

## 9.0 AUXILIARY SYSTEM

The auxiliary systems include the support systems that are essential for 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 and includes new and used fuel storage and handling; cooling and makeup water; compressed air; process sampling; drains; heating, ventilation, and air conditioning (HVAC); fire protection; and emergency diesel generators.

### 9.1 Fuel Storage Handling

#### 9.1.1 **New-Fuel Storage (Related to RG 1.206 Sections 9.1.1, “Criticality Safety of Fresh and Spent Fuel Storage and Handling,” and 9.1.2, “New and Spent Fuel Storage”)**

To be provided at a later date.

#### 9.1.2 **Spent Fuel Storage (Related to RG 1.206 Section 9.1.1, “Criticality Safety of Fresh and Spent Fuel Storage and Handling,” and Section 9.1.2, “New and Spent Fuel Storage”)**

To be provided at a later date.

### 9.1.3 **Fuel Pool Cooling and Cleanup**

#### 9.1.3.1 ***Introduction***

This section of the FSAR addresses the system that removes the decay heat from the fuel pool, maintains pool water level and quality, and removes radioactive materials from the pool to minimize the release of radioactive materials into the environment.

#### 9.1.3.2 ***Summary of Application***

Section 9.1.3 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.1.3 of the certified ABWR DCD referenced in 10 CFR Part 52, Appendix A. In addition, in FSAR Section 9.1.3, the applicant provides the following:

#### *Tier 1 Departure*

- STD DEP T1 2.4-1 Residual Heat Removal System and Spent Fuel Pool Cooling

This departure adds the capability to choose a third loop of residual heat removal (RHR) in the augmented fuel pool cooling and fuel pool makeup modes. The connection of RHR Loop A to fuel pool cooling (FPC) increases the flexibility and redundancy of the spent FPC system.

### Tier 2 Departure Not Requiring Prior NRC Approval

- STD DEP 9.1-1 Update of Fuel Storage and Handling Equipment

This departure provides minor wording and design changes that make Section 9.1.3 in the COL FSAR only slightly different from the ABWR DCD. The major impact of this departure on Section 9.1.3 is one of clarity. With this departure, the COL FSAR now clearly states that the maximum capacity of the spent fuel pool is equal to 270 percent of the core load capacity, until the bounding heat load evaluation is revised.

### COL License Information Items

- COL License Information Item 9.9 Spent Fuel Firewater Makeup Procedures and Training

This Col license information item concerns the spent fuel firewater makeup procedures and training. The applicant proposes to provide the required information with Commitment (COM) 9.1-5 before fuel loading.

- COL information item 9.10 Protection of RHR System Connections to FPC System

This COL license information item concerns the protection of RHR system connections to the FPC system. The applicant proposes to provide the required information with COM 9.1-6 before fuel loading.

#### **9.1.3.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503.

In addition, the relevant requirements of the Commission regulations for the Fuel Pool Cooling and Cleanup, and the associated acceptance criteria, are given in Section 9.1.3 of NUREG-0800.

In addition, in accordance with Section VIII, “Processes for Changes and Departures,” of, “Appendix A to Part 52--Design Certification Rule for the ABWR Design,” the applicant identifies Tier 1 and Tier 2 departures. Tier 1 departures require prior NRC approval and are subject to the requirements of 10 CFR 52 Appendix A, Section VIII.A.4. Tier 2 departures not requiring prior NRC Approval are subject to the requirements of 10 CFR 52 Appendix A Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

In particular, the regulatory basis and review criteria for COL License Information Items 9.9 and 9.10, and the Tier 1 and Tier 2 departures described above as they relate to the fuel pool fluid systems, are specified in SRP Section 9.1.3, “Spent Fuel Pool Cooling and Cleanup System.”

#### **9.1.3.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.1.3 of the certified DCD for the ABWR design. The staff reviewed Section 9.1.3 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the

information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

### Tier 1 Departure

In general, Tier 1 Departure identified by the applicant in this section requires prior NRC approval in the form of an exemption and the full scope of their technical impact may be evaluated in the other sections (and chapters) of this SER. For more information, please refer to COL application Part 07, Section 5.0 for a listing of all FSAR sections affected by this Tier 1 departure.

- STD DEP T1 2.4-1 Residual Heat Removal System and Spent Fuel Pool Cooling

NRC staff reviewed STD DEP T1 2.4-1, which involves the connection of a third RHR system to the FPC system (the DCD only had two of the three RHR systems configured to allow a connection to the FPC system). This connection results in greater flexibility in operations, higher system reliability, and redundancy during emergencies. By allowing the potential of all three RHR systems to connect to the spent fuel pool, refueling operations can proceed at higher decay heat levels even when a single RHR system is unavailable. The staff found the proposed departure will improve plant safety. This departure is therefore acceptable.

### Tier 2 Departure Not Requiring Prior NRC Approval

In general, Tier 2 Departures not requiring prior NRC approval identified by the applicant in this section may also be evaluated in other sections (and chapters) of this SER. For more information, please refer to COL application Part 07, Section 5.0 for a listing of all FSAR sections affected by these departures.

- STD DEP 9.1-1 Update of Fuel Storage and Handling Equipment

NRC staff reviewed STD DEP 9.1-1, which inserts a number of editorial changes in FSAR Section 9.1.3 to clarify the language. The major impact of this departure on Section 9.1.3 is one of clarity. With this departure, the COL FSAR now clearly states that the maximum capacity of the spent fuel pool is equal to 270 percent of the core load capacity, until the bounding heat load evaluation is revised. Many of the changes in this departure impact other COL FSAR sections, and the changes are evaluated in the respective SER sections. The changes also make Tier 2 consistent with Tier 1.

The applicant's evaluation determined that this departure does not require prior NRC approval in accordance with 10 CFR Part 52, Appendix A, Section VIII.B.5. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

approval. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

COL License Information Items

- COL License Information Item 9.9                      Spent Fuel Firewater Makeup Procedures and Training

COL License Information Item 9.9 concerns the spent fuel firewater makeup procedures and training. The applicant established a commitment item (COM-9.1-5) stating that firewater makeup procedures and training will be in place and available onsite for inspection before fuel loading. The staff found this commitment acceptable.

- COL Information Item 9.10                              Protection of RHR System Connections to FPC System

COL License Information Item 9.10 specifies that a confirmatory analysis needs to be performed to demonstrate that the RHR system connections to the FPC system are adequately protected from the effects of pipe whip, internal flooding, internally generated missiles, and a moderate energy pipe rupture in the vicinity. The applicant states that these protections cannot be accomplished until the plant is built and the as-built plant conditions are available for inspection. The applicant has proposed a commitment item (COM-9.1-6) to satisfy this COL license information item before fuel loading.

NRC staff determined that the applicant has not adequately addressed COL License Information Item 9.10. The staff issued **RAI 09.01.03-01 (eRAI 130)** requesting the applicant to justify why this COL license information item cannot be completed within the COL application review period or be addressed by a new ITAAC. In the response to this RAI dated June 12, 2008 (ML081710126), the applicant states that the staff will be notified (before the installation of RHR system components) of the availability of the design analysis that ensures the RHR system connections are adequately protected. The applicant commits to perform an as-built analysis that identifies as-built conditions in the vicinity of the RHR connections.

The staff acknowledges that the design of some pipe system has not been finalized. Section 3.6.1 and 3.6.2 of this SER evaluates the protection of all safety-related SSCs from pipe failures. In Section 3.6.1, a site-specific ITAAC has been created to evaluate the as-designed protections of safety-related SSCs against pipe failures. The protection of the RHR connections will be evaluated in the pipe break hazard analysis. The staff's evaluation of flood protection considerations for all SSCs is discussed in Section 3.4.1 of this SER. The staff's evaluation of internal missile protection for SSCs is discussed in Section 3.5.1 of this SER. The staff has already evaluated the methodology used in designing the SSCs protections from the effects of pipe whip, internal flood, internally-generated missiles, and a moderate energy pipe rupture.

The applicant's proposed commitment (COM 9.1-6) to notify the staff of the completion of the design analysis for the RHR connection protections and to complete an as-built evaluation of the conditions in the vicinity of the RHR connections will demonstrate that the new RHR system connections to FPC has been protected from the effects of pipe whip, internal flooding, internally-generated missiles, and a moderate pipe rupture following the approved methodology.

Based on this evaluation, the staff found the applicant's response acceptable, and **RAI 09.01.03-1 (eRAI 130)** is resolved and closed.

#### **9.1.3.5 Post Combined License Activities**

The applicant identifies the following commitments:

- Commitment (COM 9.1-5) – Provide the firewater makeup procedures and make them available onsite for inspection before fuel loading.
- Commitment (COM 9.1-6) – Describe an analysis ensuring that the RHR system connections are adequately protected from the effects of pipe whip, internal flooding, internally generated missiles, and a moderate energy pipe rupture in an FSAR amendment in accordance with 10 CFR 50.71(e) before fuel loading.

#### **9.1.3.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG–1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the fuel pool cooling and cleanup system that were incorporated by reference have been resolved.

