

## 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 Levy Nuclear Plant (LNP) combined license (COL) Final Safety Analysis Report (FSAR), Revision 9, incorporates by reference, with no departures or supplements, Section 9.1.1, “New Fuel Storage,” of Revision 19 of the AP1000 Design Control Document (DCD). The U.S. 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.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793, “Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design,” and its supplements.

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

##### 9.1.2.1 *Introduction*

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

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<sup>1</sup> 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 LNP COL FSAR, Revision 9, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 19. Section 9.1 of the DCD includes Section 9.1.2.

In addition, in LNP COL FSAR Section 9.1.6, the applicant<sup>2</sup> 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 LNP Part 10, Revision 2, 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 NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the fuel storage and handling are given in Section 9.1.2 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)."

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

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<sup>2</sup> The applicant, Duke Energy Florida, LLC, was formerly identified as Duke Energy Florida, Inc., and Progress Energy Florida, Inc. In a letter dated April 15, 2013, Progress Energy Florida notified the NRC that its name was changing to Duke Energy Florida, Inc., effective April 29, 2013. The name changes and a 2012 corporate merger between Duke Energy and Progress Energy are described in Chapter 1 of the SER. For the review described in this chapter completed prior to the name change, the NRC staff did not change references to "Progress Energy," "Progress Energy Florida," or "PEF," to "Duke Energy," "Duke Energy Florida," or "DEF."

- Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic licensing of production and utilization facilities,” Appendix A, “General Design Criteria for Nuclear Power Plants,” General Design Criteria (GDC) 4, “Environmental and Dynamic Effects Design Bases”
- GDC 61, “Fuel Storage and Handling and Radioactivity Control”

#### 9.1.2.4 *Technical Evaluation*

The NRC staff reviewed Section 9.1.2 of the LNP 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.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this safety evaluation report (SER) provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff’s findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant [VEGP], Units 3 and 4) were equally applicable to the LNP Units 1 and 2 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5 to the LNP COL FSAR. In performing this comparison, the staff considered changes made to the LNP COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs).
- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.
- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the LNP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application. Any confirmatory items in the standard content material retain the numbers assigned in the VEGP SER. Confirmatory items that are first identified in this SER section have an LNP designation (e.g., **Confirmatory Item LNP 9.1-1**).

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

AP1000 COL Information Item

- STD COL 9.1-7

COL Information Item 9.1-7 states:

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

STD COL 9.1-7 states:

*A spent fuel rack Metamic coupon monitoring program is to be implemented when the plant is placed into commercial operation. This program includes tests to monitor bubbling, blistering, cracking, or flaking; and a test to monitor for corrosion, such as weight loss measurements and or visual examination.*

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

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

STD COL 9.1-7

*A spent fuel rack Metamic coupon monitoring program is to be implemented when the plant is placed into commercial operation. This program includes tests to monitor bubbling, blistering, cracking, or flaking; and a test to monitor for corrosion, such as weight loss*

*measurements and / or visual examination. The program will also include tests to monitor changes in physical properties of the absorber material, including neutron attenuation and thickness measurements.*

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

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

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

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

*The program will include the methodology and acceptance criteria for the tests listed and provide corrective action requirements based on vendor recommendations and industry operating*

*experience. The program will be implemented through plant procedures.*

*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**.*

*Resolution of Standard Content Confirmatory Item 9.1-1*

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

#### **9.1.2.5 Post Combined License Activities**

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

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

#### **9.1.2.6 Conclusion**

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

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

Section 9.1.3 of the LNP COL FSAR, Revision 9, incorporates by reference, with no departures, Section 9.1.3, "Spent Fuel Pool Cooling System," of Revision 19 of the AP1000 DCD. To address recommendations of the Fukushima Near-Term Task Force described in

SECY-12-0025, "Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," (ADAMS Accession No. ML12039A103), specifically Recommendation 7.1 related to reliable spent fuel pool instrumentation, the applicant provided additional information, including supplemental information in Section 9.1.3.7 of the FSAR and a proposed license condition. Section 20.3 of this SER presents the staff's evaluation of the application with respect to NTTF Recommendation 7.1.

The NRC staff reviewed the application and checked the referenced DCD to ensure that no other issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 SFP, the cask loading area, the new fuel storage area, and the new fuel receiving and inspection area.

##### **9.1.4.2 Summary of Application**

Section 9.1 of the LNP COL FSAR, Revision 9, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 19. Section 9.1 of the DCD includes Section 9.1.4.

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

##### AP1000 COL Information Items

- STD COL 9.1-5

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

- STD COL 9.1-6

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

#### **9.1.4.3 Regulatory Basis**

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the LLHS are given in Section 9.1.4 of NUREG-0800.

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

- GDC 61
- American National Standards Institute/American Nuclear Society (ANSI/ANS) 57.1-1992, "Design Requirements for LWR Fuel Handling Systems"

#### **9.1.4.4 Technical Evaluation**

The NRC staff reviewed Section 9.1.4 of the LNP 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.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the LNP Units 1 and 2 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5 to the LNP COL FSAR. In performing this comparison, the staff considered changes made to the LNP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.
- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.
- The staff verified that the site-specific differences were not relevant.

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

The following portion of this technical evaluation section is reproduced from Section 9.1.4.4 of the VEGP SER:

AP1000 COL Information Items

- STD COL 9.1-5

COL Information Item 9.1-5 states:

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

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

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

STD COL 9.1-5 states:

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

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

*The applicant stated in its response to RAI 9.1.4-1, that an inspection and testing program will be developed to address the LLHS. Procedures defining the program will address the testing and inspection requirements outlined in Section 9.1.4.4, "Inspection and Test Requirements," of the AP1000 DCD and the procedures will include applicable manufacturer's recommendations and industry standards. The applicant stated that procedure development is tracked*

*by the overall plant construction and test schedule. The applicant further stated that details of the implementation milestones for development of procedures are not currently available and are not expected to be available until a detailed construction schedule has been developed. When it becomes available, scheduling information will be provided to the NRC as necessary to support timely completion of NRC inspection and audit functions.*

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

- *STD COL 9.1-6*

*COL Information Item 9.1-6 states:*

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

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

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

*STD COL 9.1-6 states:*

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

*The NRC staff reviewed STD COL 9.1-6, which addresses COL Information Item 9.1-6 related to radiation monitoring included under Section 9.1.4 of the BLN COL FSAR. The proposed mounting of an operating radiation monitor on any crane or fuel handling machine during fuel handling is included under Section 9.1.4.3.8 of the BLN COL FSAR. The applicant committed to develop plant procedures that will specify that an operating radiation monitor be mounted on any fuel handling machine when it is handling fuel. DCD Section 11.5.6.4 specifies the need to augment area radiation monitoring during fuel handling operations by a portable radiation monitor on the machine handling fuel. The*

*staff finds that with the addition of the portable radiation monitor to any fuel handling machine when it is handling fuel, the BLN COL FSAR meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 61 for the prevention of unacceptable radiation exposure.*

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

*Resolution of Standard Content Open Item 9.1-2*

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

*Resolution of Standard Content Confirmatory Item 9.1-2*

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

*Correction of Error in the Standard Content Evaluation Text*

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

**9.1.4.5 Post Combined License Activities**

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

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

#### **9.1.4.6 Conclusion**

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

In addition, the staff concludes that the relevant information presented in the LNP 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 LNP 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 LNP COL FSAR meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 61.

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

##### **9.1.5.1 Introduction**

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

##### **9.1.5.2 Summary of Application**

Section 9.1 of the LNP COL FSAR, Revision 9, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 19. Section 9.1 of the AP1000 DCD includes Section 9.1.5.

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

##### Supplemental Information

- STD SUP 9.1-1

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

- STD SUP 9.1-2

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

- STD SUP 9.1-3

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

#### AP1000 COL Information Items

- STD COL 9.1-5

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

- STD COL 9.1-6

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

#### **9.1.5.3 Regulatory Basis**

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the OHLHS are given in Section 9.1.5 of NUREG-0800.

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

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

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

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

#### **9.1.5.4 Technical Evaluation**

The NRC staff reviewed Section 9.1.5 of the LNP 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.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the LNP Units 1 and 2 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5 to the LNP COL FSAR. In performing this comparison, the staff considered changes made to the LNP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.
- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.
- The staff verified that the site-specific differences were not relevant.

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

The following portion of this technical evaluation section is reproduced from Section 9.1.5.4 of the VEGP SER:

#### **Supplemental Information**

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

*The staff reviewed the information provided by the applicant for STD SUP 9.1-1. The applicant stated that it did not provide an itemized list of heavy load lifts outside the scope of heavy loads described in the AP1000 DCD because no such heavy load lifts are currently planned. The applicant provided a general description for addressing heavy load movements outside the planned scope if*

*needed in the future. However, the applicant did not address all the program elements and detail listed in NUREG-0612 Section 5.1.1 and NUREG-0800 Section 9.1.5, nor did it provide a schedule for implementation of the heavy load handling program. A heavy load handling program that meets the guidelines of NUREG-0612 and NUREG-0800 Section 9.1.5, needs to be in place at a time before there is a possibility that a load drop could cause a release of radioactivity, a criticality accident, inability to cool fuel within the reactor vessel or spent fuel pool, or prevent safe shutdown of the reactor. The staff asked the applicant in RAI 9.1.5-1 to provide the program elements specified in NUREG-0612 Section 5.1.1 and NUREG-0800 Section 9.1.5, and a schedule for implementation.*

*In BLN COL FSAR, Revision 1, the applicant provided the missing and necessary information specified in NUREG-0612 Section 5.1.1 and NUREG-0800 Section 9.1.5. The applicant provided a description of the key elements of the heavy load handling system program in BLN COL FSAR Section 9.1.5. The key elements are: 1) Listing of heavy loads; 2) Listing of handling equipment; 3) Safe load paths definition, location and evaluation; 4) Procedures and maintenance manuals; 5) Inspection and testing; 6) Personnel qualification and training; and 7) Quality Assurance (QA) program to monitor and implement the heavy loads program. Also, the BLN COL FSAR, Revision 1 Section 9.1.5 describes the heavy loads handling system procedures. Because Section 9.1.5 of the BLN COL FSAR includes the key elements identified in NUREG-0612, the staff finds the aspects of RAI 9.1.5-1 regarding the key elements of the heavy loads program resolved. Therefore, the staff finds the applicant meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 4.*

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

AP1000 COL Information Items

- STD COL 9.1-5

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

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

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

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

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

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

*In the RAI response, the applicant stated that the schedule for issuing the procedures that implement the plant inspection program for the OHLHS are not yet available. The applicant also stated that implementation milestones are not expected to be available until after a detailed construction schedule has been developed, but will be provided to the NRC when available to support timely completion of inspection and audit functions. Although the response to RAI 9.1.5-2 states that the plant inspection program schedule information will be provided when available, BLN COL FSAR Table 1.8-202 lists STD COL 9.1-5 as*

having been completed by the applicant. The staff notes that STD COL 9.1-5 has not been fully addressed. The applicant is asked to revise BLN COL FSAR Table 1.8-202 to commit in the BLN COL FSAR to implementing the plant inspection program for the OHLHS before receipt of fuel. This is **Open Item 9.1-4**.

