface items are established in:

- GDC 2, "Design Basis for Protection Against Natural Phenomena"
- GDC 4
- RG 1.29, "Seismic Design Classification," Position C2
- 10 CFR 20.1406, "Minimization of Contamination"

9.2.11.4 Technical Evaluation

The staff reviewed the information provided in Section 9.2.11 of the VEGP COL FSAR that describes the RWS for the VEGP units, including the information provided by Figure 9.2-201, "Raw Water System Well Water Subsystem." 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 VEGP COL application are documented in NUREG-1793 and its supplements.

The remainder of this SER section evaluates both VEGP SUP 9.2-4 and Interface Items 9.4 and 9.5.

A. GDC 2, GDC 4, and RG 1.29

The staff's review of the information in VEGP COL FSAR Section 9.2.11 is to confirm that RWS failures will not adversely affect SSCs that are safety-related or designated for RTNSS, or impact the control room occupants. Although VEGP 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, the staff felt that more detailed information was needed to adequately describe the consequences of RWS failures and to explain why safety-related SSCs are not affected. Likewise, the staff determined that additional information was needed to explain why a failure of the RWS will not adversely affect RTNSS systems and components or impact the control room occupants. 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. Consequently, the staff requested in RAI 9.2.1-1, and supplemental RAI 9.2.1-4, that the applicant revise VEGP 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 12, 2009, for RAI 9.2.1-4, the applicant provided a detailed response to the GDC 2, GDC 4, and ITAAC and testing questions. In its response, the applicant stated that failure of the RWS piping located in the yard and inside the turbine building were considered. A summary of the applicant's response is described below.

1. River Water Subsystem

The river water subsystem of the RWS does not directly interface with any safety-related or Class D system. The piping is routed underground from the river intake structure to the main cooling towers. The aboveground portions of the RWS are at the river intake

structure and at the CWS cooling tower basins. Other aboveground portions include branch lines that provide alternate dilution flow to the blowdown sump. The river water subsystem piping system is not routed in close proximity to any safety-related or Class D SSCs, and the only RTNSS system that is in close proximity is the SWS. A resultant flood from a break in the RWS river water subsystem piping is bounded by the analysis for a break in the CWS piping. AP1000 DCD Tier 2, 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 under the yard could result in a potential flood source. However, these potential sources are located far from safety-related structures, and the consequences of a failure in the yard would be enveloped by the analysis described in AP1000 DCD Section 10.4.5, "Circulating Water System," for failure of the CWS, and the site grading would carry water away from safety-related or AP1000 Class D systems.

2. Well Water Subsystem

The well water subsystem of the RWS interfaces with the SWS, which is a Class D system. The well water subsystem is supplied from two wells located south of the CWS cooling towers that pipe water to the 1,135,000 liters (300,000 gallons) well water storage tank, also located south of the CWS cooling towers. Well water from the storage tank is then pumped by the well water transfer pumps to the various system demand points located throughout the power block and yard area. The well water transfer pumps are located in the well water pump house, located near the well water storage tank. The majority of the well water subsystem piping is routed underground. The only aboveground portions are at the deep wells, the well water pump house and where the piping interfaces with the demand point. The RWS interfaces with the CWS, the yard fire water system (YFS), the PWS and the FPS are located outside of the plant in the yard. This piping is not routed in close proximity to safety-related SSCs.

3. Other Considerations

The interfaces with the FPS are in relatively close proximity to the buried CWS pipes. A break in the RWS well water piping in the yard area is bounded by a break in the CWS. As discussed in AP1000 DCD Tier 2, Section 3.4.1.1.1, a failure of the cooling tower, the SWS or the CWS piping under the yard could result in a potential flood source. The consequences of a failure in the yard would be enveloped by the analysis described in AP1000 DCD Tier 2, Section 10.4.5, for failure of the CWS. Site grading will carry the water away from safety-related or important to safety SSCs.

Chemical treatment is not anticipated for the RWS at VEGP Units 3 and 4; therefore, there are no control room habitability concerns related to a chemical release associated with the RWS. In addition, the RWS does not have the potential to be a flow path for radioactive fluids as indicated in VEGP COL FSAR Section 9.2.11.1.1 and as shown in VEGP COL FSAR Figure 9.2-201, Sheets 1 and 2 because it has no interconnection with any system that contains potentially radioactive fluids. The RWS river water subsystem operates at a higher system pressure than those systems with which it directly interfaces (at the point of interface) and, therefore, in-leakage is not feasible. Although the RWS river water subsystem supplies an alternate source of dilution water to the WWS blowdown sump, the piping configuration precludes contamination of the RWS via the WLS. The discharge from the blowdown sump is directed to the river by an outfall pipe that discharges the water by gravity to the river. The WLS discharges its

> waste approximately 30.5 meters (100 feet) below the elevation of the blowdown sump. Additionally, the blowdown sump is open to atmosphere and receives the RWS dilution flow. Because of the elevation differential of approximately 30.5 meters (100 feet) and piping configuration, the possibility of releasing radioactivity from the RWS is not credible.
>
> As described in VEGP COL FSAR Section 14.2.9.4.24, "Raw Water System," initial testing, which is to be performed on the RWS, included system performance and structural and pressure integrity of system components.