In addition, the staff compared the additional COL license information items in the application to the relevant NRC regulations and acceptance criteria defined in NUREG–0800, Section 9.1.3. The staff's review confirmed that the applicant has adequately addressed the COL license information items. The staff found it reasonable that the identified Tier 2 departures are characterized as not requiring prior NRC approval per 10 CFR Part 52, Appendix A, Section VIII.B.5.

### **9.1.4 Light Load Handling System (Related to Refueling)**

#### **9.1.4.1 Introduction**

Section 9.1.4 of the FSAR addresses the light load handling system (LLHS). The LLHS consists of all components and equipment used for handling new fuel from the receiving station to loading spent fuel into the shipping cask. The objective of the LLHS review is to ensure criticality accidents, radioactivity releases from damage to irradiated fuel, and unacceptable personnel radiation exposures are avoided.

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

Section 9.1.4 of the STP Units 3 and 4 incorporates by reference Section 9.1.4 of the certified ABWR DCD referenced in 10 CFR Part 52, Appendix A. In STP FSAR Section 9.1.4, the information in Section 9.1.4 of the certified ABWR DCD was subject to numerous design revisions. Therefore, for purposes of clarity, the applicant presents Section 9.1.4 of the certified ABWR DCD with the proposed changes in the COL FSAR. In addition, the applicant provides the following:

### Tier 2 Departure Requiring Prior NRC Approval

- STD DEP 16.3-25 LCO 3.9.1, "Refueling Equipment Interlocks"

This departure affects Technical Specifications (TS). In this departure, the applicant limits the LCO 3.9.1, "Refueling Equipment Interlocks," by stating that these interlocks are only applicable when the reactor mode switch is in the refueling position.

### Tier 2 Departure Not Requiring Prior NRC Approval

- STD DEP 9.1-1 Update of Fuel Storage and Handling Equipment

The applicable portion of this departure identifies updates to this section addressing refueling tools, deleting outdated equipment, and clarifying safety and seismic classifications for various pieces of equipment associated with light load handling. This departure also states that there are other specific text changes in FSAR Section 9.1.4.

### COL License Information Items

- COL License Information Item 9.4 Spent Fuel Load Drop Analysis

In FSAR Subsection 9.1.6.4, the applicant provides additional information to address the spent fuel rack load drop analysis. The applicant adds that, "[t]his analysis is dependent on a vendor specific design and the as-built configuration of spent-fuel storage racks." The applicant commits (COM 9.1-2) to provide appropriate descriptions of the confirmatory load drop analysis for spent fuel storage racks in an FSAR amendment, in accordance with 10 CFR 50.71(e) before receiving fuel.

- COL License Information Item 9.5 New Fuel Inspection Stand Seismic Capability

In FSAR Subsection 9.1.6.5, the applicant provides additional information to address the new fuel inspection stand seismic capability. The applicant adds that the fuel inspection "stand design elevates fuel bundles rather than personnel and is anchored in a refueling floor pit such that it cannot fall into the fuel pool during an SSE."

- COL License Information Item 9.6 Overhead Load Handling System information

The applicant provides additional information in FSAR Subsection 9.1.6.6 to address the provision of data and information related to the overhead heavy load handling systems (OHLH) systems. The applicant adds that the "information is either vendor specific and will be established following equipment procurement, or involves associated programs that will be developed as the equipment is procured." The applicant commits (COM 9.1-3) to provide appropriate descriptions on the OHLH system in an FSAR amendment in accordance with 10 CFR 50.71(e), before receiving fuel.

#### **9.1.4.3 Regulatory Basis**

The regulatory basis for the information incorporated by reference is in NUREG-1503. In addition, the relevant requirements of the Commission regulations for the LLHS and the associated acceptance criteria are in Section 9.1.4 of NUREG-0800.

In accordance with Section VIII, "Processes for Changes and Departures," of, "Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor," the applicant identifies Tier 2 departures. Tier 2 departures affecting Technical Specifications require prior NRC approval and are subject to the requirements of 10 CFR Part 52, Appendix A, Section VIII.C.4. Tier 2 departures not requiring prior NRC approval are subject to the requirements of 10 CFR Part 52, Appendix A, Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

In addition, the regulatory basis and review criteria NRC staff used for COL License Information Items 9.4, 9.5, and 9.6 are in Section 9.1.4 of NUREG-0800.

#### **9.1.4.4 Technical Evaluation**

As documented in NUREG-1503, NRC staff reviewed and approved Section 9.1.4 of the generic DCD for the ABWR design. The staff reviewed Section 9.1.4 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR.

##### Tier 2 Departure Requiring Prior NRC Approval

- STD DEP 16.3-25 LCO 3.9.1, "Refueling Equipment Interlocks"

This departure affects Technical Specification and is reviewed in Chapter 16 of this SER.

##### Tier 2 Departure Not Requiring Prior NRC Approval

- STD DEP 9.1-1 Update of Fuel Storage and Handling Equipment

The staff reviewed STD DEP 9.1-1, which updates the equipment and special tools utilized in ABWR refueling operations, including the inspection of new fuel. Specific modifications proposed by the departure include the following:

##### **Subsection 9.1.4.1, "Design Bases"**

Changes include the applicant's clarification that the minimum water level for shielding 8.5 ft. (2,591 mm) is referenced from the top of the active fuel. The clarification of the minimum water level height reference does not change compliance of the systems to the SRP, as documented in NUREG-1503.

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

#### **Subsection 9.1.4.2.1, “Spent Fuel Cask”**

This section was expanded to include a reference to the load handling equipment and the major steps necessary to bring a spent fuel cask into the reactor building. The applicant states that the FSAR will require an amendment in accordance with 10 CFR 50.71, “Maintenance of records, making of reports,” at a future date to incorporate equipment-specific information for an actual Department of Transportation approved spent fuel cask. The additional detail of the future spent fuel cask design does not change the compliance of the systems to the SRP, as documented in NUREG–1503.

#### **Subsections 9.1.4.2.3.7, “Jib Crane”; 9.1.4.2.7.3, “Fuel Assembly Sampler”; and 9.1.4.2.3.5, “Fuel Pool Vacuum Sipper”**

This jib crane and fuel assembly sampler equipment are deleted in FSAR Revision 1 because they are outdated and are no longer used in current designs. The stated new design of the sampler in FSAR Subsection 9.1.4.2.7.3 describes an updated design and revises the name of some of the sampler components. However, Subsection 9.1.4.2.7.3 indicates that the sampler performs the same function as the ABWR DCD design. STP FSAR Revision 2 was revised to restore the design for the jib crane and fuel assembly sampler.

The fuel pool vacuum sipper is deleted in FSAR Revision 2 because it is outdated and is replaced with the fuel assembly sampler in the FSAR design. STD DEP 9.1-1 of the Departures Report states that “outdated equipment (e.g., vacuum sipper) that is no longer utilized was deleted.”

Section 9.1.4 of STD DEP 9.1-1 in the Departure Report was revised to include the fuel assembly sampler and jib crane in the STP FSAR Revision 2 design. These components were previously removed from FSAR Revision 1 because they were declared outdated equipment that will no longer be utilized. Both of these components were restored in FSAR Revision 2 to incorporate the ABWR DCD design that was reviewed and approved in NUREG–1503. However, Figure 9.1-10, “Jib Crane Channel Handling Boom,” which was in the ABWR DCD has not been restored in the STP FSAR. NRC staff was unable to determine whether the jib crane design was modified or retained as the same design as the ABWR DCD. The staff issued **RAI 09.01.04-6 (eRAI 2538)** requesting the applicant to provide the reason for not restoring the ABWR DCD jib crane in Figure 9.1-10 in the STP COL application. The applicant’s response to **RAI 09.01.04-6 (eRAI 2538)** dated August 20, 2009 (ML092360771), proposes to restore Figure 9.1-10 as it appears in the ABWR DCD. The staff found this response acceptable. Verification of the proposed change in the next COL FSAR revision is being tracked as **Confirmatory Item 09.01.04-6**.

#### **Subsection 9.1.4.2.5.1, “Reactor Vessel Service Tools”**

The requirements for heavy lifting tools were updated to allow for a safety factor of five if a dual load path is maintained for the lifting tool. This update is in accordance with Section 5 of NUREG–0612, “Control of Heavy Loads at Nuclear Power Plants.”

### **Subsections 9.1.4.2.5.6, “Dryer and Separator Strongback,” and 9.1.4.2.10.2, “Refueling Procedure”**

Load test requirements were updated for lifting strongbacks. The load tests are now performed in accordance with ANSI N14.6, “Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4,500 kg) or More,” which specifies a 150 percent test of rated load versus the original 125 percent test.

### **Subsection 9.1.4.2.7.1, “Refueling Machine”**

The applicant upgrades one auxiliary hoist on the refueling machine from 9.81 to 14.71 kN. The design, installation, and test codes remain the same.