- STD COL 9.1-6

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

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

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

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

The NRC staff reviewed STD COL 9.1-6, which addresses COL Information Item 9.1-6 related to radiation monitoring included under Section 9.1.5 of the BLN COL FSAR. The proposed mounting of an operating radiation monitor on any crane or fuel handling machine during fuel handling is included under Section 9.1.5.3 of the BLN COL FSAR. The applicant committed to develop plant procedures that will specify that an operating radiation monitor be mounted on any fuel handling machine when it is handling fuel. DCD Section 11.5.6.4 specifies the need to augment area radiation monitoring during fuel handling operations by a portable radiation monitor on the machine handling fuel. The staff finds that with the addition of the portable radiation monitor to any fuel handling machine when it is handling fuel, the BLN COL FSAR meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 61 for the prevention of unacceptable radiation exposure.

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

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

The VEGP applicant responded to **Open Items 9.1-3 and 9.1-4** in a letter dated December 30, 2009. The letter proposed a change to VEGP COL FSAR Section 9.1.5.4 in response to these open items instead of revising Table 1.8-202. The applicant proposed a revision to FSAR Section 9.1.5.4 to clarify that the OHLHS, including system inspections, will be implemented prior to

*receipt of fuel onsite. The staff finds this acceptable since the commitment provided will ensure that the procedures will be in place and the plant inspection program will be implemented for the OHLHS prior to fuel movement. Therefore, **Open Items 9.1-3 and 9.1-4** are resolved. Incorporation of the proposed revision in the FSAR is being tracked as **Confirmatory Item 9.1-3**.*

Resolution of Standard Content Confirmatory Item 9.1-3

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

**9.1.5.5 Post Combined License Activities**

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

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

**9.1.5.6 Conclusion**

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

In addition, the staff concludes that the relevant information presented in the LNP 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 LNP 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 LNP COL FSAR meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 61.

## **9.2 Water Systems**

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

#### **9.2.1.1 Introduction**

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

#### **9.2.1.2 Summary of Application**

Section 9.2 of the LNP COL FSAR, Revision 9, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the DCD includes Section 9.2.1.

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

##### **Supplemental Information**

- LNP SUP 9.2-2

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

#### **9.2.1.3 Regulatory Basis**

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

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

The NRC staff’s evaluation of the SWS focuses primarily on confirming that the SWS is capable of performing its defense-in-depth and RTNSS functions; that it will not adversely impact safety-related structures, systems and components (SSCs); and that inspections, tests,

analyses, and acceptance criteria (ITAAC), test program specifications, and RTNSS availability controls for the SWS are appropriate.

The regulatory basis for acceptance of LNP SUP 9.2-2, addressing the SWS cooling tower is the acceptance criteria in Sections 9.2.1 and 9.2.5 of NUREG-0800.

#### **9.2.1.4 Technical Evaluation**

The NRC staff reviewed Section 9.2.1 of the LNP 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.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the LNP COL FSAR:

##### Supplemental Information

- LNP SUP 9.2-2

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

##### Potential SWS Cooling Tower Interactions:

The cooling capability of the SWS mechanical draft cooling towers for the LNP units can be adversely affected by interactions that exist between the SWS two mechanical draft cooling towers between units. In addition, interactions between cooling towers circulating water system (CWS) versus service water system) may adversely affect the cooling capacity of the SWS. Since LNP is utilizing mechanical induced-draft towers for the CWS versus natural draft cooling towers as submitted by other COL applicants, interactions on the SWS cooling towers is now more likely due to the lower in height of the discharge plume. Adverse interactions can occur due to localized atmospheric influences caused by siting considerations, the locations of major structures, the locations of the mechanical draft cooling towers, mechanical draft cooling tower fan speed, and wind effects. Because the certified AP1000 design is for only a single unit site and utilizes only one SWS mechanical draft cooling tower interaction effects between the mechanical draft cooling towers of multi-unit sites was not evaluated by the staff for the AP1000 DCD. Therefore, the staff requested in RAI Letter #50, Question 9.2.1-1 that the applicant revise FSAR Section 9.2.1 to address potential adverse interactions between the LNP mechanical draft SWS cooling towers and the mechanical draft CWS cooling towers for the two LNP units. Based on the applicant's response of July 6, 2009, the applicant indicated that approximately 900 feet of separation will exist between the SWS cooling towers of adjacent units and that the large turbine building structure is located between these two cooling towers. The applicant also indicated that greater than 1,200 feet of separation will exist between the units SWS cooling towers and the two mechanical induced-draft cooling towers for the CWS. The potential for adverse impacts on the SWS tower is further limited by site meteorological

conditions. The SWS cooling towers are located so that the inclined directional wind vector would direct a tower plume away from the adjacent unit. Should site wind conditions exist that could direct the plume along the line of sight between the SWS cooling towers, the plume would still be required to navigate the interposing turbine building that separates the tower and large distance for an interface condition to occur. On this basis, the applicant concluded that there is minimal probability that a SWS cooling tower plume could travel to the vicinity of a SWS cooling tower on an adjacent unit. Also, there is a minimum probability that the CWS cooling tower plume would interact with the SWS cooling towers such that a significant degradation in performance would occur. In addition, the applicant stated that the FSAR will be revised to state that SWS cooling tower was evaluated for potential impacts from interference and air restriction effects due to yard equipment layout and tower operation on an adjacent unit and no adverse impacts were determined. Based on the information that was provided in the FSAR markup, the staff considers the licensee's response of this issue to be acceptable since the interactions between the cooling towers will be minimal and will not adversely affect the cooling capacity of the SWS. Therefore, RAI Letter #50 Question 9.2.1-1 is resolved and was incorporated into Revision 2 of the LNP COL FSAR.

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

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

- LNP SUP 9.2-2 is acceptable because the design of the SWS cooling towers meets the guidance in Sections 9.2.1 and 9.2.5 of NUREG-0800, regarding adverse interactions between the SWS cooling towers on the LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.2.2, "Component Cooling Water System (CCS)," of Revision 19 of the

AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.2.3, "Demineralized Water Treatment System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.2.4, "Demineralized Water Transfer and Storage System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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. The PWS has no safety-related functions other than to prevent in-leakage into the main control room envelope during main control room emergency habitability system (VES) operation. A loop seal in the safety-related PWS piping that penetrates the main control room envelope boundary prevents unfiltered air in-leakage into the main control room envelope.

### **9.2.5.2 Summary of Application**

Section 9.2 of the LNP COL FSAR, Revision 9, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the AP1000 DCD includes Section 9.2.5, “Potable Water System,” which addresses Section 9.2.4, “Potable and Sanitary Water Systems,” of NUREG-0800.

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

#### AP1000 COL Information Item

- LNP COL 9.2-1

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

### **9.2.5.3 Regulatory Basis**

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

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

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

### **9.2.5.4 Technical Evaluation**

The NRC staff reviewed Section 9.2.5 of the LNP 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.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the LNP COL FSAR:

AP1000 COL Information Item

- LNP COL 9.2-1

The applicant provided additional information in LNP 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 LNP COL FSAR. In these sections, the applicant proposes to use filtered 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. 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 LNP 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.

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

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

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

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

### **9.2.6.1 Introduction**

The sanitary drain system collects sanitary wastes from plant restrooms and locker room facilities. The sanitary drainage system has no safety-related function other than main control room envelope isolation. Redundant safety-related isolation valves are provided in the vent line penetrating the main control room. Therefore, there are no single active failures that would prevent isolation of the main control room envelope. 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 LNP COL FSAR, Revision 9, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the AP1000 DCD includes Section 9.2.6, “Sanitary Drains,” which addresses Section 9.2.4, “Potable and Sanitary Water Systems,” of NUREG-0800.

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

#### Departures

- LNP DEP 6.4-1

The applicant provided additional information in Section 9.2.6 of the LNP COL FSAR about LNP DEP 6.4-1 related to design changes affecting habitability of the main control room and changes to the calculated doses to control room operators. This information, as well as related LNP DEP 6.4-1 information appearing in other chapters of the FSAR, is reviewed in Section 21.2 of this SER.

#### Supplemental Information

- LNP SUP 9.2-1

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

### **9.2.6.3 Regulatory Basis**

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for LNP 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, as it relates to sanitary drains

### **9.2.6.4 Technical Evaluation**

The NRC staff reviewed Section 9.2.6 of the LNP 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.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the LNP COL FSAR:

#### Supplemental Information

- LNP SUP 9.2-1

The NRC staff reviewed the location of the waste treatment plant included under Section 9.2.6.2.1 of the LNP COL FSAR. In Section 9.2.6.2.1 of the LNP COL FSAR, the applicant proposes to treat sanitary waste onsite. It is stated that the sewage treatment plant has sufficient capacity to treat waste from LNP Units 1 and 2. The AP1000 DCD states that there are no interconnections between the sanitary drainage system and systems having the potential for containing radioactive material, and the sanitary drainage system does not service facilities in radiologically controlled areas. Therefore, the staff finds the proposed location of the waste treatment plant acceptable as it does not affect compliance with GDC 60, with respect to preventing contamination by radioactive water.

### **9.2.6.5 Post Combined License Activities**

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

### **9.2.6.6 Conclusion**

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to sanitary drains, and there is no outstanding information expected to be addressed in the LNP COL

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

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

- LNP DEP 6.4-1, related to design changes affecting habitability of the main control room and changes to the calculated doses to control room operators, is reviewed and found acceptable by the staff in Section 21.2 of this SER.
- LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.2.7, "Central Chilled Water System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 the CWS. The system consists of two 100-percent capacity pumps, three 50-percent capacity heat exchangers (connected in parallel), one surge tank, one chemical addition tank, and associated piping, valves, controls, and instrumentation. Backwashable strainers are provided upstream of each TCS heat exchanger. TCS system piping is made of carbon steel, except that nonmetallic piping may be used.

### **9.2.8.2 Summary of Application**

Section 9.2 of the LNP COL FSAR, Revision 9, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the DCD includes Section 9.2.8.