The staff finds the applicant's response to RAI 9.2.1-4 acceptable. Failure of the RWS or its components will not affect the ability of any safety-related systems to perform their intended safety functions nor will it adversely affect any RTNSS. 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 the water from the postulated break will not reach any safety-related equipment or result in impact to the control room occupants. Testing of the RWS has been properly addressed. As described in VEGP COL FSAR Section 14.2.9.4.24, "Raw Water System," initial testing to be performed on the RWS will include system performance and structural and pressure integrity of system components. RWS instrumentation requirements have been satisfied based on the staff's review of the instrumentation application of the RWS as described in VEGP COL FSAR Section 9.2.11.6, "Instrumentation Application," and Figure 9.2-201 (Sheets 1 and 2). The plant operators have sufficient indications of system alarms to identify component failures such as traveling screens, strainers, water level, and system pressures. 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 and 4 have been satisfied; therefore, RAIs 9.2.1-1 and 9.2.1-4 are closed.

B. Cold Shutdown

The RWS is relied upon for achieving and maintaining cold shutdown conditions, which is necessary for satisfying technical specification requirements. 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 VEGP 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 VEGP 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 were satisfied. Consequently, the staff requested in RAI 9.2.1-2 and supplemental RAI 9.2.1-5 that the applicant revise VEGP COL FSAR Section 9.2.11 accordingly, and to develop plant-specific ITAAC and initial test program specifications, as appropriate.

In a letter dated March 12, 2009, for RAI 9.2.1-5, the applicant stated that the VEGP RWS was designed to be a "highly reliable and robust system" capable of operating during a loss of normal alternating current (ac) power to provide RWS makeup flow under normal and abnormal conditions. A summary of the applicant's response is described below.

The RWS river water subsystem provides river water for makeup to the CWS cooling tower, provides dilution water to the Units 3 and 4 blowdown sump, and fill water for the CWS piping. The RWS well water subsystem provides well water for makeup to the SWS, PWS, YFS, and DTS. The well water subsystem also provides lubrication and cooling water to the CWS pumps and well water for miscellaneous plant uses. Because the RWS river water subsystem does not have a direct interface with any other system identified in the AP1000 design, which is safety-related, designated RTNSS or designated Class D, this response specifically focuses on the RWS well water subsystem interface with the SWS.

As described in AP1000 DCD Section 5.4.7.1.2.1, “Shutdown Heat Removal,” the normal residual heat removal system (RNS) in conjunction with its associated support systems, CCS and SWS, 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 SWS. During a normal plant cooldown, 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. In addition, SWS has short-term availability controls as described in AP1000 DCD Table 16.3-2, “Investment Protection Short-term Availability Controls.” The availability controls 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.

In the unlikely event of a failure of the RWS to provide adequate makeup flow to the SWS cooling tower basins during the short time period in which the SWS is performing an RTNSS function as stated above, the remaining water inventory in the service water cooling tower basins and the stored water, which is available in the upper region of the secondary fire water tank provide at least 24 hours to restore the RWS makeup flow or take the procedural actions necessary to exit the conditions for applicability controls. However, the RWS is designed to be a highly reliable and robust system, capable of operating during a loss of normal ac power to provide RWS makeup flow under normal and abnormal conditions. Procedural controls, which provide for continued operation of the RWS or re-establishment of operations under off-normal conditions, will be included in the operating procedures, where appropriate.

As noted in the VEGP Early Site Permit Application (ESP) Site Safety Analysis Report (SSAR) Section 2.4.12.2, “Regional and Local Groundwater Use,” the makeup well water pumps draw water from the Cretaceous aquifer, which has sufficient capacity to support operation of the makeup well water pumps to support cooldown to cold shutdown conditions and maintain VEGP Units 3 and 4 in Mode 5 for greater than 7 days.

The RWS well water subsystem is designed to provide ample makeup flow to both unit’s SWS cooling tower basins during these conditions using the makeup well water pumps and the well water transfer pumps. Each makeup well water pump is capable of providing 5,678 liters per minute (lpm) (1,500 gallons per minute (gpm)) to the well water tank. Each of the four well water transfer pumps is capable of providing 2,839 lpm (750 gpm) to the RWS distribution piping and will automatically start as required to support demand.