### **Subsection 9.1.4.2.7.2, “Auxiliary Platform”**

This auxiliary platform in Revision 1 of the STP FSAR was completely redesigned from the original platform described in the ABWR DCD. The new platform performs similar functions as the original platform, but the location and construction are different. NRC staff requested additional information related to the auxiliary platform including the weight, construction and testing requirements, and storage location/requirements. Subsection 9.1.4.2.7.2 of the STP COL application does not provide sufficient information to verify compliance with the acceptance criteria in the SRP. Therefore, the staff issued **RAI 09.01.04-1** (eRAI 287) requesting the applicant to provide this information. There was also inconsistency between the Tier 1 and Tier 2 information. The staff issued **RAI 09.01.04-2** (eRAI 287) requesting the applicant to clarify this information.

The applicant’s response to **RAI 09.01.04-1**, dated June 26, 2008 (ML081970231), states that the description of the auxiliary platform will be restored to be consistent with the ABWR DCD description in the next FSAR revision. The staff reviewed Revision 2 of the STP FSAR and determined that the description of the auxiliary platform reflects the approved ABWR DCD design. Therefore, **RAI 09.01.04-1** is considered resolved and closed.

The applicant’s response to **RAI 09.01.04-2**, dated June 26, 2008, again stated that the description of the auxiliary platform will be restored to the ABWR DCD description in the next STP FSAR revision. In addition, the applicant addresses the Tier 1/Tier 2 inconsistency by clarifying that the refueling machine is a gantry crane as indicated in Tier 1. The staff verified the revised STP FSAR that properly classifies the refueling machine as a gantry crane and as a result, Tier 1 and Tier 2 are now consistent. The additional details provided for the auxiliary design and refueling machine do change compliance of the system to the SRP, as documented in NUREG–1503. Therefore, **RAI 09.01.04-2** is resolved and closed.

### **Table 9.1.2, “Fuel Servicing Equipment”**

In Table 9.1-2 of the STP FSAR, the applicant changed the safety classification of the refueling machine from Safety Class 2 to nonsafety-related. The applicant also changes the seismic classification to Seismic Category 1. Both these changes make Table 9.1.2 consistent with the Tier 1 information in ABWR DCD Section 2.5.5.

However, Table 9.1-2 does not specifically designate the quality assurance (QA) elements applicable to the refueling machine, which is a single-failure proof crane. Because, the refueling

machine is single-failure proof, it needs to conform to NUREG-0554, "Single-Failure Proof Cranes for Nuclear Power Plants." Section 10 of NUREG-0554 lists QA elements that are applicable to single failure proof cranes. The staff issued **RAI 09.01.04-3** (eRAI 287), requesting the applicant to provide additional information to ensure that the QA elements of the refueling machine conform to NUREG-0554.

The applicant's response to **RAI 09.01.04-3** dated June 26, 2008, states that the QA requirements for the refueling machine are distinguished from other equipment by its function as a single-failure proof crane designed to meet the requirements of NUREG-0554. The staff verified that the STP FSAR states in Subsection 9.1.4.2.7.1 states that the refueling machine is designed to meet the requirements of NUREG-0554, which lists the applicable QA elements. Based on the above information, the staff determined that **RAI 09.01.04-3** is resolved and closed.

The applicant's evaluation of STD DEP 9.1-1, in accordance with 10 CFR Part 52, Item B.5 of Section VIII of Appendix A determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

#### COL License Information Items

- COL License Information Item 9.4      Spent Fuel Load Drop Analysis

COL License Information Item 9.4 addresses the load drop analysis for the spent fuel racks. The applicant states that this analysis is dependent on specific vendor information. The applicant further commits (COM 9.1-2) to provide a confirmatory load drop analysis in an FSAR amendment in accordance with 10 CFR 50.71(e) before receiving fuel. COL License Information Item 9.4 is addressed in Section 9.1.1 of this SER.

- COL License Information Item 9.5      New Fuel Inspection Stand Seismic Capability

The staff reviewed COL License Information Item 9.5, as described in Subsection 9.1.6.5 of the FSAR. This COL license information item addresses seismic capabilities of the new fuel inspection stand. The applicant's redesign of the inspection stand includes installing the stand in a pit and anchoring the stand to the floor. As indicated in FSAR Subsection 9.1.4.2.3.2, the new fuel inspection stand cannot fall or tip and will retain the fuel assembly and maintain the structural integrity of the stand during an SSE. Because the improved stand design elevates fuel bundles rather than personnel and is anchored in a refueling floor pit so that it cannot fall into the fuel pool during an SSE, the staff found that the new fuel inspection stand complies with the requirements of GDC 2 by satisfying Regulatory Position C2 of RG 1.29 and Section 2.5 of NUREG-0554.

- COL License Information Item 9.6      Overhead Load Handling System Information

The staff reviewed COL License Information Item 9.6, as described in Subsection 9.1.6.6 of the FSAR, which states that the COL applicant shall provide a list of all cranes, hoists, and elevators and their lifting capacities, including any limit and safety devices required for automatic and manual operation.

The FSAR states that this information is dependent on specific vendor information and will be available following equipment procurement. Appropriate descriptions will be added through an FSAR amendment in accordance with 10 CFR 50.71(e), before receiving fuel. This item is captured in the FSAR as commitment COM 9.1-3.

In addition, COL License Information Item 9.6, as described in Subsection 9.1.6.6 of the FSAR, also specifies that the COL applicant should provide specific information summarized in a list of six items for all such equipment, as listed in Subsection 9.1.6.6 of the FSAR. The applicant does not provide this information and is not committed to provide the information for the fuel handling cranes following equipment procurement. Therefore, NRC staff issued **RAI 09.01.05-1** requesting the applicant to provide the information.

The applicant's response to **RAI 09.01.05-1**, dated July 2, 2008 (ML081890239), provides standard supplement to address COL License Information Item 9.6 in Subsection 9.1.6.6. The supplement includes a commitment (COM 9.1-3) to provide a list of items relating to heavy load handling systems before fuel loading. Because Subsection 9.1.6.6 includes a scheduled commitment for the heavy load handling procedure, the staff determined that the operational procedures governing fuel handling, including administrative controls, should also be implemented before handling new fuel. The staff issued **RAI 09.01.04-7** requesting the applicant to provide a similar commitment when fuel handling information and procedures will be developed. The applicant's response to this RAI dated August 20, 2009 (ML092360771) clarifies that the development of operational procedures is included in STP Tier 2 FSAR Subsection 13.5.3.4, which includes refueling and core alterations in a list of general plant procedures. Subsection 9.1.4.4.2 also provides a list of procedures to be developed for review before receiving fuel. The staff found this response acceptable and **RAI 09.01.04-7** is resolved and closed.

**RAI 09.01.05-1** is evaluated by the staff in Section 9.1.5 of this SER

#### Initial Plant Test Program

The Initial Test Program is described in Chapter 14, Subsection 14.2.12.1.50, "Fuel-Handling and Reactor Component Servicing Equipment Preoperational Test." STD DEP 9.1-1 updates the equipment and special tools that are tested by this preoperational test. As stated above, the applicant's evaluation of this departure, in accordance with Item B.5 of Section VIII of 10 CFR Part 52, Appendix A, determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspection.

#### **9.1.4.5 Post Combined License Activities**

The applicant identifies the following commitments:

- Commitment (COM 9.1-2) – This commitment is addressed in Section 9.1.1 of this SER.
- Commitment (COM 9.1-3) – This commitment is addressed in Section 9.1.5 of this SER.

#### **9.1.4.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. The staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information relating to the light load handling. With the exception of **Confirmatory Item 09.01.04-6**, no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the light load handling that were incorporated by reference have been resolved.

In addition, the staff compared the changes in STD DEP 9.1-1, and the additional COL information within the application to the relevant NRC regulations, and the acceptance criteria defined in NUREG-0800, Section 9.1.4. The staff found it reasonable that the identified Tier 2 departure is characterized as not requiring prior NRC approval per 10 CFR Part 52, Appendix A, Section VIII.B.5. The staff also found that the applicant has provided adequate information that addresses the COL license information items. However, as a result of **Confirmatory Item 09.01.04-6**, the staff was unable to finalize the conclusions relating to light load handling, in accordance with the NRC requirements.

#### **9.1.5 Overhead Heavy Load Handling Systems (OHLH)**

##### **9.1.5.1 Introduction**

This FSAR section addresses the OHLH consisting of all components and equipment for moving all heavy loads (i.e., loads weighing more than one fuel assembly and its handling device—loads greater than 4.45 kN [1,000 lbf])— at the plant site. NRC staff reviewed the OHLH systems to ensure that inadvertent operations or equipment malfunctions—separately or in combination—will not cause a release of radioactivity, a criticality accident, or an inability to cool fuel within the reactor vessel or spent fuel pool or to safely shut down the reactor.