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

#### **Site-Specific Information Replacing Conceptual Design Information**

- LNP CDI

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

### **9.2.8.3 Regulatory Basis**

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

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

### **9.2.8.4 Technical Evaluation**

The NRC staff reviewed Section 9.2.8 of the LNP 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.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the LNP COL FSAR:

#### **Site-Specific Information Replacing Conceptual Design Information**

- LNP CDI

The AP1000 standard plant allows the use of either circulating water or raw water for removing heat from the TCS heat exchangers. The AP1000 DCD leaves it up to the COL applicant to specify a specific source of cooling water for plant-specific applications. The LNP design specifies the use of only the circulating water for this purpose and raw water is not utilized for the TCS. This arrangement was reviewed and approved by the NRC during its evaluation of the AP1000 DCD. Consequently, the LNP 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 LNP TCS is acceptable.

LNP COL FSAR Section 9.2.8.2.2, "Component Description – Piping," states that the TCS system piping is made of carbon steel and that piping and connections are welded, except where flange connections are used for accessibility and maintenance of components. Nonmetallic piping may be used. Since ASME B31.1, "Power Piping," Appendix III states that nonmetallic piping is limited to 140 °Fahrenheit (F) (60 °Celsius (C)) and 150 pounds per square inch (psi) (1000 kilopascals (kPa)) in the water service application, the staff generated RAI Letter #54 Question 9.2.2-1 to ask if nonmetallic piping can be used based on the service conditions of the TCS.

The applicant responded to Question 9.2.2-1 on June 23, 2009, and stated that the TCS was reviewed during the AP1000 certification and the application of nonmetallic piping is under the design authority of Westinghouse. In addition, the applicant stated that Westinghouse Technical Report TR-103 (APP-GW-GLN-019), "Fluid System Changes" provides the following information on page 21 of 154, which address this RAI:

As far as application of AP1000 systems, HDPE [High Density Polyethylene] may be used for systems and system areas of low pressure and low temperature. Based on manufacturer's recommendations, HDPE will be used in systems with pressure up to 150 psi (1000 kPa) and temperature up to 140 °F (60 °C) for water service. Pressure and temperature limits for other services shall be based on the hazards involved, but in no application they shall exceed 150 psi (1000 kPa) and 140 °F (60 °C).

The applicant's response addressed the staff's concerns regarding the use of nonmetallic piping in the TCS service. The staff finds the response acceptable since nonmetallic material is limited up to 150 psi (1000 kPa) and temperatures up to 140 °F (60 °C); therefore, RAI Letter #54 Question 9.2.2-1 is resolved.

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

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

- LNP 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) collects and processes the waste water from the equipment and floor drains in the nonradioactive building areas during plant operations and outages. The WWS has no safety-related function other than main control room envelope isolation. A normally closed safety-related isolation valve is provided in the drain line penetrating the main control room. The drain line is safety related up to the isolation valve to ensure that the main control room habitability pressure boundary is maintained. The wastewater that collects in the retention basins is routed to the Crystal River Energy Complex (CREC) discharge canal through the CWS blowdown.

### **9.2.9.2 Summary of Application**

Section 9.2 of the LNP COL FSAR, Revision 9, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the AP1000 DCD includes Section 9.2.9, “Waste Water System,” which addresses Section 9.3.3, “Equipment and Floor Drainage System,” of NUREG-0800.

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

#### AP1000 COL Information Item

- LNP COL 9.2-2

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

### **9.2.9.3 Regulatory Basis**

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the WWS are given in Section 9.3.3 of NUREG-0800.

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

- GDC 4

- GDC 60

#### **9.2.9.4 Technical Evaluation**

The NRC staff reviewed Section 9.2.9 of the LNP 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.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the LNP COL FSAR:

##### AP1000 COL Information Item

- LNP COL 9.2-2

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

The wastewater from the retention basin is routed to the CREC discharge canal through the CWS blowdown. The staff performed an initial review of Section 9.2.9 of the LNP COL FSAR and determined that the description of wastewater routing and components was insufficient. To address the COL items, additional information was needed before for the staff could review the adequacy of the site-specific wastewater retention basin and associated components.

In order to meet GDC 60, the applicant was asked to demonstrate suitable control of the release of radioactive materials in liquid effluent. The staff requested the applicant in Letter #51 related to RAI 9.3.3-1, to describe how the potentially radioactive effluents draining into the water basin will be monitored and justify the absence of water level instrumentation and radiation monitoring in the WWRB. The staff also requested the applicant provide additional details on the routing of water and a description of the associated components (i.e., transfer pumps, size of basin, etc.) as requested in COL Information Item 9.2-2.

The applicant responded to the staff's request in a letter dated June 23, 2009. The response provided additional information on radiation monitoring, level instrumentation and components for the WWRB.

The WWRBs are located southwest of LNP 1 and 2 near the sewage treatment plant. One basin is provided per unit. For redundancy, each unit is provided to intake the maximum possible flow from two units if one basin is out of service. The basins are constructed of reinforced concrete walls and continuously poured base mats with no construction joints in the mats or any exterior walls (except a construction joint with a waterstop may be used at the exterior wall/mat junction) and waterstops at all construction joints to minimize seepage. The size of the basins provides retention time for settling of solids larger than 10 microns that may be suspended in the wastewater stream.

Two 100 percent pumps for each retention basin are provided to transfer water from the WWRB to the CWS blowdown. For each retention basin, only one of the pumps will operate at any given time. The pumps will have separate feeds from the 480 volts alternating current (VAC) distribution system. In the event of a loss of offsite power (LOOP), power will not be supplied to the WWRB transfer pumps. The basin transfer pumps are designed to discharge a maximum of 850 gallons per minute (gpm) to the CWS blowdown.

The applicant confirmed that fluids discharging into the retention basin are either monitored with radiation monitoring instrumentation or preclude interconnection with systems containing radioactive fluids. The applicant further clarified that a radiation monitor will be installed on the common discharge of the basin transfer pumps and will provide an alarm and trip the basin transfer pumps upon detecting radioactivity in the waste water.

To protect against flooding, a level indicator and level transmitter are provided for each WWRB to automatically control flow out of the WWRB. High alarms will indicate basin level where operator action is required.

The applicant's response to RAI 9.3.3-1 above and subsequent incorporation into Section 9.2.9 of the LNP COL FSAR is acceptable to the staff. The LNP COL FSAR adequately addresses COL Information Item 9.2-2. Therefore, RAI 9.3.3-1 is resolved.

The staff finds that GDC 4 is met based on the WWS arrangement to prevent flooding that could adversely affect safety-related SSCs and GDC 60 is met based on the requirements for controlling the inadvertent release of radioactive materials by preventing the inadvertent transfer of contaminated fluids to system portions for noncontaminated drainage that could result in radioactive release to the environment.

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

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

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

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

### **9.2.10 Hot Water Heating System**

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

Section 9.2 of the LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.2.10 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 freshwater and saltwater subsystems. The RWS freshwater subsystem pumps water from ground water wells and the saltwater subsystem supplies water from the Cross Florida Barge Canal (CFBC), for use by the LNP units.

The RWS saltwater subsystem supplies raw (unprocessed) water for make-up to the CWS mechanical draft cooling tower basins. In addition, the unprocessed water is used for water for the make-up strainer backwash and for the screen wash pump suction source. The RWS saltwater subsystem supply pumps can also be used to provide alternate dilution flow for the liquid waste discharge when cooling tower blowdown is not available for the discharge path. Only the RWS saltwater subsystem is shared by the two LNP units through cross ties.

The RWS freshwater subsystem provides water from the ground water wells for make-up to the SWS cooling tower basins, the demineralizer water treatment system (DTS), PWS, and the fire protection system (FPS) fire water storage tanks. The RWS freshwater subsystem also provides the water for the strainer backwash and the media filter backwashes and an alternate make-up for the SWS via the secondary fire water storage tank clearwell to the cooling tower basin. The SWS cooling tower basins rely upon make-up from the RWS freshwater subsystem

in order to achieve and maintain cold shutdown conditions.

### **9.2.11.2 Summary of Application**

Section 9.2.11 of the LNP COL FSAR, Revision 9, provides information concerning the RWS design basis, system description, system operation, safety evaluation, tests and inspections, and instrumentation. The RWS was referred to in the AP1000 DCD in relation to the CWS, SWS, DTS, and FPS, but an RWS section was not included in the AP1000 DCD for the NRC staff to evaluate.

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

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

#### Interface Requirements

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

#### Supplemental Information

- LNP SUP 9.2-1

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 LNP units is provided in this section.

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

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

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

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

#### **9.2.11.4 Technical Evaluation**

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

The remainder of this SER section evaluates both LNP SUP 9.2-1 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 LNP COL FSAR Section 9.2.11 is to confirm that RWS failures will not adversely impact the control room occupants or adversely affect SSCs that are safety-related or designated for RTNSS. Although 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, more detailed information is needed to adequately describe the consequences of RWS failures and to explain why safety-related SSCs are not affected. Likewise, additional information is 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 is unable to confirm compliance with GDC 2, GDC 4, conformance with the guidance in RG 1.29, Position C.2, and passive plant policy considerations and passive plant policy considerations. The staff requested in RAI Letter #52 Question 9.2.1-2 that the applicant revise Section 9.2.11 to address the impact of RWS failures accordingly, including development of plant-specific ITAAC and test program specifications as appropriate.

In its response dated July 22, 2009, the applicant provided a detailed response to the GDC 2, GDC 4, ITAAC and testing questions. A summary of the applicant's response is described below.

The applicant stated that failure of the RWS piping located in the yard and inside the turbine building were considered.

The LNP RWS consists of two subsystems, a freshwater subsystem that supplies groundwater for make-up to the DTS, PWS, FPS fire water storage tanks, and SWS cooling tower basins; and a saltwater subsystem that supplies water from the CFBC for make-up to the CWS mechanical draft cooling tower basins. The potential failures of the two RWS subsystems and the corresponding impact on SSCs that are safety-related or AP1000 equipment Class D are described below.

For failure of RWS piping in yard areas, the saltwater subsystem of RWS does not directly interface with any safety-related system, but only interfaces with CWS. The piping is routed underground from the intake structure on the CFBC to the CWS cooling tower basin. The only above ground portions of the RWS saltwater subsystem are at the intake structure and at the CWS cooling tower basin. This piping is not routed in close proximity to any safety-related SSCs. DCD Section 3.4.1.1.1 indicates that a failure of the CWS cooling tower, the SWS piping, or the CWS piping could result in a potential flood source. However, these potential sources are located far from safety-related structures and the consequences of a failure in the yard would be enveloped by the analysis described in DCD Section 10.4.5 for failure of the CWS. Site grading will carry water away from safety-related or AP1000 Class D SSCs.

For failure of RWS piping in yard areas, the freshwater subsystem of RWS interfaces with DTS, FPS, PWS, and SWS, none of which are safety-related systems. The piping for the freshwater subsystem is routed underground from the wells to the well water storage tanks and from the media filters to the points of interface with the other systems. This piping is not routed in close proximity to any safety-related SSCs. The only RTNSS system in close proximity to this subsystem is the SWS. Because of the significant difference in system capacities, a resultant flood from a break in the RWS freshwater subsystem piping is bounded by the analysis for a break in the CWS piping.