Based on Westinghouse's AP1000 design data, the maximum makeup requirement for the SWS for both units is 6,284 lpm (1,660 gpm) (3,142 lpm – (830 gpm per unit), which includes a blowdown flow of 776 lpm (205 gpm) per unit. This flow represents a design maximum, occurring four hours after a simultaneous shutdown of both units, when the maximum SWS heat load decreases during cooldown with an accompanying decrease in makeup requirements. There are two makeup well water pumps, each with a design flow rate of 5,678 lpm (1,500 gpm). In the event of a pump failure, a single makeup well water pump is sufficient to support SWS makeup to both units by adjusting the blowdown rate as required. There are four 2,839 lpm (750 gpm) capacity well water transfer pumps. A failure of one well water transfer pump leaves 8,517 lpm (2,250 gpm) of pumping capacity, which is more than adequate to provide for SWS makeup. The Westinghouse AP1000 design data also indicates that an RWS flow of approximately 409 lpm (108 gpm) will provide sufficient makeup to account for evaporation and drift losses from the SWS cooling tower following the first 28 hours of a loss of offsite power (LOOP) scenario. This would equate to 818 lpm (216 gpm) for two units. This value is well within the 5,678 lpm (1,500 gpm) capability of a single makeup well water pump and 2,839 lpm (750 gpm) capacity of a single well water transfer pump. Therefore, as stated in VEGP COL FSAR Section 9.2.11.3.2, "RWS Well Water Subsystem," one well water pump and one well water transfer pump will support both units in a LOOP scenario.

If cooldown to cold shutdown (Mode 5) is required within 36 hours to comply with a limiting condition of 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 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 water is available to provide makeup to the SWS cooling tower basins for both VEGP Units 3 and 4 simultaneously.

The underground RWS piping will be designed and installed to American Society of Mechanical Engineers (ASME) B31.1, "Power Piping," and made from high-density polyethylene (HDPE), which is not susceptible to corrosion. Heat tracing has been provided on aboveground pipe lines that are susceptible to freezing.

The well water subsystem is designed to prevent transient water hammer associated with the restart of system pumps following a loss of normal power. The majority of the system piping is buried below grade; whereas, the system demand points and the well water tank are located above grade. Therefore, drainage of large sections of pipe is precluded. In addition, the well water subsystem is equipped with check valves and air release valves as required to prevent the formation of voids within the piping.

The lack of designation of the RWS as RTNSS or Class D indicates there is no performance requirement for the system during a LOOP or in the event of a single active failure. Nonetheless, a single failure of an active component in the RWS would not affect normal plant cooldown. A 1,135,000-liter (300,000-gallon) well water tank provides operational flexibilities should both makeup well water pumps becomes unavailable. Only one of the two makeup deep well water pumps, which are separated by a minimum of 305 meters (1000 feet), and two of the four well water transfer pumps

> are required to support makeup to the SWS cooling tower basins for both VEGP units during all modes of SWS operation. Failure of an operating pump or electrically-operated valve in the makeup path to the SWS would not prevent the RWS from providing makeup to either of the SWS cooling towers. In addition, the power supplies for the makeup well water pumps, the well water transfer pumps and the components supporting this function are powered from the offsite retail power system normal ac power system, specifically, the Plant Wilson loop, and have a backup power supply from a dedicated well water pump house package diesel generator, with a capacity sufficient to power all necessary pumps and components simultaneously. This package diesel also supplies backup power to the PWS. In the event of a loss of normal ac power, all components are automatically transferred to the diesel power feed. Operator actions are proceduralized to manipulate SWS blowdown and RWS makeup supply control valves as required.

The staff finds the applicant's response to RAI 9.2.1-5 acceptable. The staff finds that the RWS is designed with adequate materials, redundant pumps and with the provision of single failure since the RWS well water subsystem components can be supplied with backup power from the package well water pump house diesel generator as necessary. Buried HDPE will be designed and installed in accordance with industry codes such as ASME B31.1 and American Water Works Association (AWWA) C906, "Polyethylene (PE) Pressure Pipe and Fittings, 4 in (100mm) through 63 in (1,575mm), for Water Distribution and Transmission." This material is an industry-proven material that is corrosion resistant inside and out, hydraulically smooth, and tends to resist buildup (biofouling) so the inner surface usually remains in this condition throughout the service life of the pipe. In addition, HDPE has a life expectancy of approximately 50 years. Ultraviolet protection is of no concern since the RWS HDPE piping will be buried. HDPE materials are well within the temperature and pressures ranges in which the RWS piping system will be exposed to during operations.

During a loss of station power, RWS makeup to the SWS is not required for 12 hours due to existing cooling tower basin inventory. After 12 hours, onsite makeup 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 redundancies of pumps and other well water subsystem components. As part of the response to RAI 9.2.1-5, the applicant also provided an extensive markup of VEGP COL FSAR Section 9.2.11. Based on the staff's review of the supplied markup of the VEGP COL FSAR, which was correctly incorporated into Revision 2 of the VEGP COL FSAR, the RWS has been adequately addressed for cold shutdown consideration; therefore, RAIs 9.2.1-2 and 9.2.1-5 are closed.

C. Regulatory Treatment of Nonsafety-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 evidently not needed to support the SWS cooling function when the reactor water inventory is reduced because RWS is not designated for RTNSS. However, there was no explanation in VEGP COL FSAR Section 9.2.11 as to why this is the case. Also, because the SWS cooling tower basins are very limited in their capacity, it was not clear why RWS makeup is not required for this situation. Consequently, the staff requested in RAI 9.2.1-6 that the applicant revise VEGP COL FSAR Section 9.2.11 to explain

why RWS makeup is not needed during reduced reactor inventory conditions and in particular, to describe controls that will be implemented to ensure that assumptions remain valid.