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

Section 9.1.5 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.1.5 of the certified ABWR DCD referenced in 10 CFR Part 52, Appendix A. In FSAR Section 9.1.5, the certified ABWR DCD was subject to numerous design revisions. Therefore, the applicant presents Section 9.1.5 of the certified ABWR DCD with the proposed changes in the COL FSAR. In addition, the applicant provides the following:

##### *Tier 2 Departure Not Requiring Prior NRC Approval*

- STD DEP 9.1-1 Update of Fuel Storage and Handling Equipment

This departure identifies the inclusion of American Society of Mechanical Engineers (ASME) NOG-1, "Rules for Construction of Overhead and Gantry Cranes," as a technical standard for the Type 1 reactor building crane. Additionally, the description and use of the under-vessel rotating platform were updated with minor changes, and the description of the auxiliary hoist on the refueling machine was clarified.

- STD DEP 1.1-2 Dual Units at STP 3 & 4

The reference ABWR DCD is based on a single-unit site. STP Units 3 and 4 is a dual unit project on an existing site with STP Units 1 and 2.

### COL License Information Items

- COL Information Item 9.6 Overhead Load Handling System Information

The applicant provides additional information in FSAR Subsection 9.1.6.6 to address the data and information related to the overhead load handling systems. The applicant adds that the “information is either vendor specific and will be established following equipment procurement, or involves associated programs that will be developed as the equipment is procured.” The applicant commits (COM 9.1-3) to provide appropriate descriptions of the OHLH systems in an FSAR amendment in accordance with 10 CFR 50.71(e), before receiving fuel.

#### **9.1.5.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503.

In addition, the relevant requirements of the Commission regulations for the OHLH systems and associated acceptance criteria are in Section 9.1.5 of NUREG–0800,

In accordance with Section VIII, “Processes for Changes and Departures,” of, “Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor,” the applicant identifies Tier 2 departures. Tier 2 departures not requiring prior NRC approval are subject to the requirements of 10 CFR Part 52, Appendix A, Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

In addition, the regulatory basis and review criteria used by the staff for COL License Information Item 9.6 are specified in Section 9.1.5, of NUREG–0800.

#### **9.1.5.4 Technical Evaluation**

As documented in NUREG–1503, the NRC staff reviewed and approved Section 9.1.5 of the generic DCD for the ABWR design. The staff reviewed Section 9.1.5 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section..

The staff reviewed the information in the COL FSAR:

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<sup>1</sup> See “*Finality of Referenced NRC Approvals*” in SER Section 1.1.3 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

### Tier 2 Departures that do not require prior NRC approval

The following Tier 2 departure was identified by the COL applicant as not requiring NRC review and approval.

- STD DEP 9.1-1 Update of Fuel Storage and Handling Equipment

The staff reviewed STD DEP 9.1-1, which involves updates to the fuel handling and storage equipment. Sections 9.1.1, 9.1.2, 9.1.3 and 9.1.4 of this SER also include discussions regarding this departure.

#### **Subsection 9.1.5.2.1 “Reactor Building Crane”**

The ABWR DCD originally referenced NUREG–0554, “Single Failure Proof Cranes for Nuclear Power Plants,” as the design standard for the reactor building single-failure proof crane. In the STP FSAR, the applicant references the updated ASME NOG-1 standard, “Rules for Construction of Overhead and Gantry Cranes,” as the design standard for the reactor building crane. The reactor building crane is now designed as a Type 1 single-failure proof crane and meets the guidelines of NUREG–0554 and ASME NOG-1. Additionally, the reactor building crane is seismically designed to maintain its position and to hold a load during safe-shutdown earthquake conditions. SRP Section 9.1.5 states that cranes designed to the criteria of ASME NOG-1 2004 for a Type 1 crane are acceptable under the guidelines of NUREG–0554, for the construction of a single-failure proof crane. Subsection 9.1.5.1 of the STP Units 3 and 4 FSAR for the reactor building crane specifies ASME NOG-1 without citing the year of the edition. The staff issued **RAI 09.01.05-2 (eRAI 289)** requesting the applicant to provide the reference year for ASME NOG-1.

The applicant’s response to this RAI dated July 2, 2008 (ML081890239), states that the 2004 edition of ASME NOG-1 will be applied to the reactor building crane, and STP FSAR Subsection 9.1.5.1 will be revised. Furthermore, the applicant provides a revised RAI response dated April 2, 2009 (ML090960321) specifying that Table 1.8-21a “Codes and Standards of Site-Specific Systems” in STP FSAR will be revised to reflect the correct reference year of the NOG-1 2004 code. The staff found that providing the reference to the NOG-1 2004 edition in Table 1.8-21a and only NOG-1 in Section 9.1.5 is acceptable and consistent with the other codes referenced in Section 9.1.5 and Table 1-8-21a of the FSAR.

The applicant has revised Table 1.8-21a in Revision 3 to the FSAR to incorporate the correct reference year of NOG-1. Use of the 2004 edition meets the guidance in SRP Section 9.1.5. Therefore, the staff found the applicant’s RAI response acceptable and **RAI 09.01.05-2 (eRAI 289)** is considered resolved and closed.

#### **Subsection 9.1.5.2.2.2, “Lower Drywell Servicing Equipment”**

The applicant made editorial changes to this subsection. Several pieces of equipment were renamed and minor changes were made in the process of servicing the reactor internal pumps (RIPs).

### **Subsection 9.1.5.5, “Safety Evaluations”**

In this subsection, the applicant identifies an upgrade for the auxiliary hoist on the refueling machine. The capacity of the hoist was increased from 9.81 kN (2205 lbf) to 12.33 kN (2772 lbf). The increased capacity allows the auxiliary hoist to lift the parts from the RIPs for servicing. The hoist is attached to the refueling machine and both pieces of equipment are single-failure proof, in accordance with NUREG–0554. The ABWR DCD also designated the refueling machine and auxiliary hoist as single-failure proof.

The applicant’s evaluation of this departure, in accordance with 10 CFR Part 52, Item B.5 of Section VIII of Appendix A, determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant’s process for evaluating departures and other changes to the DCD is subject to NRC inspections.

- STD DEP 1.1-2 Dual Units at STP 3 & 4.

The staff reviewed STD DEP 1.1-2, which lists the systems shared by the STP Units 3 and 4 and the systems shared with the STP Units 1 and 2. None of these systems include the OHLH system. The applicant’s evaluation of this departure, in accordance with Item B.5 of Section VIII of Appendix A, determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant’s process for evaluating departures and other changes to the DCD is subject to NRC inspections. The acceptance of the STP Units 3 and 4 with regard to General Design Criterion 5 is documented in the applicable SER sections.

#### COL License Information Item

- COL License Information Item 9.6 Overhead Load Handling System information

NRC staff reviewed COL License Information Item 9.6 described in Subsection 9.1.6.6 of the FSAR, which states that the COL applicant shall provide a list of all cranes, hoists, and elevators and their lifting capacities, including any limit and safety devices required for automatic and manual operation. This COL license information item further states that the following information shall be provided for the OHLH systems equipment:

1. Heavy load handling system operating and equipment maintenance procedures.
2. Heavy load handling system and equipment maintenance procedures and manuals.
3. Heavy load handling system and equipment inspection and test plans; (NDE, visual, etc.)
4. Heavy load handling safe load paths and routing plans.
5. QA Program to monitor and assure implementation and compliance of heavy load handling operations and controls.
6. Operator Qualifications, Training and Control Program.

The applicant states that the above information is dependent on specific vendor information and will be available following equipment procurement. According to the applicant, appropriate descriptions will be added in an FSAR amendment in accordance with 10 CFR Part 50.71(e) before receiving fuel. This item is captured as commitment **COM 9.1-3**. The staff has determined that the six items listed above are not captured in COM 9.1-3. Therefore, the staff issued **RAI 09.01.05-1 (eRAI 289)** requesting the applicant to provide this information.

The applicant's response to this RAI dated July 2, 2008 (ML081890239), states that the original response to the COL License Information Item 9.6 in the STP FSAR should have indicated that all of the information requested will be provided as it becomes available. Revision 2 of the STP COL FSAR was revised to capture all six items listed above in commitment **COM 9.1-3**, in addition to provisions of the commitment to provide a list of all cranes, hoists, and elevators and their lifting capacities, including any limit and safety devices required for automatic and manual operation. The staff found that the addition of the six items listed above meets the guidance of NUREG-0612 and SRP Section 9.1.5.

However, the applicant did not include all elements of the Heavy Load Handling Program of Regulatory Guide (RG) 1.206 Section C.I.9.1.5 "Overhead Heavy Load Handling System." RG 1.206 states that the COL applicant is to include a listing of all heavy loads and heavy load handling equipment outside the scope of the loads described in the referenced certified design and the associated heavy load attributes (load weight and typical load paths). RG 1.206 also requests a safety evaluation for heavy loads outside the scope of the loads described in the certified design that are handled by non-single-failure-proof handling systems. Therefore, the staff in supplemental **RAI 09.01.05-3 (eRAI 2537)** requested that the applicant provide this information.

The applicant's response to **RAI 09.01.05-3 (eRAI 2537)** dated August 20, 2009 (ML092360771), amends the response to **RAI 09.01.05-1**. In the amended response, the applicant proposes to update Subsection 9.1.6.6 to include the following information:

Procedures containing elements of the heavy load handling program outlined in Regulatory Guide 1.206, Section C.I.9.1.5 and NUREG-0612 will be developed as part of the Plant Operating Procedures Development Plan contained in Subsections 13.5.3.1 and 13.5.3.4.1.