For failure of RWS piping inside the turbine building, the RWS freshwater subsystem piping is routed outside in the yard area and inside the turbine building to the interface points with the SWS and DTS systems. The RWS-to-DTS interface is upstream of the DTS filters and DTS feed pumps. The primary source of flooding would be from the RWS water that discharges through the break prior to securing the raw water booster pumps. A break in the RWS piping to the DTS or the SWS is bounded by a break in the CWS piping. As discussed in DCD Section 3.4.1.2.2.3, the bounding flooding source inside the turbine building is a break in the CWS piping. Flow from any postulated pipe failures above DCD elevation 100'-0" (NGVD29 elevation 52'-0") would travel down to elevation 100'-0" via floor gratings and stairwells. There is also no safety-related equipment in the turbine building. The CCS and SWS components on elevation 100'-0", which provide RTNSS support for the normal residual heat removal system (RNS) are expected to remain functional following a flooding event in the turbine building since the pump motors and valve operators are above the expected flood level. Therefore, failure of the RWS piping within the turbine building will not adversely impact any safety-related or RTNSS SSCs.

The RWS-to-SWS interface and the effects of RWS failure is as follows:

The RWS to SWS interface is at the SWS make-up control valve V009, as shown in DCD Figure 9.2.1-1. The SWS piping is routed from the control valve V009 to the top of the SWS cooling tower basin. There is an air gap between the SWS cooling tower basin water level and the discharge. The air gap ensures any break upstream of the raw water make-up water path will not result in the draining of the SWS cooling tower basin.

No chemical treatment is anticipated for the LNP RWS freshwater subsystem make-up to SWS. Therefore, there are no chemical releases associated with RWS that could adversely impact control room habitability.

Section 2.4.13 of the LNP COL FSAR presents a conservative analysis of the effect of an accidental release of liquid effluents to the ground water environment through the postulated failure of the liquid waste system effluent holdup tank. A substantial release directly to the Floridan aquifer is unlikely. However, the impact on public and private water use was examined should such a release occur. LNP COL FSAR Table 2.4.13-205 shows bounding activity concentrations that could occur at the nearest private or public well 2 kilometers (km) (1.2 miles (mi)) from the LNP site. With the exception of tritium, the maximum activity concentration for each radionuclide at the closest well is negligible compared to the nuclides' effective concentration limit (ECL). The maximum activity concentration of tritium is less than 0.7 percent of its ECL. Therefore, the accidental release of effluents to groundwater results in effective dose equivalents that are very small fractions of the limits in 10 CFR Part 20, "Standards for protection against radiation," for water supplies derived from groundwater aquifers.

The RWS has no interconnection with any system that contains potentially radioactive fluids. The RWS 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. Thus, the possibility of releasing radioactivity from the RWS is remote.

Failure of the RWS or its components will not affect the ability of any other safety-related systems to perform their intended safety functions nor will it adversely affect any RTNSS systems. Postulated breaks in the RWS piping will not impact safety-related components because the RWS is not located in the vicinity of any safety-related equipment and the water from the postulated break will not reach any safety-related equipment, result in impact to the control room, or result in a release of radioactivity to the environment. Because the RWS is not safety-related and its failure does not lead to the failure of any safety-related systems, the requirements of GDC 2, GDC 4, and the guidance of NUREG-0800 Section 9.2.1 regarding safety-related systems, do not apply. Further, the applicant stated that RWS piping and structures are designed and constructed in accordance with nationally recognized codes and standards (such as ASME B31.1 and American Water Works Association (AWWA)). Design features have been included (such as the use of buried piping and power supply redundancy) to ensure RWS is reliable and will be available to support normal plant operation and shutdown functions.

As noted in FSAR Section 14.3.2.3.3, this site-specific system (RWS) does not meet the ITAAC selection criteria. ITAAC screening was performed for the RWS, using the screening criteria of FSAR Section 14.3.2.3, which concluded that ITAAC is not applicable as indicated in FSAR Table 14.3-201.

No specific Technical Specifications are required for the RWS and none are applicable.

Technical Specifications for the AP1000 are provided in FSAR Chapter 16, DCD Section 16.1, and were evaluated by the NRC in NUREG-1793, Chapter 16.

There are no availability controls for the RWS and they are not required based on the RTNSS evaluation in NUREG-1793, Chapter 22 and Westinghouse Commercial Atomic Power (WCAP)-15985, "AP1000 Implementation of the Regulatory Treatment of Nonsafety-Related Systems Process," Revision 2. Also, FSAR Chapter 16 and DCD Chapter 16 do not identify any availability requirements for the RWS.

The applicant stated that no change to the FSAR is proposed as a result of this response related to GDC 2 or GDC 4. The revised FSAR Section 9.2.11 is provided as part of the response to Question 9.2.1-3 and addresses the information discussed in the response to this question as appropriate, consistent with NRC guidance provided in RG 1.206, Section C.III.

The staff determined that failure of the RWS or its components will not affect the ability of any safety-related systems to perform their intended safety function nor will it adversely impact any Class D systems. Postulated breaks in the RWS piping will not impact safety-related components because the RWS is not located in the vicinity of any safety-related equipment, and the water from a postulated pipe break will not reach any safety-related equipment or result in injury to occupants of the control room or result in a release of radioactivity to the environment. Testing of the RWS has been properly addressed, and the RWS instrumentation requirements have been satisfied. In addition, the staff has determined that appropriate testing of the RWS was addressed in LNP COL FSAR Section 14.2. 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 GDC 4 and the guidance in RG 1.29 have been satisfied; therefore, Question 9.2.1-2 is resolved.

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

#### B. Cold Shutdown

The RWS is relied upon for achieving and maintaining cold shutdown conditions, which (in addition to the passive plant policy considerations discussed in SECY-94-084) is necessary for satisfying the 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 Section 9.2.11 does 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 make-up for the two LNP 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 is unable to confirm that the

cooldown and policy considerations that apply to passive plant designs are satisfied. The staff requested in RAI Letter #52 Question 9.2.1-3 that the applicant revise LNP COL FSAR Section 9.2.11 adequately define and address RWS design-bases considerations with respect to its cooldown function, and to develop plant-specific ITAAC and initial test program specifications as appropriate.

In a response dated July 22, 2009, the applicant stated the following:

RWS consists of two subsystems. The freshwater subsystem provides a continuous supply of groundwater for several plant services including make-up to the DTS, PWS, the FPS fire water storage tanks, and SWS cooling tower basins. The saltwater subsystem supplies water from the CFBC for fill and make-up to the CWS mechanical draft cooling tower basins.

This response specifically focuses on the RWS interface with the SWS because, as noted in the response to Question 9.2.1-2, the other functions performed by RWS do not have a direct interface with any other system identified as safety-related, designated for RTNSS, or designated as AP1000 Class D.

RWS provides a water fill/make-up function for the SWS. The SWS has investment protection short-term availability controls as described in DCD Table 16.3-2, which are applicable in Mode 5 with the RCS pressure boundary open and in Mode 6 with the upper internals in place or cavity level less than full. Under these conditions, SWS is directly providing active core cooling and, as noted in the response to Question 9.2.1-2, was evaluated by Westinghouse and determined to meet the RTNSS criteria as documented in NUREG-1793 and WCAP-15985. Unlike the SWS, the RWS does not directly provide core cooling and, as discussed in response to Question 9.2.1-2, the RWS support of the SWS cooling function was evaluated in WCAP-15985 and determined to not meet the RTNSS criteria and to not require investment protection short-term availability controls.

In the event of a failure of RWS to provide adequate make-up flow to the SWS cooling tower basins during the short time period in which SWS is performing a RTNSS function as stated above, the remaining 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 ample time (more than 24 hours) to restore the RWS make-up flow or take the procedural actions necessary to exit the conditions for applicability. Therefore, RWS is not a RTNSS system or subject to investment protection short-term availability controls. However, the RWS is designed to be a highly reliable and robust system, capable of operating during a loss of normal alternating current (ac) power to provide RWS make-up 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.

In DCD Section 5.4.7.1.2.1, the applicant describes that the RNS, in conjunction with its associated support systems, the CCS and SWS, are used for shutdown heat removal. The RWS provides indirect support for this function by providing a source of make-up

water to the SWS cooling tower basins to compensate for evaporation, drift, and blowdown. The RWS provides this make-up water to support the cooling requirements for SWS. During a normal plant cooldown, the RNS and CCS reduce the temperature of the RCS from approximately 121 °C (350 °F) to approximately 51.6 °C (125 °F) within 96 hours after shutdown. Each unit's RWS is designed to provide ample make-up flow during these conditions using the RWS pumps. The two raw water well pumps provide approximately 3936 liters/minute (1,040 gpm) each from the aquifer to the raw water storage tank, and the four raw water booster pumps provide 1892 liters/minute (500 gpm) each from the raw water storage tank. The SWS design make-up flow is approximately 3142 liters/minute (830 gpm).

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

An ample inventory of water is available to provide make-up to the SWS cooling tower basins. As noted in FSAR Section 2.4.12.2.4, as of 2005, Southwest Florida Water Management District (SWFWMD) had permitted approximately 83.133 million liters per day (mld) or 21.956 million gallons per day (mgd) of nondomestic groundwater use in the portion of LNP that falls within the SWFWMD. Approximately only 29.061 mld (7.677 mgd) or permitted capacity was used (total water demand, which includes unpermitted domestic demands, was 35.942 mld (9.495 mgd)). As stated in FSAR Section 2.4.1.1, an estimated average of 4.805 mld (1.269 mgd) and a maximum of approximately 22.139 mld (5.848 mgd) of groundwater will be used at the LNP site. Therefore, the groundwater usage at the LNP site will not result in a total groundwater use greater than that already permitted by the SWFWMD and thus, there is sufficient capacity to support cooldown to cold shutdown conditions and maintain the station in Mode 5 for greater than 7 days.

The lack of designation of RWS as RTNSS or Class D indicates there is no performance requirement for the system during a loss of normal ac power or in the event of a single active failure. Nonetheless, RWS is highly reliable based on its design, and a single failure of an active component in RWS would not affect normal plant cooldown. Make-up flow to the CWS is not normally required after the plant is shutdown; therefore, the RWS make-up pumps do not need to operate during a loss of normal ac power to cool the plant down during this event. Each raw water well pump and raw water booster pump can deliver make-up flow to the SWS cooling tower basins to meet demand during all normal modes of operation. Failure of an operating pump, discharge valve, or strainer would not prevent the RWS from providing make-up to the SWS cooling towers. The raw water well and booster pumps, discharge valves, and automatic strainer are powered from the normal ac power system and have a back-up power supply from the diesel generators. In the event of a loss of normal ac power, the components are manually loaded onto the appropriate diesel bus and are manually started by the

operator. Only one raw water well pump and one booster pump can be loaded on a diesel generator at a time. The valves associated with flow to the four 50 percent media filters fail in a position to provide continuous RWS filtered flow. The RWS pump discharge valves have handwheels to manually adjust the RWS flow as required. Twenty-four hours after a loss of normal ac power, the make-up requirement is 1014 liters/minute (268 gpm) (with blowdown reestablished), well within the capacity of one 1892 liters/minute (500 gpm) RWS booster pump. The RWS, therefore, continues to maintain the capability to provide make-up water to the SWS cooling tower basins during the loss of normal ac power events even with a single active failure of one standby diesel. The underground RWS piping will be HDPE, which is not susceptible to corrosion. Therefore, periodic inspections of the underground RWS piping are not required.