In a letter dated March 12, 2009, related to RTNSS questions, the applicant stated that the RWS does not have a direct interface with any other system identified in the AP1000 design, which is safety-related; designated for RTNSS, or as designated as AP1000 Class D. The RWS provides a water fill/makeup function for the SWS, and the SWS has investment protection short-term availability controls as described in AP1000 DCD Table 16.3-2, "Investment Protection Short-Term Availability Controls," 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 and determined to meet the RTNSS criteria as documented in NUREG-1793 and WCAP-15985, "AP1000 Implementation of the Regulatory Treatment of Nonsafety-Related System Process." Unlike the SWS, RWS does not directly provide core cooling and was evaluated in WCAP-15985 and determined to not meet the RTNSS criteria and to not require investment protection short-term availability controls. Neither the SWS nor RWS are 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-1973.

In its response to RAI 9.2.1-6, which references RAI 9.2.1-5, the applicant also stated that in the unlikely event of a failure of the RWS to provide makeup flow to the SWS cooling tower basis during the short time period (as stated above) that SWS is performing a RTNSS function, the remaining inventory in the SWS cooling tower basins and water in the secondary fire tank will provide more than 24 hours to restore RWS makeup flow or take procedural actions to exit the conditions for applicability.

In summary, the staff finds the applicant's response to RAI 9.2.1-6 acceptable because the NRC previously concluded in NUREG-1793 that the SWS meets the RTNSS criteria for provided active core cooling. The RWS does not directly provided core cooling. Therefore, the staff concludes the RWS need not be considered RTNSS and RAI 9.2.1-6 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, the staff requested in RAI 9.2.1-3 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 a response dated November 4, 2008, the applicant indicated that:

> Contamination of the RWS piping is not plausible based on the RWS design and the configuration relative to potential sources of contamination. No unique design provisions or other features are required for RWS compliance with 10 CFR 20.1406. The only buried RWS piping which is located directly north of the power block is a short portion of the RWS well water subsystem supplying well water demands in the turbine building. The buried elevation of this piping is several feet above the auxiliary building lower floor evaluation and well above the groundwater table. The various well water demands, especially makeup to the SWS cooling tower basins, require the system to be in almost constant operation, even during plant outages. Because of this, the piping is almost constantly pressurized. Therefore, migration of any potential contamination from the power block into the piping is considered very unlikely.
>
> RWS well water makeup wells are located well to the south of the power block and are screened in the Cretaceous aquifer which is located below the Blue Bluff Marl. The Cretaceous aquifer is considered to be confined because of the low permeability of the Blue Bluff Marl (REF. ESP SSAR Subsection 2.4.13). Therefore, in the unlikely event of a radioactive fluids release into the groundwater above the Blue Bluff Marl, contamination of the RWS well water system is considered to be very unlikely.

The staff's evaluation of the RAI found this response was acceptable. The applicant adequately described that the contamination of the RWS is not credible due to its configuration relative to potential sources of contamination and meets the intent of 10 CFR 20.1406.

The groundwater monitoring program is described in Section 12 of this SER. VEGP COL FSAR Section 12AA.5.4.14, "Groundwater Monitoring Program," describes monitoring areas of the site in the event of groundwater contaminating. In a letter dated October 30, 2009, Southern Nuclear Operating Company addressed Chapter 12 open items, including standard Open Item 12.3-1. As a result of the response provided, standard COL application changes for the incorporation of the approved version of Nuclear Energy Institute (NEI) 08-08A, "Generic FSAR Template Guidance for Life Cycle Minimization of Contamination," was incorporated into the VEGP COL FSAR.

Related to fire protection, the well water pumps are not required for post-fire safe shutdown, and the well water pump house and packaged diesel are located in the outlying area south of the cooling tower, quite far away and/or separated by 3-hour rated fire barriers from other safety-related equipment, the combustible loading/fire hazards associated with this diesel generator is not a concern and is generically addressed in VEGP COL FSAR Section 9.5, Appendix 9A, for hazards in outlying areas.

Water quality of the RWS was addressed by the applicant in VEGP COL FSAR Section 9.2.11.2.1, "General Description," which states both the RWS well water subsystem and RWS river water subsystem do not require additional water treatment. Water from the cretaceous aquifer is supplied to the fire protection system (FPS) by the RWS well pumps. FPS water quality is further discussed in Section 9.5.1.

Based on the above technical evaluation, the NRC staff finds acceptable the information added to the VEGP COL FSAR to address VEGP SUP 9.2-4 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 VEGP 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 VEGP RWS, as described under VEGP SUP 9.2-4 in Section 9.2.11 of the VEGP COL FSAR, including Interface Items 9.4 and 9.5, 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 VEGP COL FSAR, Revision 2, incorporates by reference Section 9.3 of the AP1000 DCD, Revision 17. Section 9.3 of the AP1000 DCD includes Section 9.3.1.

In addition, in VEGP 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 the FSER related to the DCD.