The staff found that the applicant's response to **RAI 09.01.05-1 (eRAI 289)** and **RAI 09.01.05-3 (eRAI 2537)** adequately addresses COL License Information Item 9.6 in FSAR Section 9.6.6, because the heavy load handling procedures will include all the applicable guidance of NUREG-0612, SRP Section 9.1.5 and RG 1.206. Therefore based on COM 9.1-3, **RAI 09.01.05-1 and RAI 9.1.5-3** are considered resolved. Verification of the proposed changes in future revision to FSAR is being tracked as **Confirmatory Item 09.01.05-03**.

The applicant's response to **RAI 09.01.05-1 (eRAI 289)** also provides additional information stating that heavy load handling at the plant will begin during plant construction and therefore a heavy load handling program that meets Section 5.1.1 of NUREG-0612 should be in place at the time that heavy load handling begins. The applicant's response dated July 2, 2008, also provides an additional discussion on the use of the heavy load handling system during construction. The applicant states that, "In regard to the application of a heavy load handling program during construction, conditions do not exist during construction prior to fuel load that require a heavy loads handling system in accordance with NUREG-0612." Furthermore, the

applicant states that during construction, lifts of significant loads are regarded and addressed as occupational safety hazards and are recognized risks to cost and schedules. According to NUREG-0554 Section 2.1, when the overhead crane handling system is used during plant construction, separate performance specifications may be needed to reflect the duty cycles and loading requirements for each service. The staff found that the use of overhead load handling cranes during construction is acceptable and does not violate any NRC guidelines.

#### **9.1.5.5 Post Combined License Activities**

The applicant identifies the following commitment:

- Commitment (COM 9.1-3) – Procedures containing elements of the heavy load handling program outlined in RG 1.206 Section C.I.9.1.5 and NUREG-0612 will be developed as part of the Plant Operating Procedures Development Plan in Subsections 13.5.3.1 and 13.5.3.4.1. Appropriate descriptions will be added with an FSAR amendment in accordance with 10 CFR Part 50.71(e), before receiving fuel.

#### **9.1.5.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is documented in NUREG-1503. The staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information relating to the OHLH systems. With the exception of **Confirmatory Item 09.01.05-03**, no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the OHLH systems that were incorporated by reference have been resolved.

In addition, the staff has compared the changes identified in STD DEP 9.1-1, STD DEP 1.1-2 and the additional COL license information item in the application to the relevant NRC regulations, and acceptance criteria defined in NUREG-0800, Section 9.1.5. The staff's review confirmed that the applicant has adequately addressed the COL license information. The staff found it reasonable that the identified Tier 2 departures are characterized as not requiring prior NRC approval per 10 CFR Part 52, Appendix A, Section VIII.B.5. However, as a result of the **Confirmatory Item 09.01.05-03**, the staff was unable to finalize the conclusions relating to the OHLH systems, in accordance with the NRC requirements.

## **9.2 Water Systems**

### **9.2.1 Station Service Water System**

See SER Section 9.2.15, "Reactor Service Water System."

### **9.2.2 Closed Cooling Water System**

See SER Section 9.2.11, "Reactor Building Cooling Water System", Section 9.2.12, "HVAC Normal Cooling Water System", Section 9.2.13, "HVAC Emergency Cooling Water System, and Section 9.2.14, "Turbine Building Cooling Water System".

### **9.2.3 Demineralized Water Makeup System**

See SER Sections 9.2.8, "Makeup Water System (Preparation),"9.2.9, "Makeup Water System (Condensate)," and 9.2.10, "Makeup Water System (Purified)" of this report.

### **9.2.4 Potable and Sanitary Water System**

#### **9.2.4.1 Introduction**

This section of the FSAR reviews the plant's potable and sanitary water (PSW) system with regard to design features intended to prevent radioactive material from contaminating the PSW system.

#### **9.2.4.2 Summary of Application**

Section 9.2.4 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.2.4 of the certified ABWR DCD Revision 4 referenced in 10 CFR Part 52, Appendix A. In addition, in COL FSAR Section 9.2.4, the applicant provides the following:

#### **Tier 2 Departure Not Requiring Prior NRC Approval**

- STP DEP 9.2-8 Potable and Sanitary Water System

This departure addresses several plant modifications, including the change from a single unit to dual units (STP Units 3 and 4) that is described in STP DEP 1.1-2. In conjunction with STP DEP 9.2-8, the flow capacity of the PSW system has been doubled to provide potable water to both of the new units. Other changes included in this departure are as follows:

1. Potable water will be directly supplied by unfiltered, but chemically treated water from the well water system;
2. The sewage treatment and sanitary drainage systems will collect and process sanitary waste from all four units at the site;
3. Tepid water will be required for emergency eyewash and shower stations; and
4. The system supply pressure will be regulated at a maximum of 60 psig.

As discussed in Section 3.0 of the STP Units 3 and 4 Departures Report, the applicant evaluated this departure against the requirements of 10 CFR Part 52, Appendix A, Section VIII.B.5. Based on this review, the applicant determined that prior NRC approval of this departure is not required.

### Interface Requirements

The applicant provides information to address the Tier 2 interface requirements in STP FSAR Subsection 9.2.4.2.2, "Power Generation Design Bases (Interface Requirements)."

### COL License Information Item

- COL License Information Item 9.2.4.2.5 Evaluation of Potable and Sanitary Water System Performance (Interface Requirements)

This DCD COL license information item states that the COL applicant will analyze the PSW system to assure that all applicable regulatory requirements are met and that the PSW is compatible with site conditions. Note that the DCD identifies this statement as an interface requirement, and the statement is not cross-referenced in DCD Tier 2 Table 1.9-1, "Summary of ABWR Standard Plant COL License Information." However, in STP COL FSAR Subsection 9.2.4.2.5, the applicant refers to it as a "COL License Information Item."

#### **9.2.4.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG-1503. In addition, the relevant requirements of the Commission regulations for the potable and sanitary water, and the associated acceptance criteria, are given in Section 9.2.4 of NUREG-0800.

In accordance with Section VIII, "Processes for Changes and Departures," of "Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor," the applicant identifies one Tier 2 departure. Tier 2 departures not requiring prior NRC approval are subject to the requirements of 10 CFR Part 52, Appendix A, Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

The regulatory basis for reviewing COL License Information Item is in Section 9.2.4 of NUREG-0800.

#### **9.2.4.4 Technical Evaluation**

As documented in NUREG-1503, the NRC staff reviewed and approved Section 9.2.4 of the generic DCD for the ABWR design. The staff also reviewed Section 9.2.4 of the STP Units 3 and 4 COL FSAR and considered the referenced ABWR DCD to ensure that the combination of information in the COL FSAR and information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

The staff reviewed the information in the COL FSAR:

Tier 2 Departures Not Requiring NRC Approval

- STP DEP 9.2-8 Potable and Sanitary Water System

Although no Tier 2 departures requiring NRC review and approval are proposed, the applicant plans to implement Tier 2 departures that do not require NRC review and approval as permitted by 10 CFR Part 52, Appendix A, Section VIII.B.5. This regulation allows the applicant to depart from the ABWR DCD Tier 2 information without obtaining NRC approval if (among other provisions) the departure does not result in more than a minimal increase in (a) the likelihood of occurrence or the consequences of a malfunction of a SSC important to safety, or (b) the consequences of an accident previously evaluated in the plant-specific DCD. However, in order to assure that this requirement is being properly implemented, this departure was selected for evaluation: NRC staff reviewed STP DEP 9.2-8, which addresses several plant modifications including the change from a single unit design to the dual units (STP Units 3 and 4) described above. This change means that there may be a possibility that radioactive contamination introduced into the PSW system of one unit will spread into another unit by means of shared equipment and/or cross-connections. As previously noted, the sewage treatment and sanitary drainage systems will collect and process sanitary waste from all four units at the site. The STP COL does not appear to explicitly indicate whether there are any cross-connections between the potable water supply systems. Therefore, to assure that NRC approval is not required for this departure, the staff requested the applicant to provide information to sufficiently demonstrate that the PSW system is designed to preclude the potential for cross-contamination between units, in the event that radiological contamination occurs in the PSW system of one of the units. A review of the design for potential cross-contamination is also consistent with the acceptance criteria specified in SRP 9.2.4 related to multi-unit facilities. More specifically, SRP 9.2.4, Subsection II specifies that an evaluation needs to be performed to determine the potential for radiological contamination that includes a consideration of the safety implications inherent in shared multi-unit facilities. Accordingly, the staff issued **RAI 09.02.04-03 (eRAI 2607)** requesting the applicant to demonstrate that the design of the PSW system precludes the potential for cross-contamination between units.