The saltwater subsystem intake bays at the intake structure will be inspected periodically for silt buildup and cleaned as necessary based on operating experience from other Progress Energy plants. Equipment that remains idle for extended periods of time (pumps, traveling screens, strainers) will be operated periodically in accordance with vendor recommended maintenance practices.

In the event that all RWS flow to the SWS cooling towers is lost, there is ample time to identify and correct the situation or to align alternate sources of water to provide that make-up flow, and RWS is shown to not be a RTNSS system nor subject to investment protection short-term availability controls. Neither the RNS, CCS, 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-1793.

As a follow-up to the applicant's response to Question 9.2.1-3, the staff requested additional clarification in the FSAR as stated in RAI Letter #67, Question 9.2.1-6 regarding: a) saltwater subsystem cross-tie between Units 1 and 2 and GDC 5, "Sharing of Structures, Systems and Components"; b) power supplies (backup) for raw water strainer; c) raw water storage capability; d) booster pump controls or interlocks; and e) system materials. In a letter dated October 22, 2009, the applicant provided the following response:

- a) Saltwater subsystem cross-tie discussion: The applicant stated that it is correct that FSAR Figure 10.4-201 describes the CWS and the saltwater subsystem of the RWS and indicates a cross-tie exists between Units 1 and 2. However, as noted in Section 9.2.11.2.1 of the FSAR, the RWS is shown in Figures 9.2-201 (freshwater subsystem) and 10.4-201 (saltwater subsystem). The RWS freshwater subsystem supplies strained and filtered groundwater for makeup to three plant systems and to the service water cooling tower basins. There is no cross-tie between the two units for the RWS freshwater subsystem. The functions of the RWS, other than the SWS makeup, do not have a direct interface with any other system identified with the AP1000, which is safety-related, designated for RTNSS, or designated as AP1000 Class D.

Criterion 5 of 10 CFR Part 50, Appendix A, states that SSCs important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units. Because only the freshwater subsystem of RWS has a direct interface with any system that is safety-related, RTNSS, or designated as AP1000 Class D, and because the freshwater subsystem of RWS has no cross-tie between units, including a discussion of the RWS system cross-tie in the FSAR is not required.

The staff finds item 'a' acceptable since the cross-tie between the saltwater subsystem is not considered important to safety; therefore, GDC 5 does not apply. The freshwater subsystem of RWS has no cross-tie between units. In addition, the freshwater subsystem of RWS has no direct interface with any system that is safety-related, RTNSS, or designated as AP1000 Class D.

- b) Strainer power supplies: The applicant stated that the strainer is designed to fail "as-is" under loss of power and does not need a back-up power supply. There is also a bypass line around the strainer with a normally closed manual valve that can be operated in the unlikely event the strainer becomes fouled during loss of normal power. A differential pressure transmitter is installed across the strainer and will alert operators if the strainer becomes fouled.

As noted in the response to Question 9.2.1-3, the entire FSAR Section 9.2.11 is being revised. Section 9.2.11.2.2.1, "Valves," states the RWS makeup water pump discharge valves have a backup power feed from the diesel generators. A clarification will be made to the revised FSAR Section 9.2.11.2.2.1, "Automatic Self-Cleaning Strainer," that the strainer is designed to fail as-is during loss of normal ac power.

The staff finds item 'b' acceptable since the strainer can be operated manually on its bypass if the strainer becomes fouled during a loss of normal power, thus the functional loss of the strainer has no negative effects for the RWS.

- c) Raw water storage capability: As noted in FSAR Section 9.2.11.2.2.1, "Raw Water Well Pumps," two 100 percent capacity well pumps for each unit are supplied. Only one of those pumps is designed to operate at a time. Both pumps can be manually loaded onto the standby diesel generator bus although only one can be loaded at a time. Thus, sufficient redundancy is provided in the system design to reasonably expect at least one of the well pumps will be available to supply makeup water in the event of a loss of normal ac power. For this reason, it is not necessary to postulate impacts to the SWS cooling tower basin supply if both well pumps are not available to support cooldown. Minimum dimensions for the raw water storage tank are provided in FSAR Section 9.2.11.2.2.1, "Raw Water Storage Tank," which is 9.1 meters (30 feet) in diameter x 9.1 meters (30 feet) tall.

The staff finds item 'c' acceptable since either of the two freshwater pumps can be manually loaded onto the emergency power supply generator; thus, sufficient redundancy exists for the RWS to support plant cold shutdown. In addition, the staff concludes that the raw water storage tank has a capacity to hold approximately 567,000 liters (150,000 gallons) of raw water to support plant operations to support cold shutdown.

- d) **Booster pump controls or interlocks:** There are no automatic booster pump controls or interlocks associated with the raw water storage tank level. As noted in FSAR Section 9.2.11.6.1, a level control system in the tank provides automatic start and stop control for the raw water well pumps. Normally, one well pump is in operation. The level control system starts the second well pump at very low tank levels and stops the pump when 50 percent level is established in the tank. Because the capacity of the well pumps is approximately double that of the booster pumps, filling of the storage tank by the well pumps occurs more quickly than emptying the tank by the booster pumps.

In addition, a redundant level transmitter on the raw water storage tank will provide continuous level indication and input to a low level alarm in the main control room (MCR). The low level alarm setpoints for the diverse level instrumentation ensure the operators are informed of an abnormal low level before the minimum net positive suction head (NPSH) requirements for the booster pumps are reached. This will allow plant operators to promptly detect low level in the tank and initiate corrective action as needed. This description will be added to the FSAR.

The staff finds item 'd' acceptable since the raw water storage tanks is maintained full by the level control systems that controls the well pumps and low level alarm setpoints for the storage tank ensures the operators are informed of an abnormal low level before the minimum NPSH requirements for the booster pumps are reached.

- e) **System materials:** The FSAR will be revised to reflect the use of HDPE piping in the buried portions of the RWS system. However, the applicant has not discussed the ASME Code for power piping for the RWS in the text of the FSAR. In a telephone call, the applicant agreed to include the RWS power piping code in the FSAR in a revision to this response.

The staff finds item 'e' acceptable since buried HDPE will be designed and installed in accordance with industry Codes such as ASME B31.1 and 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.

In summary, the staff finds that the RWS is designed with the provision to protect against single failure since many of the freshwater subsystem RWS components can be supplied with backup

power from the onsite diesel generators as necessary or operated locally. During a loss of station power, RWS make-up to the SWS is not required for 12 hours due to existing cooling tower basin inventory. After 12 hours, onsite make-up capacity from the fire protection storage tank is available for more than an additional 12 hours. In addition, the RWS is considered highly reliable and able to supply required water for the SWS for greater than 7 days due to the redundancies of pumps and other well water subsystem components. Since the RWS is not safety-related and its failure does not lead to the failure of any safety-related systems, the staff concludes that the RWS system design is consistent with the guidance in SECY-94-084; therefore, Question 9.2.1-3 and Question 9.2.1-6 are resolved. All associated FSAR markups provided by the applicant have been incorporated into Revision 2 of the COL FSAR.

### C. Regulatory Treatment of Nonsafety-Related System

The RWS supports the SWS cooling function by providing make-up 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 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 the RWS make-up is not required for this situation. Consequently, the staff requested in RAI Letter #52 Question 9.2.1-4 that the applicant revise Section 9.2.11 to explain why the RWS make-up 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 its response to this question dated July 22, 2009, the applicant stated that the RWS does not have a direct interface with any other system identified within the AP1000, which is safety-related, designated for RTNSS, or 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 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. Unlike the SWS, the applicant stated that the 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. In addition, the applicant stated that 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 recognized throughout the AP1000 DCD and NUREG-1793.

The staff finds the applicant's response to Question 9.2.1-4 acceptable since: 1) the RWS was previously evaluated in WCAP-15985 in Table 1-1, "Nonsafety-related System Evaluation in AP1000 RTNSS Process," which was previously approved by the staff; 2) the RWS does not directly provide core cooling; 3) the RWS has no direct RTNSS applicability; and 4) the RWS has adequate stored water within the SWS cooling towers and fire water tank for more than 24 hours to support the SWS RTNSS functions. The 24 hours stored on site water supply provides ample time to restore RWS makeup flow or take the procedural actions necessary to

exit the condition of applicability for the SWS and its RTNSS function. Therefore, Question 9.2.1-4 is resolved.

#### D. System Design Consideration

As stated in LNP COL FSAR Section 9.2.11.4, the liquid waste stream effluent is released offsite through a dilution flow stream. Dilution flow is routed from the RWS to the CWS cooling tower blowdown during shutdown conditions. During normal operation, the CWS circulating water pumps provide dilution flow to the cooling tower blowdown pipe. Contamination of the RWS is not possible since the liquid waste stream effluent enters the blowdown pipe downstream of the RWS interface.

As specified by 10 CFR 20.1406, COL applicants are required to describe how the 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 Letter #52 Question 9.2.1-5 that the applicant provide additional information to describe design provisions and other measures that will be implemented to satisfy the requirements specified by 10 CFR 20.1406, including measures that will be implemented to monitor the RWS for contamination and corrective actions that will be taken to eliminate any radioactive contamination that is identified.

In its response dated July 22, 2009, the applicant stated that the RWS has no interconnection with any system that contains potentially radioactive fluids as shown on FSAR Figures 9.2-201 and 10.4-201. The RWS operates at a higher system pressure than the SWS and CWS, systems that it directly interfaces with (at the point of interface). Therefore in-leakage is not feasible. In addition, the applicant indicated that the groundwater monitoring program should minimize the possibility of contaminating the RWS from external subsurface sources. The applicant noted that the ground water monitoring program is described in LNP COL FSAR Section 12AA.5.4.14. The staff's evaluation of the groundwater monitoring program is provided in Chapter 12 of this SER. Because there is no interconnection with any system that contains potentially radioactive fluids as indicated in LNP COL FSAR Section 9.2.11.1.1, the staff concludes that the requirements of 10 CFR 20.1406 are satisfied.

The staff finds that the applicant adequately addressed the 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. The staff considers the applicant's resolution of this issue to be acceptable, and Question 9.1.2-5 is resolved.