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 VEGP 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 VEGP COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no open or confirmatory items related to the standard content in the BLN SER.

The following portion of this technical evaluation section is reproduced from Section 9.3.1.4 of the BLN 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation

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

In addition, the staff concludes that the relevant information presented in the VEGP 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 VEGP 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 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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.3.2, "Plant Gas System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.3.3, "Primary Sampling System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.3.4, "Secondary Sampling System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.3.5, "Equipment and Floor Drainage Systems," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 chemical and volume control system (CVCS) 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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.3.6, "Chemical and Volume Control System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 nuclear island nonradioactive ventilation system (VBS), in conjunction with the main control room 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 VEGP COL FSAR, Revision 2, incorporates by reference Section 9.4 of the AP1000 DCD, Revision 17. Section 9.4 of the DCD includes Section 9.4.1, describing the VBS.

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

- VEGP COL 9.4-1b

The applicant provided additional information in VEGP 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 the FSER related to the DCD.

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 VEGP 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 VEGP COL application are documented in NUREG-1793 and its supplements.

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

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no open or confirmatory items related to the standard content in the BLN SER.

The following portion of this technical evaluation section is reproduced from Section 9.4.1.4 of the BLN 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.

- VEGP COL 9.4-1b

The applicant provided additional information in VEGP 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] 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 VEGP 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP 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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.4.2, "Annex/Auxiliary Buildings Nonradioactive HVAC System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.4.3, "Radiologically Controlled Area Ventilation System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

9.4.4 Balance-of-Plant Interface

This section not applicable to AP1000.

9.4.5 Engineered Safety Features Ventilation System

This section 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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.4.6, "Containment Recirculation Cooling System", of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference Section 9.4 of the AP1000 DCD, Revision 17. 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 VEGP 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 VEGP COL FSAR.

9.4.7.3 Regulatory Basis

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the containment air filtration system are given in Section 9.4.5 of NUREG-0800.

The applicable regulatory guidance for the containment air filtration system is as follows:

- RG 1.140

9.4.7.4 Technical Evaluation

The NRC staff reviewed Section 9.4.7 of the VEGP COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the containment air filtration system. The results of the NRC staff's evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no open or confirmatory items related to the standard content in the BLN SER.

The following portion of this technical evaluation section is reproduced from Section 9.4.7.4 of the BLN 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 containment air filtration system, and there is no outstanding information expected to be addressed in the VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.4.8, "Radwaste Building HVAC System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.4.9, "Turbine Building Ventilation System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review

confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.4.10, "Diesel Generator Building Heating and Ventilation System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.4.11, "Health Physics and Hot Machine Shop HVAC System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 fire protection system 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, fire protection systems 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, "Fire Protection for Nuclear Power Plants," Revision 1.

9.5.1.2 Summary of Application

Section 9.5 of the VEGP COL FSAR, Revision 2, incorporates by reference Section 9.5 of the AP1000 DCD, Revision 17. Section 9.5 of the AP1000 DCD includes Section 9.5.1.

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

Tier 2 Departure

- VEGP 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 in Section 9.5.1.8, "Fire Protection Program," and in Appendix 9A of the VEGP 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 VEGP 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.

- VEGP COL 9.5-2

The applicant provided additional information in VEGP 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 area and outlying buildings in 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 on site hydrants, hose couplings, and standpipe risers and equipment used by the off-site 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 VEGP 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 VEGP 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 the FSER related to the DCD.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the fire protection system are given in Section 9.5.1 of NUREG-0800.

The regulatory basis for acceptance of STD COL 9.5-1, STD COL 9.5-4, STD COL 9.5-8, STD COL 9.5-6, and STD COL 9.5-3 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 VEGP 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 VEGP COL application are documented in NUREG-1793 and its supplements.

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

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was one confirmatory item (Confirmatory Item 9.5-1) related to the standard content in the BLN SER and one item related to an additional license condition item. Their resolutions are addressed in this SER.

The following portion of this technical evaluation section is reproduced[2] from Section 9.5.1.4 of the BLN 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*

[2] Only the BLN SER text relevant to VEGP 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 VEGP, it was not reproduced here. Also, the discussion of VEGP COL 9.5-2 (corresponds to BLN COL 9.5-2) was moved to the end of this technical evaluation section.

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 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.*

<u>License Conditions</u>

- *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 and NFPA 25 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.

Resolution of VEGP 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 VEGP DEP 18.8-1 has no adverse impact on the post-fire safe shutdown capability. Therefore, the staff concluded 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 fire water supply system and the qualifications of the engineer in charge of fire protection, respectively.

In its response to the site-specific RAI related to the fire water supply system, the applicant stated that no filtration or water treatment is specifically needed for the well water subsystem, which services the fire water supply system, since the water is drawn from the same cretaceous aquifer that supplies the Units 1 and 2 fire water supply system with no significant issues related to bio-fouling or microbiologically-induced corrosion. Furthermore, the well water will be sampled upon initial installation and routinely monitored as required to support the proper operation of the water treatment system on the potable water and demineralized water system. If any water quality concerns are discovered as a result of the monitoring of the well water, appropriate actions will be taken to prevent or control bio-fouling and microbiologically-induced corrosion. Based on the above, the staff finds the VEGP fire water supply system satisfies RG 1.189 and, therefore, is acceptable.