The applicant's response to **RAI 09.02.04-03** in a letter dated August 26, 2009 (ML092430133), states that backflow preventers will be provided for both Units 3 and 4 to prevent possible cross contamination. The response includes an FSAR markup incorporating this information. The staff determined that the installed backflow preventers will adequately address the possibility for cross contamination. Confirmation of this proposed change to the FSAR is being tracked as **Confirmatory Item 09.02.04-03**.

The applicant's evaluation in accordance with 10 CFR Part 52, Appendix A Section VIII, Item B.5 determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that this departure does not require prior NRC approval. In addition, the applicant's process for evaluating departures from and changes to the DCD are subject to NRC inspections.

Interface Requirements

NRC staff reviewed the applicant's information in Section 9.2.4 of the application addressing the Tier 2 interface requirements that include Table 9.2-15, "Potable and Sanitary Water System

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Components (Interface Requirements)”; Figure 9.2-9, “Potable and Sanitary Water System (Sheet 1 of 2),” and Figure 9.2-9b, “Potable Water System P&ID.” As described in STP COL FSAR Subsection 9.2.4.2.5, the design and installation of the PSW system will meet the requirements of International Plumbing Code 2003 and all state and local codes. The Tier 2 interface requirements related to compliance with GDC 60 are satisfied because this system will not have any interconnections with other systems that might potentially contain radioactive material. Furthermore, air gaps will be used where necessary to protect against radioactive contamination of the PSW system. Upon reviewing the application, the staff noted that in Figure 9.2-9, Sheet 2 of 2 was not included. Therefore, the staff issued **RAI 09.02.04-4 (eRAI 2607)** requesting the applicant to provide the missing portion of this figure. In a letter dated August 26, 2009 (ML092430133), the applicant’s response to **RAI 09.02.04-4** provides the requested information. The staff found the applicant’s response acceptable and **RAI 09.02.04-4** is resolved and closed.

The staff reviewed Section 9.2.4 of the COL application to determine the methods used to monitor, measure, and analyze any radioactive effluent released from the non-radioactive drainage (NRD) system. The staff issued **RAI 09.02.04-2 (eRAI 2556)** requesting the applicant to provide additional information concerning monitoring, measuring, and analyzing radioactive liquid effluent from this system. The applicant’s response to **RAI 09.02.04-2 (eRAI 2556)** dated August 20, 2009, (U7-C-STP-NRC-090104, ML092360771) states that the effluents from this system are released to the main cooling reservoir, and these releases are measured and monitored in accordance with the current processes in effect at STP Units 1 and 2. Samples released from the NRD system will be analyzed—they will undergo radiological and non-radiological monitoring after combining with the sanitary system discharge and prior to being released into the environment. A liquid radiation monitor will also to be installed on this combined discharge line. The staff found the applicant’s response acceptable and **RAI 9.02.04-2** is resolved and closed.

The staff reviewed Section 9.2.4 of the COL application to determine the radiological methods used to sample and monitor the onsite well water supplying STP Units 3 and 4. The staff issued **RAI 09.02.04-1 (eRAI 2550)** requesting the applicant to provide information concerning sampling and monitoring of the onsite wells. The applicant’s response to **RAI 09.02.04-1 (eRAI 2550)** dated August 20, 2009, (U7-C-STP-NRC-090104, ML092360771) states that onsite wells that are the source of water for the PSW system are monitored for radioactive contamination under the existing site Radiological Environmental Monitoring Program (REMP). The applicant also commits to add a sentence changing FSAR Subsection 9.2.4.2.2 to state, “Radiological monitoring of the well water system will continue to be performed under the site Radiological Environmental Monitoring Program (REMP).” The staff found this response acceptable and RAI 09.02-04-1 is closed. Verification of the proposed FSAR changes is being tracked as **Confirmatory Item 09.02.04-1**.

#### **9.2.4.5 Post Combined License Activities**

There are no post COL activities related to this subsection.

#### **9.2.4.6 Conclusion**

The NRC staff’s finding related to information incorporated by reference is in NUREG–1503. NRC staff reviewed the application and checked the referenced DCD. The staff’s review confirmed that the applicant has addressed the required information relating to PSW system.

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With the exception of **Confirmatory Items 09.02.04-1 and 09.02.04-03**, no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the PSW system that were incorporated by reference have been resolved..

The staff found it reasonable that the identified Tier 2 departures are characterized as not requiring prior NRC approval per 10 CFR Part 52, Appendix A, Section VIII.B.5.

Based on the results of this evaluation, the staff determined that the applicant's additional information addressing the COL license information and interface requirements referred to above are acceptable as described in the technical evaluation section, and that the applicant has adequately addressed the STP PSW design. However, as a result of **Confirmatory Items 09.02.04-1 and 09.02.04-03**, the staff was unable to finalize the conclusions relating to the PSW system, in accordance with the NRC requirements.

## **9.2.5 Ultimate Heat Sink**

### **9.2.5.1 Introduction**

This section of the FSAR addresses the STP Units 3 and 4 ultimate heat sinks (UHS). The UHS typically consists of an assured supply of water that is credited for dissipating reactor decay heat and essential station heat loads after a normal reactor shutdown or a shutdown following an accident or transient, including a loss-of-coolant accident (LOCA). The water sources that make up the UHS are reviewed to assure that they are capable of performing their safety functions.

### **9.2.5.2 Summary of Application**

In the ABWR DCD Section 9.2.5, the UHS design relied upon a spray pond cooling system. However, the STP applicant replaced that conceptual design, including all subsections, tables, and figures, with plant specific information, along with supplemental information to address the Interface Requirements. The applicant replaces the conceptual design information of the referenced ABWR DCD with that of the site-specific design information. The STP UHS design incorporates multiple forced convection cooling towers above a single water storage basin for each unit. Each unit provides cooling to three redundant reactor service water (RSW) trains. Each train consists of two parallel pumps and two parallel cooling towers. In normal plant operations, one pump and one cooling tower will be in operation from each train. During accident conditions, all pumps and all cooling towers will operate, however, only four pumps and four cooling towers are required to cool the nuclear plant. This allows safe operation with a single failure. The design change from the DCD conceptual UHS design resulted in significant departures from the certified design. The applicant provides information to address interfaces between the site-specific design and the certified DCD design. Interfaces for standard design item 9.2.5 addresses the safety design bases and the power generation design bases for UHS system.

In addition, in the COL FSAR the applicant provides the following:

### Tier 1 Departure

- STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

This departure eliminates the flammability control system that was called for in the ABWR DCD.

### Tier 2\* Departure

- STD DEP 1.8-1 Tier 2\* Codes, Standards, and Regulatory Guide Edition Changes

This departure updates the references to codes and standards to more current revisions or editions.

### Tier 2 Departures Requiring Prior NRC Approval

The following departures affect TS and require prior NRC approval.

- STD DEP 16.3-16 LCO 3.7.1, Reactor Building Cooling Water (RCW) System, Reactor Service Water (RSW) System, and Ultimate Heat Sink (UHS) - Operating and LCO 3.7.2, Reactor Building Cooling Water (RCW) System, Reactor Service Water (RSW) System and Ultimate Heat Sink (UHS) – Shutdown

This departure eliminates some Limiting Conditions of Operation items by claiming that they are redundant.

- STD DEP 16.3-46 LCO 3.7.2, RCW, RSW, and UHS Applicability

This departure alters some wording in the Technical Specifications (TS) to make it more consistent with other sections.

The staff's evaluation of the above two TS departures is addressed in Section 9.2.11, "Reactor Building Cooling Water System," of this SER.

### Tier 2 Departures Not Requiring Prior NRC Approval

- STD DEP 9.2-1 Reactor Building Cooling Water System

This departure revises the design characteristics of the reactor building cooling water (RCW) system and corrects inconsistencies in the System Design Description in Subsection 9.2.11.2 of the ABWR DCD. It also clarifies that all heat exchanger pumps are normally placed in operation, rather than required for shutdown cooling as stated in Subsection 9.2.11.3.2 of the ABWR DCD. The major impact of this departure is increased heat removal capacities and resulting higher performance margins.

This departure revises the RSW design flow rate specified in the ABWR DCD in order for the site specific RSW system to accomplish its safety and power generation design basis. This departure is largely the result of STD DEP 9.2-1, which increases the capacity of the RCW heat exchangers to provide for additional heat removal capability and increased margin due to fouling and other requirements.

Interface Requirements

The applicant provides supplemental information to address UHS interface requirements for the certified design on safety design bases, power generation design bases, safety evaluation, conformance to RG 1.27 and 1.72, instrumentation and alarms, and tests and inspections.

**9.2.5.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements of the Commission regulations for the UHS, and the associated acceptance criteria, are in Section 9.2.5 of NUREG–0800. NRC staff acceptance of the design is based on meeting the requirements of GDC 2, 5, 44, 45, and 46:

1. GDC 2, as it relates to the capability of the structures housing the system and the system itself to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, and floods.
2. GDC 5, as it relates to the capability of shared systems and components important to safety to perform required safety functions
3. GDC 44, as it relates to:
  - a. The capability to transfer heat loads from safety-related structures, systems, and components (SSCs) to the UHS under both normal and accident conditions.
  - b. Suitable component redundancy so that functions can be performed assuming a single, active component failure coincident with a loss of offsite power components (SSCs) to the UHS under both normal and accident conditions.
  - c. The capability to isolate components, systems, or piping if required so safety functions are not compromised.
  - d. GDC 45, as it relates to the design provisions to permit inservice inspection of safety-related systems or components.
4. GDC 46, as it relates to the design provisions to permit operational functional testing of safety-related systems or components.