To address the fire protection interface with the RWS, the applicant states that the freshwater subsystem is filtered by media filters before being delivered to the fire water tanks; therefore, the staff finds this acceptable because it ensures that the FPS is appropriately maintained with respect to the interface with the RWS. The staff's evaluation of the FPS is included in Section 9.5.1.

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

#### **9.2.11.5 *Post Combined License Activities***

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

#### **9.2.11.6 *Conclusion***

The NRC staff has evaluated the RWS as described in LNP 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 LNP RWS, as described under LNP SUP 9.2-1 in Section 9.2.11 of the LNP COL FSAR, is acceptable.

### **9.3 Process Auxiliaries**

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

##### **9.3.1.1 *Introduction***

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

##### **9.3.1.2 *Summary of Application***

Section 9.3 of the LNP COL FSAR, Revision 9, incorporates by reference Section 9.3 of the AP1000 DCD, Revision 19. Section 9.3 of the AP1000 DCD includes Section 9.3.1.

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

### Departures

- LNP DEP 6.4-2

The applicant provided additional information in Section 9.3.1.1.2 of the LNP COL FSAR about LNP DEP 6.4-2 related to design changes affecting how the temperature and humidity in the main control room are maintained within the limits for reliable human performance. This information, as well as related LNP DEP 6.4-2 information appearing in other chapters of the FSAR, is reviewed in Section 21.3 of this SER.

### AP1000 COL Information Item

- STD COL 9.3-1

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

#### **9.3.1.3 Regulatory Basis**

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the compressed and instrument air system are given in Section 9.3.1 of NUREG-0800.

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

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

#### **9.3.1.4 Technical Evaluation**

The NRC staff reviewed Section 9.3.1 of the LNP 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.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside of the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP

Units 3 and 4) were equally applicable to the LNP Units 1 and 2 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5 to the LNP COL FSAR. In performing this comparison, the staff considered changes made to the LNP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.
- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.
- The staff verified that the site-specific differences were not relevant.

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

The following portion of this technical evaluation section is reproduced from Section 9.3.1.4 of the VEGP SER:

*AP1000 COL Information Item*

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

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

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

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

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

*The applicant proposed to resolve STD COL 9.3-1 by providing training and procedures for operations and maintenance of the instrument air subsystem and air operated valves. The methodology to develop system operating procedures, abnormal operating procedures, and alarm response procedures is reviewed in Section 13.5 of this SER. The training program for operators and maintenance personnel is reviewed in Section 13.2 of this SER. The applicant also stated that the compressed and instrument air system will be maintained and tested in*

*accordance with the manufacturers' recommendations and procedures and that the system will be periodically tested to demonstrate conformance with the quality requirements of ANSI/ISA-7.3-1981.*

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

#### **9.3.1.5 Post Combined License Activities**

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

#### **9.3.1.6 Conclusion**

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

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

- LNP DEP 6.4-2, related to design changes affecting how the temperature and humidity in the main control room are maintained within the limits for reliable human performance, is reviewed and found acceptable by the staff in Section 21.3 of this SER.
- 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 LNP COL FSAR meets the guidance in NUREG-0933, Issue 43 and is acceptable.

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

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

Section 9.3 of the LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.3.2, "Plant Gas System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating

to this section remained for review.<sup>1</sup> 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 LNP 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 Post Accident 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.3.3, "Primary Sampling System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 Post Accident 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.3.4, "Secondary Sampling System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.3.5, "Equipment and Floor Drainage Systems," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to

ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

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

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

Section 9.3 of the LNP COL FSAR, Revision 9, incorporates by reference, Section 9.3.6, "Chemical and Volume Control System," of Revision 19 of the AP1000 DCD. In addition, in the LNP COL FSAR, the applicant provided the following:

#### Departures

- LNP DEP 7.3-1

The applicant provided additional information in Section 9.3.6 of the LNP COL FSAR about LNP DEP 7.3-1 related to required design changes for the PMS source range neutron flux doubling logic to comply with the requirements of IEEE Std. 603-1991, Clause 6.6. This information, as well as related LNP DEP 7.3-1 information appearing in other chapters of the FSAR, is reviewed in Section 21.5 of this SER.

The NRC staff reviewed Section 9.3.6 of the LNP 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 section. The NRC staff's review confirmed that the applicant addressed the required information to satisfy the evaluation criteria. There is no outstanding information expected to be addressed in the LNP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the LNP COL application are documented in NUREG-1793 and its supplements.

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

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

#### **9.4.1.1 Introduction**

The VBS, in conjunction with the MCR emergency habitability system described in Section 6.4, provides a controlled environment for the comfort and safety of control room personnel and

assures the operability of control room and nearby components during normal operating, anticipated operational transient, and design-basis accident conditions.

#### **9.4.1.2 Summary of Application**

Section 9.4 of the LNP COL FSAR, Revision 9, incorporates by reference Section 9.4 of the AP1000 DCD, Revision 19. Section 9.4 of the DCD includes Section 9.4.1, describing the VBS.

In addition, in LNP COL FSAR Sections 9.4.1, 9.4.1.4, and 9.4.12, the applicant provided the following:

##### Departures

- LNP DEP 6.4-1

The applicant provided additional information in Section 9.4.1 of the LNP COL FSAR about LNP DEP 6.4-1 related to design changes affecting habitability of the main control room and changes to the calculated doses to control room operators. This information, as well as related LNP DEP 6.4-1 information appearing in other chapters of the FSAR, is reviewed in Section 21.2 of this SER.

- LNP DEP 6.4-2

The applicant provided additional information in Section 9.4.1 of the LNP COL FSAR about LNP DEP 6.4-2 related to design changes affecting how the temperature and humidity in the main control room are maintained within the limits for reliable human performance. This information, as well as related LNP DEP 6.4-2 information appearing in other chapters of the FSAR, is reviewed in Section 21.3 of this SER.

##### 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 LNP COL FSAR Section 9.4.12, the applicant provided the following:

- LNP COL 9.4-1b

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

### **9.4.1.3 Regulatory Basis**

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the VBS are given in Section 9.4.1 of NUREG-0800.

The applicable regulatory guidance for the VBS is as follows:

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

### **9.4.1.4 Technical Evaluation**

The NRC staff reviewed Section 9.4.1 of the LNP 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.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the LNP Units 1 and 2 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5 to the LNP COL FSAR. In performing this comparison, the staff considered changes made to the LNP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.
- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.
- The staff verified that the site-specific differences were not relevant.

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

The following portion of this technical evaluation section is reproduced from Section 9.4.1.4 of the VEGP SER:

AP1000 COL Information Items

- STD COL 9.4-1a

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

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

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

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

*The NRC staff reviewed STD COL 9.4-1a related to COL Action Item 9.4-1 included under Section 9.4.1.4 of the BLN COL FSAR. The NRC staff reviewed the resolution to STD COL 9.4-1a on the proposed implementation of a program to maintain compliance with industry standards and RGs for the VBS included under Section 9.4.1.4 and Section 9.4.12 of the BLN COL FSAR, and concludes that this item has been resolved for the VBS because the applicant has referenced the applicable regulatory guide and industry standards.*

Correction of Error in the Standard Content Evaluation Text

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

- LNP COL 9.4-1b

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

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

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

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

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

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

The NRC staff review of LNP 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 LNP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the LNP 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. The staff based its conclusion on the following:

- LNP DEP 6.4-1, related to design changes affecting habitability of the main control room and changes to the calculated doses to control room operators, is reviewed and found acceptable by the staff in Section 21.2 of this SER.
- LNP DEP 6.4-2, related to design changes affecting how the temperature and humidity in the main control room are maintained within the limits for reliable human performance, is reviewed and found acceptable by the staff in Section 21.3 of this SER.

- STD COL 9.4-1a, related to a program for inspections and testing applicable to the VBS, is adequately addressed by the applicant and is resolved.
- LNP COL 9.4-1b, addressing the local toxic gas services are evaluated to determine the need for monitoring for control room habitability, is reviewed by the staff 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.4.2, “Annex/Auxiliary Buildings Nonradioactive HVAC System,” of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.4.3, “Radiologically Controlled Area Ventilation System,” of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

#### **9.4.4 Balance-of-Plant Interface**

This section is not applicable to AP1000.

#### **9.4.5 Engineered Safety Features Ventilation System**

This section is not applicable to AP1000.

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

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

Section 9.4 of the LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.4.6, “Containment Recirculation Cooling System”, of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 LNP COL FSAR, Revision 9, incorporates by reference Section 9.4 of the AP1000 DCD, Revision 19. Section 9.4 of the DCD includes Section 9.4.7, “Containment Air Filtration System,” which addresses Section 9.4.5, “Engineered Safety Feature Ventilation System,” of NUREG-0800.

In addition, in LNP 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 LNP COL FSAR.

### **9.4.7.3 Regulatory Basis**

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

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

The applicable regulatory guidance for the VFS is as follows:

- RG 1.140

### **9.4.7.4 Technical Evaluation**

The NRC staff reviewed Section 9.4.7 of the LNP 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.<sup>1</sup> The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the VFS. The results of the NRC staff's evaluation of the information incorporated by reference in the LNP COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the LNP Units 1 and 2 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5 to the LNP COL FSAR. In performing this comparison, the staff considered changes made to the LNP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.
- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.
- The staff verified that the site-specific differences were not relevant.

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

The following portion of this technical evaluation section is reproduced from Section 9.4.7.4 of the VEGP SER:

AP1000 COL Information Item

- STD COL 9.4-1a

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

*The Combined License applicants referencing the AP1000 certified design will implement a program to maintain compliance with ASME AG-1, ASME N509, ASME N510, and Regulatory Guide 1.140 for portions of the nuclear island nonradioactive ventilation system and the containment air filtration system identified in subsection 9.4.1 and 9.4.7. The Combined License applicant will also provide a description of the MCR/TSC HVAC subsystem's recirculation mode during toxic emergencies, and how the subsystem equipment isolates and operates, as applicable, consistent with the toxic issues, including conformance with Regulatory Guide 1.78, to be addressed by the Combined License applicant as discussed in DCD subsection 6.4.7.*

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

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

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

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

Correction of Error in the Standard Content Evaluation Text

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

#### **9.4.7.5 Post Combined License Activities**

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

#### **9.4.7.6 Conclusion**

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

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

#### **9.4.8 Radwaste Building HVAC System**

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

Section 9.4 of the LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.4.8, "Radwaste Building HVAC System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.4.9, "Turbine Building Ventilation System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.4.10, "Diesel Generator Building Heating and Ventilation System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.4.11, "Health Physics and Hot Machine Shop HVAC System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

## **9.5 Other Auxiliary Systems**

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

#### **9.5.1.1 *Introduction***

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

#### **9.5.1.2 *Summary of Application***

Section 9.5 of the LNP COL FSAR, Revision 9, incorporates by reference Section 9.5 of the AP1000 DCD, Revision 19. Section 9.5 of the AP1000 DCD includes Section 9.5.1.