In its response to the site-specific RAI related to the qualifications of the engineer in charge of fire protection, the applicant revised Section 13.1.2.1.1.6 to state that the engineer in charge of fire protection is trained and experienced in fire protection and nuclear safety or has available personnel who are trained and experienced in fire protection and nuclear plant safety. 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.

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 Item

- VEGP COL 9.5-2 (COL Action Item 9.5.1-2), involving fire protection analysis information

The applicant provided additional information in VEGP 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 VEGP 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 VEGP COL

FSAR, and determined that the yard area, administration building and other outlying areas are adequately described in the fire hazard analysis, which is, therefore acceptable.

9.5.1.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff proposes to include the following license conditions associated with the fire protection system:

- License Condition (9-X) - The licensee shall implement the Fire Protection (FP) 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-X) - The licensee shall submit to the appropriate Director of the NRC, a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of NRC inspections of the FP Program. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the FP Program has been fully implemented or the plant has been placed in commercial service, whichever comes first.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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 VEGP, 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 FP Program is adequately addressed by the applicant and is resolved.

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

- VEGP 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 loss of offsite power.

9.5.2.2 Summary of Application

Section 9.5 of the VEGP COL FSAR, Revision 2, incorporates by reference Section 9.5 of the AP1000 DCD, Revision 17. Section 9.5 of the DCD includes Section 9.5.2.

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

AP1000 COL Information Items

- VEGP COL 9.5-9, involving offsite interfaces

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

- VEGP COL 9.5-10, involving emergency offsite communications

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

- STD COL 9.5-11, involving security communications

The applicant provided additional information in STD 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 the FSER related to the DCD.

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 VEGP COL 9.5-9, addressing interfaces to offsite locations, is based on:

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

The regulatory basis for VEGP 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 STD 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 VEGP 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 VEGP COL application are documented in NUREG-1793 and its supplements.

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

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no open or confirmatory items related to the standard content in the BLN SER.

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

AP1000 COL Information Items

- VEGP COL 9.5-9

The applicant provided additional information in VEGP 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 VEGP COL 9.5-9 involving offsite interfaces included under Section 9.5.2.2.5 and Section 9.5.2.5.1 of the VEGP COL FSAR. Section 9.5.2.5.1 of the VEGP COL FSAR states that VEGP COL 9.5-9 is addressed in Section F of the Vogtle Early Site Permit (ESP) Application, Revision 5, Emergency Plan. Section F of the VEGP ESP Emergency Plan presents the following methods of communication between the site and the NRC:

- Emergency Notification System (ENS): The ENS is provided by the Federal Telecommunications System (FTS). The ENS is the primary means of communication between the site and the NRC. The ENS is backed up by commercial telephone lines and the Southern Company Communications network. The NRC Region II office in Atlanta, Georgia, may also be connected on the ENS through Rockville, Maryland.

- Health Physics Network (HPN): The HPN phone service is also provided by the FTS. HPN phones are located in the Technical Support Center (TSC) and Emergency Operating Facility (EOF). The HPN is also backed up by commercial telephone lines and the Southern Company Communications network.

- Emergency Response Data System (ERDS): The primary means by which plant parameters are transmitted to the NRC. The ERDS computer, when activated, periodically will transmit a predefined list of critical plant parameters over the dedicated ERDS FTS lines to the NRC Operations Center in Rockville, Maryland.

Communications among the control room, TSC, EOF, and Operations Support Center (OSC) will be completed using dedicated telephone circuits, normal plant telephones, and radio, using the plant network. The radio system will also be used for communications with the radiological monitoring teams.

The following offsite locations will have established communications with EOFs in the case of an emergency at the station:

- State of Georgia (GA): The primary means of communication between the site and the State of Georgia is the Emergency Notification Network (ENN). The ENN is a dedicated telephone system from the site to the State Emergency Operating Center (EOC). The ENN system is available on a 24 hour a day basis. Commercial telephones and Southern Company Communications in Atlanta provide backup for the dedicated telephone circuits. The plant telephone backup power is supplied by a battery system.

- Burke County (GA): The primary means of communication between the site and Burke County is the ENN, which provides a dedicated telephone system from the site to the Burke County EOC. The ENN is available on a 24 hour a day basis. Commercial telephone lines and the Burke County Emergency Management Agency (EMA) radio network provide backup communication means for the ENN.

- State of South Carolina (SC): The ENN provides a dedicated telephone system from the site to the State of South Carolina emergency response agencies and is the primary means of communications. The ENN is available on a 24 hour a day basis. Commercial telephones serve as the backup communication path to the ENN.

- Aiken, Barnwell and Allendale Counties (SC): The primary means of communication between the site and SC counties will be the ENN, which provides a dedicated telephone system to each county's emergency response agencies. Commercial telephone lines provide a backup means of communication.