In addition, in accordance with Section VIII, “Processes for Changes and Departures, of Appendix A to Part 52--Design Certification Rule for the ABWR Design,” the applicant identifies Tier 1, Tier 2\* and Tier 2 departures. Tier 1 and Tier 2\* departures require prior NRC approval and are subject to the requirements of 10 CFR Part 52, Appendix A, Section VIII.A.4, and Section VIII.B.6, respectively. Tier 2 departures affecting TS require prior NRC approval and

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are subject to the requirements of 10 CFR 52 Appendix A, Section VIII.C.4. Tier 2 departures not requiring prior approval are subject to the requirements of 10 CFR Part 52, Appendix A, Section VIII.B.5, which are similar to the requirements of 10 CFR 50.59.

#### **9.2.5.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.2.5 of the certified ABWR DCD. However, as indicated in Section 4.1 of Tier 1 of the ABWR DCD, the UHS is not within the scope of the certified design. Therefore, Section 9.2.5 of the ABWR DCD provides a conceptual UHS design. The plant-specific UHS design in Section 9.2.5 of the STP COL FSAR differs significantly from the conceptual design in the ABWR DCD. The staff reviewed the information in STP COL FSAR Section 9.2.5 related to the site-specific design of the UHS, in accordance with NUREG–0800 Section 9.2.5. Conformance with the acceptance criteria of SRP Section 9.2.5 formed the basis for the evaluation of the UHS, with respect to the applicable regulations.

ABWR DCD Section 9.2.5 provides a conceptual design of the UHS and interface requirements. The ABWR DCD conceptual design may be adopted by a COL applicant, in which case the COL applicant must indicate the adoption of the conceptual design and address the interface requirements. The applicant may also choose to depart from the conceptual design in the DCD and provide a plant specific UHS design. The UHS conceptual design in the DCD utilized a Seismic Category I spray pond that provided sufficient cooling water for reactor operations, shutdown cooling, and accident mitigation. The STP COL application did not adopt the DCD conceptual design. Instead, the STP plant specific UHS design incorporates multiple forced convection cooling towers above a single water storage basin for each unit.

The STP UHS utilizes a dedicated UHS water storage basin in a Seismic Category I concrete structure built partially below grade, and sized for a water volume sufficient to meet the cooling requirements for 30 days following a design basis accident (DBA) with no makeup water and without exceeding design basis temperature and chemistry limits. Above the basin is a counterflow mechanical induced draft cooling tower with six cooling tower cells, of which two cells are dedicated to each of the three RSW divisions. The RSW pump house is contiguous with the UHS storage basin and houses the RSW pumps and associated piping and valves. The RSW pump house is partially located below grade and is integral with the UHS water storage basin.

The UHS for STP Units 3 and 4 are separate stand-alone structures with no cross ties. The UHS is composed of three divisions of cooling water supply and return; each division has two fans for cooling water being returned to the basin, two 50-percent RSW pumps, spray nozzles, and associated piping and valves. Each UHS division is physically and electronically separated and emergency power is provided for essential RSW system pumps, fans, valves, and controls.

##### **9.2.5.4.1 System Design Considerations**

- A. GDC 2, “Design bases for protection against natural phenomena,” and RG 1.27, “Ultimate Heat Sink.”

NRC staff reviewed the UHS for compliance with the GDC 2 requirements with respect to protection against the effects of natural phenomena such as earthquakes, tornados, hurricanes

and floods. Compliance with the GDC 2 requirements is based on adherence to Positions C.2, and C.3 of RG 1.27, "Ultimate Heat Sink for Nuclear Power Plants."

GDC 2 requires SSCs important to safety such as the UHS, to be capable of withstanding the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, and floods without losing the capability to perform safety functions with and without available offsite power. The applicant states in FSAR Subsection 9.2.5.1. "Safety Design Bases." that the UHS and any pumps, fans, valves, structure, and other safety systems are designed to Seismic Category I and ASME Code, Section III, Class 3. FSAR Subsection 9.2.5.8, "Conformance to RG 1.27 and 1.72," states that the UHS is capable of withstanding, without the loss of its safety function, the most severe single natural phenomena expected at the site, site-related events, and a single failure of manmade structural features. Analyses, design features, and provisions that are credited for satisfying GDC 2 requirements are described in STP Tier 2 FSAR Chapter 3 (Sections 3.4 and 3H.6) and are discussed in the staff's evaluations of the analyses, design features, and provisions in the corresponding Chapter 3 sections of this SER. The staff confirmed that the safety and nonsafety-related parts of the UHS are properly classified so that the analyses, design features, and provisions described in Chapter 3 will ensure that the UHS is capable of performing its safety functions during natural phenomena. Also, because each of the safety-related UHS trains has its own safety-related emergency power source that is protected from the effects of natural phenomena, as described in Chapter 3, the loss of offsite power as a result of natural phenomena will not adversely affect the capability of the UHS to perform its safety functions.

The applicant also demonstrates UHS compliance with GDC 2 requirements by addressing Interface Requirement 5, which the applicant responds to in Tier 2, Subsection 9.2.5.8 of the STP COL FSAR. STP COL FSAR Subsection 9.2.5.8 also discusses conformance with RG 1.27. The staff reviewed the applicable interface requirements and found them to be acceptable as detailed in the interface requirement reviews below. Based on this review, the staff concluded that the UHS design conforms to the guidelines of Regulatory Positions C.2 and C.3 of RG 1.27 and the requirements of GDC 2, as they relate to the protection of the UHS against natural phenomena such as earthquakes, tornados, hurricanes, and floods.

#### B. GDC 5, "Sharing of structures, systems, and components"

GDC 5 requires that SSCs important to safety shall not be shared. NRC staff reviewed the UHS design for compliance with the requirements of GDC 5 with respect to sharing SSCs. Acceptance is based on the failure of any component, including a pipe break and a single active failure, not preventing the safe shutdown and cool down of either unit (together or singularly).

NUREG-1503 concludes that, for the ABWR, the requirements of GDC 5 for sharing SSCs do not apply because the ABWR is designed as a single unit plant. The NUREG goes on to state that any application for a multi-unit facility requires a review of the design for compliance with GDC 5. This COL application is for two new units at the STP site that already has two units in operation. The STP COL application identifies Departure STP DEP 1.1-2, "Dual Units at STP 3 & 4," which addresses this issue for the facility. This departure identifies the set of STP systems that the units share. The UHS components are not identified as a shared system. Therefore, the staff concluded that the UHS site-specific design described in the COL application meets GDC 5 requirements relative to the sharing of SSCs.

C. GDC 44, "Cooling water," RG 1.27, "Ultimate Heat Sink,"

GDC 44 requires systems to transfer heat from SSCs important to safety to a UHS. Systems must be able to function under normal and accident conditions assuming a single failure. This criterion is covered in the applicant's response to interface requirements. NRC staff reviewed these interface requirements and issued a number of RAIs. As discussed later in this section, the staff concluded that the application does not meet the requirements of GDC 44 until the open items are satisfactorily resolved.

D. GDC 45, "Inspection of cooling water system"

GDC 45 requires that the cooling water system be designed to permit appropriate periodic inspections of important components (e.g., heat exchangers and piping) to ensure the integrity and capability of the system. NRC staff found the design acceptable because it meets the GDC 45 requirement, and the applicant's response to Interface Requirement 11 adequately addresses conformance with this criterion, which is reviewed later in SER Subsection 9.2.5.4.2.

E. GDC 46, "Testing of cooling water system"

GDC 46 requires that the cooling water system be designed to permit appropriate periodic pressure and functional testing to ensure the leaktight integrity and operability of its components, as well as the operability of the system as a whole, under conditions as close to the design basis as is practical. This criterion is addressed in the applicant's response to Interface Requirement 11. NRC staff reviewed the applicant's response and determined that the applicant meets the GDC 46 requirement.

#### 9.2.5.4.2 Safety Design Bases (Interface Requirements)

FSAR Subsection 9.2.5.1 of the COL application presents 13 interface items that relate to the UHS and are referred to below in quotes. An NRC staff review follows each item:

1. "The UHS is designed to provide sufficient cooling water to the RSW system to permit safe shutdown and cooldown of the unit and maintain the unit in a safe shutdown condition. The RSW water temperature at the inlet to the RCW/RSW heat exchangers is not to exceed 35°C during a LOCA."