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

#### **Departures**

- LNP DEP 6.3-1

The applicant revised DCD Table 9.5.1-1, "AP1000 Fire Protection Program Compliance with BTP CMEB 9.5-1," Sheet 11 of 33, as new LNP COL FSAR Table 9.5.1-201, providing additional information about LNP DEP 6.3-1 related to quantifying the duration that the passive residual heat removal system heat exchanger can maintain safe shutdown conditions, changing the indefinite duration to greater than 14 days. This information, as well as related LNP DEP 6.3-1 information appearing in other chapters of the LNP COL FSAR, is reviewed in Section 21.1 of the SER.

#### **AP1000 COL Information Items**

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

The applicant provided additional information in STD COL 9.5-1 and STD COL 9.5-3 to resolve COL Information Items 9.5-1 and 9.5-3 (COL Action Item 9.5.1-1(a) through 9.5.1-1(o)) by establishing the site-specific implementation of the fire protection program, including the organization, responsibility, qualification, and training for fire protection program personnel and fire brigade members in Section 9.5.1.8, "Fire Protection Program," and in Appendix 9A of the LNP 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 LNP 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.

- LNP COL 9.5-1

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

- LNP COL 9.5-2

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

#### Supplemental Information

- STD SUP 9.5-1

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

#### License Conditions

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

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

#### **9.5.1.3 Regulatory Basis**

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

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

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

- RG 1.189, "Fire Protection for Nuclear Power Plants"
- 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 LNP 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.<sup>1</sup> The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the FPS. The results of the NRC staff's evaluation of the information incorporated by reference in the LNP COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the LNP Units 1 and 2 COL application, the staff undertook the following reviews:

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

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.
- The staff verified that the site-specific differences were not relevant.

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

The following portion of this technical evaluation section is reproduced<sup>3</sup> from Section 9.5.1.4 of the VEGP SER:

*Supplemental Information*

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

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

*AP1000 COL Information Items*

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

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

*The Combined License applicant will address qualification requirements for individuals responsible for development of the fire protection program, training of firefighting personnel,*

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<sup>3</sup> Only the BLN SER text relevant to LNP 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 LNP, it was not reproduced here. Also, the discussion of LNP COL 9.5-2 (corresponds to BLN COL 9.5-2) was moved to the end of this technical evaluation section.

*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.*

#### License Conditions

- *License Condition 3, addressing the Fire Protection Program implementation milestones*
- *License Condition 6, addressing the Fire Protection Program implementation schedule*

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

- *Milestone D.1 states that the applicable portions of the Fire Protection Program will be implemented prior to initial receipt of fuel onsite.*
- *Milestone G.6 states that the Fire Protection Program will be implemented prior to initial fuel load.*

*In Part 10 of the BLN COL FSAR, proposed License Condition 6, “Operational Program Readiness,” the applicant states:*

*The licensee shall submit to the appropriate Director of the NRC, a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of the NRC inspection of the operational programs listed in the operation program FSAR Table 13.4-201. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the operation programs in the FSAR table have been fully implemented or the plant has been placed in commercial service.*

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

#### *Correction of Error in the Standard Content Evaluation Text*

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

#### *Resolution of Standard Content Confirmatory Item 9.5-1*

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

#### *Proposed License Condition 3. Item C.2*

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

*Protection Program in accordance with RG 1.189 by identifying and providing the implementation schedule for each of the operational program aspects of the Fire Protection Program.*

AP1000 COL Information Items

- LNP COL 9.5-1

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

- The responsibilities of the engineer in charge of fire protection and his staff.
- The organization of the fire brigade.
- The engineer in charge of fire protection is responsible for the formulation and implementation of the fire protection program and meets the qualification requirements listed in LNP COL FSAR Section 13.1.2.1.4.9.

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

- LNP COL 9.5-2

The applicant provided additional information in LNP 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.

This 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 analysis as required by LNP COL 9.5-2 related to the site-specific fire protection information included under Section 9.5.1.9.2 and Section 9A.3.3 of the LNP COL FSAR, and determined that the yard area, administration building and other outlying areas are adequately described in accordance with RG 1.189 in the fire hazard analysis, which is, therefore, acceptable.

### Resolution of Site-Specific RAIs

In addition to the review of the standard content, the staff also reviewed LNP site-specific content and issued letters 6 and 7 that requested site-specific RAIs, RAIs 9.5.1-1 and 9.5.1-2, related to the filtering and chemical treatment of the fire water supply system and qualifications of the engineer in charge of fire protection, respectively.

In its response dated February 19, 2009, to the site-specific RAI related to the filtering and chemical treatment of the fire water supply system to prevent or control bio-fouling or microbiologically-induced corrosion of the fire water system, the applicant revised FSAR Section 9.2.11.3.2 to state that chemical injection points are provided to treat the raw water supply to the FPS fire water storage tanks with sodium hypochlorite. Effectiveness of the treatment is monitored by periodic sample inspections of the wetted portions of the FPS headers. Based on the above, the staff finds the applicant has adequately provided a program for maintaining an adequate level of quality for the fire protection water system in accordance with 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 FSAR Section 13.1.2.1.4.9 to state that the engineer in charge of fire protection is trained and experienced in nuclear safety or has available personnel who are trained and experienced in nuclear plant safety. In addition, this FSAR section states that in accordance with RG 1.189, the engineer in charge of fire protection is a graduate of an engineering curriculum of accepted standing and has completed not less than 6 years of engineering experience, three of which were in a responsible position in charge of fire protection engineering work. Based on the above, the staff finds the description of the fire protection engineer qualifications is in accordance with RG 1.189 and, therefore, is acceptable.

#### **9.5.1.5 Post Combined License Activities**

The license condition language in this section has been clarified from previously considered language. In a letter dated March 22, 2016 (ADAMS Accession No. ML16084A099), the applicant did not identify any concerns with the clarified license condition language. The changes do not affect the staff's above analysis of the conditions, and therefore, for the reasons discussed in the technical evaluation section above, the staff finds the following license conditions acceptable:

- License Condition (9-2) – The licensee shall implement the Fire Protection Program or applicable portions thereof as described in the milestones below:
  1. The fire protection measures in accordance with Regulatory Guide (RG) 1.189 for designated storage building areas (including adjacent fire areas that could affect the storage area) implemented before initial receipt of byproduct or special nuclear materials that are not fuel (excluding exempt quantities as described in 10 CFR 30.18);
  2. The fire protection measures in accordance with RG 1.189 for areas containing new fuel (including adjacent areas where a fire could affect the new fuel) implemented before receipt of fuel onsite;

3. All fire protection program features implemented before initial fuel load;
  - License Condition (9-3) – No later than 12 months after issuance of the COL, the licensee shall submit to the Director of the NRO a schedule 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 the FP Program has been fully implemented.

#### **9.5.1.6 Conclusion**

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

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

- LNP DEP 6.3-1, related to quantifying the duration that the passive residual heat removal system heat exchanger can maintain safe shutdown conditions, is reviewed and found acceptable by the staff in Section 21.1 of this SER.
- 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 LNP is adequately addressed by the applicant and is resolved.
- STD COL 9.5-4, addressing the deviations from the applicable NFPA codes and standards and to those in the AP1000 DCD is also adequately addressed by the applicant and is resolved.
- STD COL 9.5-6, addressing the establishment of a process for identifying deviations between the as-built installation of fire barriers and their tested configurations is adequately addressed by the applicant and is resolved.
- STD COL 9.5-8, addressing establishment of procedures to minimize risk for fire areas breached during maintenance is adequately addressed by the applicant and is resolved.
- STD COL 9.5-3, addressing the site-specific implementation of the Fire Protection Program is adequately addressed by the applicant and is resolved.
- LNP COL 9.5-1, addressing the plant-specific issues for the fire protection program at LNP, is adequately addressed by the applicant and is resolved.

- LNP COL 9.5-2, addressing the site-specific fire protection analysis information for the LNP yard areas and outlying buildings 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 LNP COL FSAR, Revision 9, incorporates by reference Section 9.5 of the AP1000 DCD, Revision 19. Section 9.5 of the DCD includes Section 9.5.2.

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

#### AP1000 COL Information Items

- LNP COL 9.5-9, involving offsite interfaces

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

- LNP COL 9.5-10, involving emergency offsite communications

The applicant provided additional information in LNP 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 NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the communications system are given in Section 9.5.2 of NUREG-0800.

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

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

The regulatory basis for LNP 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”
- 10 CFR 73.46(f), “Fixed site physical protection systems, subsystems, components, and procedures”
- 10 CFR 73.55(j), “Requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage”

#### **9.5.2.4 Technical Evaluation**

The NRC staff reviewed Section 9.5.2 of the LNP 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.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

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

#### **AP1000 COL Information Items**

- LNP COL 9.5-9

The applicant provided additional information in LNP 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 staff reviewed the resolution to LNP COL 9.5-9 involving offsite interfaces included under Section 9.5.2.5.1 of the LNP COL FSAR. To determine how the applicant addressed NRC Bulletin (BL) 80-15, "Possible Loss of Emergency Notification System (ENS) with Loss of Offsite Power," the staff requested additional clarification on the design of the site's primary and emergency power supplies by issuing RAI 2226 to the applicant. In its response dated March 11, 2011, the applicant committed to revising FSAR Section 9.5.2.2.5 in Revision 3 to provide the following information:

The Emergency Notification System (ENS) onsite primary power supply is backed up by automatic transfer to a highly reliable secondary power supply, which complies with the requirements of NRC Bulletin 80-15 regarding loss of offsite power to the ENS. The ENS is accomplished by the communications system (EFS). The subsystems of the EFS that accomplish the ENS function are the wireless telephone system, telephone/page system and the private automatic branch system (PABX) system. These communication subsystems are independent of one another; therefore, a failure in one subsystem does not degrade performance of the other subsystems. Per DCD Subsections 9.5.2.2.1, 9.5.2.2.2, and 9.5.2.2.3, the normal 120-V ac power supplies the wireless telephone switch, the telephone/page system, and the PABX system. Upon loss of the normal power, the telephone switch, the telephone/page system, and the PABX system are powered from the non-Class 1E dc and uninterruptible power supply system sized to supply power for 120 minutes.

The non-Class 1E dc and UPS system (EDS) is described in DCD Subsection 8.3.2.1.2 and the on-site standby power system (ZOS) is described in DCD Subsection 8.3.1.1.2.1. The non-Class 1E main ac power system (ECS) is described in DCD Subsection 8.3.1 1.1.