- Savannah River Site: The ENN serves as the primary means of communication

between the site and the Savannah River Site and is available on a 24 hour basis. Commercial telephones serve as a backup means of communication.

10 CFR Part 50, Appendix E, 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, "Possible Loss of Emergency Notification System (ENS) with Loss of Offsite Power," states that the applicant should provide backup power sources for the ENS in case of loss of offsite power. The staff requested the applicant provide further details on the backup power sources for the onsite and offsite ENS and for the ENN, and how these backup power sources will provide continuity of communication in the event that the normal power source is lost. In a letter dated December 23, 2008, the applicant provided the following response to RAIs 9.5.2-1, 9.5.2-2, and 9.5.2-4:

In June of 2000, Regulatory Information Summary (RIS) 00-011 informed the industry that the NRC would be transitioning to a new system for the Emergency Telecommunications System (ETS) which would include the ENS function. The replacement system (Federal Telecommunications System [FTS] 2001) service does not use local switches. Power for ENS site equipment is supplied by the offsite system and does not rely on station power.

Back-up power for the ENS is provided by the FTS 2001 supplier (i.e., Federal Telephone System). Onsite systems supporting the FTS system are provided with multiple power sources including diesel and battery backup. ENS phones are located in the Control Room, TSC and EOF. Dedicated telephone communication links provided by the FTS, and their locations, include:

- NRC Emergency Notification System (ENS)
  - Control Room
  - TSC
  - EOF
- NRC Health Physics Network (HPN)
  - TSC
  - EOF
- Reactor Safety Counterpart Link (RSCL)
  - TSC
  - EOF
- Protective Measures Counterpart Link (PMCL)
  - TSC
  - EOF
- Management Counterpart Link (MCL)
  - TSC
  - EOF
- Operations Center LAN (OCL)
  - TSC

- EOF

> Detailed design features for the communication power supply are not yet completely determined. However, design specifications include provisions for multiple power sources for the communication system. The design provides for back-up power to be provided by a combination of diesel generator and/or battery supplied power. Communication system power supplies will be identified in Emergency Implementing Procedures.

The offsite communications interfaces with the site are described as follows:

> [The] design specifications [for the ENN] include provisions for multiple power sources for the communication system. The design provides for back-up power to be provided by a combination of diesel generator and/or battery supplied power. Communication system power supplies will be identified in Emergency Implementing Procedures.

In its response, the applicant proposed to modify VEGP COL FSAR Section 9.5.2.2.5, "Offsite Interfaces," to include the description of the offsite communications links, backup power sources, and supporting communications equipment. The staff finds the applicant's response acceptable in that the applicant has demonstrated sufficient means for onsite and offsite communications, with adequate backup power sources, to meet the requirements of 10 CFR Part 50, Appendix E, Section IV.E(9). In addition, the staff finds that the use of a battery system and a diesel generator to provide backup power to the ENS in case of loss of offsite power adequately addresses NRC Bulletin 80-15. Therefore, the staff concludes that COL Action Item 9.5.2-3 has been resolved. The staff also verified that the VEGP COL FSAR is revised to include the above. As a result, RAIs 9.5.2-1, 9.5.2-2, and 9.5.2-4 are closed.

- VEGP COL 9.5-10

The applicant provided additional information in VEGP 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 VEGP 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 VEGP COL FSAR.

The staff requested additional clarification on the design of the site's crisis management radio system. In a letter dated March 15, 2010, the applicant provided the following response to RAI 9.5.2-3:

Communications among the Control Room, Technical Support Center (TSC), Operations Support Center (OSC), Emergency Operations Facility (EOF) and offsite agencies (state and local authorities) are accomplished using a combination of dedicated telephone circuits, normal plant telephones, and radios. The radio system available for emergency communications will have the following characteristics:

- The radio system consists of several base stations and the associated cabling and antennas strategically located to afford the best possible coverage and accessibility with respect to maintenance, security and uninterrupted power.

- For control of the base station, remotes are used in selected facilities. Some remotes are capable of channel selection as well as volume control.

- Trunked Radios utilizing iDEN® (Integrated Digital Enhanced Network) and TDMA (Time Division Multiple Access). TDMA is a channel access method for shared medium networks. It allows several users to share the same frequency channel by dividing the signal into different time slots. The users transmit in rapid succession, one after the other, each using their own time slot. This allows multiple stations to share the same transmission medium (e.g. radio frequency channel) while using only a part of its channel capacity. TDMA is used in the digital 2G cellular systems such as Global System for Mobile Communications (GSM), IS-136, Personal Digital Cellular (PDC) and iDEN, and in the Digital Enhanced Cordless Telecommunications (DECT) standard for portable phones. It is also used extensively in satellite systems, and combat-net radio systems.

- Hand-held radios form another part of the radio system. These are small portable battery operated radios capable of one or several channels.

- Mobile radios are mounted in vehicles and use a 12V DC power source supplied by the vehicle's battery. Mobile radios are capable of one or several channels and have an external antenna mounted on the vehicle. Radio controls such as volume, channel selection and microphone are provided.