Offsite interfaces and emergency offsite communications are specifically discussed in Section F of the LNP COL Emergency Plan (EP). The emergency offsite communications between the site and NRC are described as follows:

- Emergency Notification System (ENS): Provides initial notifications to the NRC, as well as ongoing information about plant systems, status and parameters. ENS lines are located in the Control Rooms, Technical Support Centers (TSCs), and Emergency Operating Facility (EOF).
- Health Physics Network (HPN): Provides communications regarding radiological and meteorological conditions, assessments, trends, and protective measures. HPN lines are located in the TSCs and EOF.

- Reactor Safety Counterpart Link (RSCL): Allows for internal NRC discussions regarding plant and equipment conditions. RSCL lines are located in the TSCs and EOF.
- Protective Measure Counterpart Link (PMCL): Allows for conduct of internal NRC discussions on radiological releases, meteorological conditions, and protective measures. PMCL lines are located in the TSCs and EOF.
- Emergency Response Data System (ERDS) Channel: Allows transmittal of reactor parametric data from LNP Nuclear Plant (LNP) to the NRC. ERDS data is transmitted to the NRC Operations Center in Rockville, Maryland. ERDS provides a real-time transfer of plant data from LNP information systems. Duke Energy will activate the ERDS within one hour of the declaration of an Alert or higher emergency classification in accordance with LNP implementing procedures.
- Management Counterpart Link (MCL): This system has been established for internal discussions between the NRC Executive Team Director/members and the NRC Site Team Director or Duke Energy management. MCL lines are located in the TSCs and EOF.
- NRC Remote Access: Provides access to the NRC local area network (LAN). Modem access is provided in the TSCs and EOF for NRC access.

Additional onsite/offsite communications methods are described as follows:

- Commercial Telephones: Commercial telephones are located throughout LNP. These phones operate through the Florida Telephone switchboard located in Leesburg, Florida.
- DEF Voicenet System: The Voicenet System interconnects all Duke Energy Florida (DEF) plants, major substations, and main offices. Voicenet serves as the primary connection for ENS and is interconnected with the area public telephone system. This communication service is available throughout the DEF service area. The DEF Voicenet system routes calls independently of the local telephone lines that are used for the ENS function but will use these lines if available to route a call. This also allows the ENS function to be routed geographically independent of the local phone connections, thereby achieving the reliability required in Regulatory Issue Summary (RIS) 2000-11, "NRC Emergency Telecommunications System." Backup for Voicenet is commercial telephone lines. The Voicenet system is wholly owned and operated by Duke Energy.
- The Florida Emergency Satellite Communications System (ESATCOM): This is an intrastate communications system that is operated by the State of Florida Division of Emergency Management in Tallahassee, Florida. The system connects the State Warning Point-Tallahassee (SWPT), state agencies, all Florida counties; weather service forecast offices, nuclear facilities, and other select locations via a satellite communications link. Voice transmissions from any of the locations are received at all other locations. The satellite dish is located at LNP with connections to the Control

Rooms, TSCs, and EOF. The LNP Control Room ESATCOM will provide back-up communications for notification of an emergency at LNP.

- Private telephone capability to the county and state warning points/Emergency Operation Centers (EOCs).
- Dedicated radio networks to the state and county warning points/EOCs.
- State of Florida Hot Ringdown Telephone System (HRTS): This system serves as the primary means of 24-hour per day communications between the following areas:
  - LNP Control Rooms
  - TSCs
  - SWPT
  - Department of Health, Bureau of Radiation Control (DHBRC)
  - Citrus County EOC
  - Levy County EOC
  - Marion County EOC

The HRTS consists of three separate networks utilizing dedicated telephone circuits to communicate with the SWPT. LNP will be able to dial all stations on the circuit or call a selected station(s). Each network includes LNP; the SWPT; Citrus, Levy and Marion County EOCs; the EOF; and the DHBRC. All stations on the network can call all or a selected number of other stations by utilizing a dial-up code. There are three separate conference-line phone systems established:

- Between the EOF and TSCs for emergency status information.
- Between the Control Rooms, TSCs and EOF for dose assessment information.
- Between the TSCs and Control Rooms for accident assessment information.

Appendix E to 10 CFR Part 50, Section IV.E(9) requires at least one onsite and one offsite communications system; each system shall have a backup power source. In addition, NRC BL 80-15 states that the applicant should provide backup power sources for the ENS in case of loss of offsite power. The emergency communications design for the LNP COL application provides multiple methods for both onsite and offsite communications including landlines dedicated for communications to the NRC, commercial lines and multiple forms of wireless communications such as satellite phones and radio networks. For the LNP COL application, the ENS is powered by the 120V-ac power system. Should a loss of the ac power system occur, the ENS is automatically switched over to the diesel backed, non-Class 1E direct current (dc) and uninterruptible power supply systems.

The staff finds the design of the emergency communications system provides sufficient means for onsite and offsite communications, with adequate backup communications methods. In addition, the staff finds that the design also provides adequate primary and backup power sources, to meet the requirements of Appendix E to 10 CFR Part 50, Section IV.E(9). The use

of an uninterruptible power supply and diesel generator to provide backup power to the ENS in case of loss of offsite power adequately addresses NRC BL 80-15. The applicant committed to revising Section 9.5.2.2.5 in Revision 3 of the LNP COL FSAR to add the content quoted above and deleting the content that exists in Revision 2. These actions will be tracked as **Confirmatory Items 9.5-1** and **9.5-2** until such time as the applicant provides the staff Revision 3 of the FSAR with the changes verified.

#### Resolution of Confirmatory Items 9.5-1 and 9.5-2

Confirmatory Items 9.5-1 and 9.5-2 are applicant commitments to update section 9.5.2.2.5 of the LNP FSAR. The staff verified that LNP COL FSAR Section 9.5.2.2.5 was appropriately updated (or revised). As a result, Confirmatory Items 9.5-1 and 9.5-2 are now closed.

- LNP COL 9.5-10

The applicant provided additional information in LNP 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 the resolution to LNP COL 9.5-10 concerning the emergency offsite communication system, including the crisis management radio system included under Section 9.5.2.5.2 of the LNP COL FSAR. The offsite communications interfaces with the site were described in Section 9.5.2.4 of this evaluation. This includes the following methods:

- Local Commercial Telephone System
- DEF Voicenet System
- Florida ESATCOM
- HTRS

The applicant also provides the following alternative communication methods to the dedicated phone lines that comprise the primary onsite and offsite communication methods:

- **Florida Department of Law Enforcement (FDLE) Radio System**: This is the Emergency Plan crisis management radio system. The LNP portion of this radio system is powered by the normal 120-Vac power supply with the non-Class 1E and uninterruptible power supply system providing power on loss of the normal power supply.

- **Portable UHF Radios:** These radios are available to emergency teams for limited communication on the LNP site. During normal day shift operations, key plant staff personnel have ultra high frequency (UHF) radios available for communication with the Control Rooms. These radios are the primary communications link during a fire. The system utilizes UHF repeaters and antennas located in the plant to aid in radio communications. Earphones are provided in high noise areas.
- **Dedicated Radio Networks:** These networks provide communications between state and county warning points and the EOCs.

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 and in Section 9.5.2.4 of this evaluation 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 FDLE radio system adequately serves as the crisis management radio system. The FDLE radio system is a trunked design. The trunked system design for radio communications is commonly used by Federal and state authorities such as fire departments, police dispatch, etc. The trunked system design allows for multiple users (talk-groups), to use a small set of actual radio frequencies without hearing each other's conversations. With a trunked system, there is no 'dedicated' channel as in a conventional radio system so if a particular frequency channel is interrupted, a controlling computer will automatically rotate the affected talk-group to the next available frequency. The design allows two-way continuous communication between plant personnel and offsite authorities at county warning points and other state authorities. Therefore, the staff concludes that COL Action Item 9.5.2-1 has been addressed.

- STD COL 9.5-11

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

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

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

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

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

#### **9.5.2.5 Post Combined License Activities**

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

### **9.5.2.6 Conclusion**

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

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

- LNP 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.
- LNP COL 9.5-10 has been adequately addressed by the applicant in that the LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.5.3, "Plant Lighting System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 LNP COL FSAR, Revision 9, incorporates by reference Section 9.5 of the AP1000 DCD, Revision 19. Section 9.5 of the AP1000 DCD includes Section 9.5.4.

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

##### AP1000 COL Information Item

- STD COL 9.5-13

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

##### **9.5.4.3 Regulatory Basis**

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

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the diesel generator fuel oil system are given in Section 9.5.4 of NUREG-0800.

##### **9.5.4.4 Technical Evaluation**

The NRC staff reviewed Section 9.5.4 of the LNP 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.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.

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

equally applicable to the LNP Units 1 and 2 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 5 to the LNP COL FSAR. In performing this comparison, the staff considered changes made to the LNP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.
- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.
- The staff verified that the site-specific differences were not relevant.

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

The following portion of this technical evaluation section is reproduced from Section 9.5.4.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 9.5-13*

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

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

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

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

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

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

*High fuel oil quality is provided by specification of the required grade and properties of the fuel oil for procurement, by testing of samples of new fuel oil prior to addition into the tanks, and by monitoring the fuel oil for contamination and degradation with periodic testing of samples from the storage tanks in accordance with manufacturer's recommendations.*

*The fuel oil storage tanks are inspected at least once per 92 days to check for and remove accumulated water.*

*The fuel oil quality is verified by sampling and testing from the storage tanks at least once per 92 days. New fuel oil is tested prior to its addition to the storage tanks to verify that the sample meets the following minimum requirements:*

- Water and sediment content of less than or equal to 0.05 volume percent.*
- Kinematic viscosity at 40°C of greater than or equal to 1.0 mm<sup>2</sup>/s (1.9 centistokes), but less than or equal to 4.1 mm<sup>2</sup>/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 word "kinetic" should read as "kinematic." The staff thought this was a typographical error on the applicant's part because Table 1 of ASTM D975, "Standard Specification for Diesel Fuel Oils," which is the appropriate reference, specifies "kinematic viscosity." Therefore, the staff concludes that STD COL 9.5-13 has been resolved pending incorporation of the proposed revision in the VEGP COL FSAR, which is being tracked as **Confirmatory Item 9.5-3**.*

Resolution of Standard Content Confirmatory Item 9.5-3

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

**9.5.4.5 Post Combined License Activities**

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

**9.5.4.6 Conclusion**

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

In addition, the staff concludes that the relevant information presented in the LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.5.5, "Standby Diesel Generator Cooling Water System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.5.6, "Standby Diesel Generator Starting Air System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.5.7, "Standby Diesel Generator Lubrication System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP 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 LNP COL FSAR, Revision 9, incorporates by reference, with no departures or supplements, Section 9.5.8, "Standby Diesel Generator Combustion Air Intake and Exhaust System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> 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 LNP COL application are documented in NUREG-1793 and its supplements.