Multiple radios are contained within the emergency communications radio system. These radios, collectively, constitute the crisis management radio system and are described below:

The In-plant Radio will be used for communications with in-plant Radiological Emergency Teams (RETs). The radio will be pre-programmed with channels for individual departments and/or functional areas of the emergency response. This radio is accessible from the Control Room, TSC (remote unit) and EOF Voice Over Internet Protocol (VOIP), Central Alarm Station (CAS) and Secondary Alarm Station (SAS).

The Field Monitoring Team Radio is used as a back-up communication device for communications with Radiological Field Monitoring Teams. The primary radio for this function is the Southern LINC radio system. Field Monitoring Teams will use mobile radios available in vehicles or hand-held units as needed. This radio is accessible from the Control Room, TSC (remote unit) and EOF.

The Security Team Radio is used for communications between in-plant Security personnel and operations personnel as appropriate. Tone remotes are located in the Control Room, the Central Alarm Station and the Secondary Alarm Station. Handheld radios are used through-out the plant site.

The Burke County Emergency Management Radio is used as a back-up to the ENN. This radio is accessible from the TSC (remote unit) and EOF (VOIP). Communications via this radio are direct between SNC and the Burke County Emergency Operations Center.

The South Carolina Emergency Management Division (SCEMD) Radio is used as a back-up to the ENN. This radio is accessible from the TSC (remote unit). Communications via this radio are direct between SNC and the SCEMD Emergency Operations Center (SEOC). This radio is accessible from the TSC (remote unit).

10 CFR 50.47(b)(8) requires that adequate emergency facilities and equipment to support the emergency response be provided and maintained. The staff finds the offsite communications systems described above are adequate in providing emergency communications equipment and facilities and thus meet the requirements of 10 CFR 50.47(b)(8). In addition, the staff finds the radio system adequately serves as the crisis management radio system. Therefore, the staff concludes that COL Action Item 9.5.2-1 has been resolved, pending incorporation of the proposed revision associated with the response to RAI 9.5.2-3 in Part 5 of the VEGP COL application, which is being tracked as **Confirmatory Item 9.5-2**.

The following portion of this technical evaluation section is reproduced from Section 9.5.2.4 of the BLN SER:

AP1000 COL Information Items

- *STD COL 9.5-11 (COL Action Item 9.5.2-2), involving security communications*

The applicant provided additional information in BLN 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 Section 13.6.*

The commitment was also captured as COL Action Item 9.5.2-2 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

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

The staff will review the resolution to BLN COL 9.5-11 on the security communications. This review will be documented in Section 13.6 of this SER.

Correction of Errors in the Standard Content Evaluation Text

The NRC staff identified two errors in the text reproduced above from Section 9.5.2.4 of the BLN SER that require correction. First, the BLN SER includes the following statement: "The applicant provided additional information in BLN COL 9.5-11 to resolve COL Information Item 9.5-11." The reference to BLN COL 9.5-11 should be to STD COL 9.5-11. Second, the quoted material for COL Information Item 9.5-11 in the BLN SER is missing text. The correct quote for COL Information Item 9.5-11 is:

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

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes, pending closure of **Confirmatory Item 9.5-2,** that the relevant information presented in the VEGP 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:

- VEGP 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 loss of offsite power, and thus meets the guidance in NRC Bulletin 80-15.

- VEGP COL 9.5-10 has been adequately addressed by the applicant in that the VEGP 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).

- STD 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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.5.3, "Plant Lighting System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference Section 9.5 of the AP1000 DCD, Revision 17. Section 9.5 of the AP1000 DCD includes Section 9.5.4.

In addition, in VEGP 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 the FSER related to the DCD.

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 VEGP 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 VEGP COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside of the scope of the DC and use this review in evaluation subsequent COL applications. To ensure the staff's findings on standard content that were documented in the SER with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no open or confirmatory items related to the standard content in the BLN SER.

The standby and ancillary diesel generators are classified as AP1000 Class D, nonseismic systems. As such, they incorporate standard industrial QA standards to provide integrity and function and are included in the AP1000 Investment Protection Short-Term Availability Controls (IPSAC) and Design Reliability Assurance Program (D-RAP) programs.

The following portion of this technical evaluation section is reproduced from Section 9.5.4.4 of the BLN 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 1.0 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 feels this was a typographical error on the applicant's part because Table 1 of ASTM D975, 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**.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes, pending closure of **Confirmatory Item 9.5-3,** that the relevant information presented in the VEGP 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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.5.5, "Standby Diesel Generator Cooling Water System,"

of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.5.6, "Standby Diesel Generator Starting Air System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.5.7, "Standby Diesel Generator Lubrication System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.5.8, "Standby Diesel Generator Combustion Air Intake and Exhaust System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.5.6, "Standby Diesel Generator Starting Air System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.5.7, "Standby Diesel Generator Lubrication System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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 VEGP COL FSAR, Revision 2, incorporates by reference, with no departures or supplements, Section 9.5.8, "Standby Diesel Generator Combustion Air Intake and Exhaust System," of Revision 17 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

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