The staff reviewed the application and found that the design is adequate to remove the required heat load from the site to allow a safe shutdown of the unit. However, the performance of the UHS system should be validated through ITAAC 3.0-1.2a, because the final design (including piping and component sizes) is not yet complete at this point in time. The RSW pumps need to be designed to operate properly. However, no ITAAC item was provided to assure that the pump design is adequate in regards to net positive suction head (NPSH). In Section 9.2.15, "Reactor Service Water System," of this SER, the staff issued **RAI 09.02.01-6 (eRAI 3211)** requesting the applicant to provide an ITAAC to verify, through tests and verification, the NPSH requirements for the RSW pumps.

The applicant's response to **RAI 09.02.01-6** dated September 8, 2009 (U7-C-STP-NRC-090133, ML092530407), adds a site-specific ITAAC item to verify the NPSH requirements for the RSW pumps. The staff reviewed the proposed site-specific ITAAC (in Table 3.0-5) and found it acceptable because it requires through inspection, tests, and analysis, verification that the RSW

pump NPSH requirements are met. The staff's review of **RAI 09.02.01-6** is included in Section 9.2.15 of this SER.

The staff also noted that the minimum water level above the pump suction was not consistently stated in the COL application. The staff issued **RAI 09.02.05-1 (eRAI 3231)** requesting the applicant to clarify the minimum water level above the pump suction and to correct inconsistencies in the COL application.

The applicant's response to **RAI 09.02.05-1** dated August 28, 2009 (U7-C-STP-NRC-090123, ML092450155), states that the COL application will be modified to make all of the elevations cited within the application consistent. Some of the apparent discrepancies were due to the use of different elevation data points. In this response, the applicant proposes changes to COL application Part 9, Table 3.0-1, Acceptance Criteria 2.(a); COL application Part 2 Tier 2, Subsections 9.2.5.5.2(7) and 9.2.5.7.3, Table 9.2-17, Subsection 9.2.15.2.1(2), Table 9.2-18, Section 19R.1(5), and Subsections 3H.6.3.1 and 3H.6.3.3; and COL application Part 2, Tier 2 Figure 1.2-35. The applicant's RAI response highlights portions of Figure 1.2-35 that will be modified. However, the minimum pool level height shown does not agree with the version of this figure in Revision 2 of the COL application, but the applicant's response does not identify or modify this discrepancy. However, this discrepancy is identified as a modification in the applicant's response to **RAI 09.02.05-4** (summarized below), and thus it is acceptable. However, the curb identified in COL application Tier 2 Subsection 9.2.5.2(5) and also in the old version of Figure 1.2-35 is not visible on the new version of Figure 1.2-35. This curb was included to prevent sediment migration to the pump. The applicant provides no justification for the elimination of the curb. Thus, the staff found the response to **RAI 09.02.05-1** inadequate and issued **RAI 09.02.05-8 (eRAI 4171)** requesting the applicant to clarify whether the curve has been eliminated from the UHS design.

The applicant's response to **RAI 09.02.05-8** dated February 18, 2010 (U7-C-STP-NRC-100045, ML100550029) states that the curb described in COL FSAR Revision 3, Tier 2 Subsection 9.2.5.2(5) and also identified in COL application Tier 2, Revision 2 Figure 1.2-35 has not been eliminated from the UHS design. The applicant has provided a detailed drawing (sketch) of the section of Figure 1.2-35 that contains the curb. The staff reviewed the applicant's response and COL FSAR Revision 3 Figure 1.2-35 and determined that the 0.3-m (1-ft) curb is indicated on the drawing and the curb has not been eliminated. Because the applicant's information verifies that the curb continues to be part of the UHS design, the applicant has adequately addressed the concern raised in **RAI 09.02.05-1** and therefore, **RAI 09.02.05-8** is resolved. Hence, **RAI 09.02.05-1** and **RAI 09.02.05-8** are closed.

Finally, in the COL application, Tier 2 Table 9.2-26, the data for the UHS basin temperature are missing. The staff issued **RAI 09.02.05-2 (eRAI 3231)** requesting the applicant to revise Table 9.2-26 to include the UHS basin temperature.

The applicant's response to **RAI 09.02.05-2** dated August 28, 2009 (U7-C-STP-NRC-090123, ML092450155) states that the COL application will be modified to include the missing data for the UHS basin temperature in Table 9.2-26. These data are presented graphically in Figure 9.2-17 in the COL application. The applicant's response includes the requested data in Table 9.2-26. Thus, **RAI 9.2.5-2** is resolved. The incorporation of COL application revisions that specify the UHS basin transient temperature is being tracked as **Confirmatory Item 09.02.05-2**.

2. "In the event of an accident, the UHS is designed to provide sufficient cooling water to the RSW system to safely dissipate the heat for that accident. The amount of heat to be removed is provided in Tables 9.2-4a, 9.2-4b and 9.2-4c of the ABWR DCD."

NRC staff reviewed the water usage calculations in the COL application and found that they conservatively demonstrate that the UHS basin capacity is adequate and demonstrates 30 days of operation without makeup. However, this calculation is based on numerical values presented in Tables 9.2-4a, 9.2-4b, and 9.2-4c of DCD Tier 2. The applicant does not justify the amount of excess margins included in the design to account for uncertainties, component wear and aging effects, fouling of heat transfer surfaces and spray nozzles, and strainer debris collection (among other areas of concern). The staff issued **RAI 09.02.05-3 (eRAI 3231)** requesting the applicant to address the excess margins and to justify that the margins are adequate. The performance of the UHS system will have to be validated through ITAAC 3.0-1.2a because the final design is not yet complete at this point in time. Finally, the amount of water required for 30 days of operation without makeup is not consistently stated in the COL application. The staff issued **RAI 09.02.05-4 (eRAI 3231)** requesting the applicant to clarify the minimum water level required to operate the plant for 30 days and to correct inconsistencies in the COL application.

The applicant's response to **RAI 09.02.05-3** dated August 28, 2009 (U7-C-STP-NRC-090123, ML092450155) states that the UHS design has not been finalized so the margins requested in **RAI 09.02.05-3** are not available. The applicant adds that the goal is to provide the margins, and margins are provided for related systems. The applicant also states that margins for the UHS will be included in the performance requirements in the procurement process. The staff issued **RAI 09.02.05-9 (eRAI 4171)** requesting the applicant to specify the margins.

The applicant's response to **RAI 09.02.05-9** dated April 26, 2010 (U7-C-STP-NRC-100096, ML101190118), provides additional information about the system design margin, including specific margins for procurement specifications of major system components. The applicant also indicates that the design values specified in the FSAR are based on the most limiting input parameters. For example, the performance of the RSW heat exchanger is based on accident heat loads with a performance margin of 20 percent for fouling. The NPSH available for the UHS is based on equipment, piping, and components assumed to be in their most fouled or degraded conditions, and the total developed head (TDH) calculation required for the UHS is based on cold water cases that maximize the service water density.

The applicant's response to the RAI also states that the RSW system is integral to the UHS and relies on three major components to transfer heat from the RCW heat exchangers to the UHS: the RSW system pumps, the RCW system heat exchangers, and the UHS cooling towers. The applicant also states in the RAI response that the RSW self-cleaning strainers are also of interest due to the increased pressure drop experience across the component with an increase in debris accumulation. The applicant provides the following information about the design process and preliminary design margins for these components.

The RSW system pumps will be specified with an additional 10 percent margin for the TDH and flow rate above the required values using the most limiting input parameters. A minimum available NPSH was also determined using the most limiting parameters and conservatively reduced by 10 percent for the RSW pump procurement.

The stated capacities of the RSW system heat exchangers in FSAR Table 9.2-4d are based on accident loads and provide a performance margin of 20 percent to allow for fouling.

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The RCW system UHS cooling tower total head load for the most bounding RSW division was considered in determining the required cooling tower range (the difference between the hot water inlet temperature and the cold water outlet temperature). The selected range of 8 degrees Celsius in FSAR Subsection 9.2.5.6 bounds the required cooling tower range. The divisional heat transfer capacities of the UHS cooling tower will be specified to be greater than the divisional heat transfer capacities of the RCW heat exchangers, which preserve the 20 percent margin of the RCW heat exchangers.

The RSW system hydraulic calculations assume a conservative RSW system strainer differential pressure.

The applicant also states that in addition to applying a margin during the design phase, the RSW system performance will be monitored to ensure that system components are in an adequate operating condition and a significant margin exists to perform their safety function. The applicant proposes revising FSAR Subsections 9.2.5.6 and 9.2.15.2.3 to include an additional discussion on margins associated with the UHS and RWS system designs. As part of the response to **RAI 09.02.05-9**, the applicant includes a markup of those subsections.

The staff reviewed the applicant's response to **RAI 09.02.05-9** and found it acceptable, because the applicant's design requirements are based on evaluations that took into consideration component and system degradation based on industry experience. The applicant also provides an additional margin of 10 to 20 percent in the specified requirements for the major RCW and RSW components. Therefore, the staff considers **RAI 09.02.05-9** resolved. Verification of the applicant's proposed changes to FSAR Tier 2 Subsections 9.2.5.6 and 9.2.15.2.3 are being tracked as **Confirmatory Item 09.02.05-9**.

The applicant's response to **RAI 09.02.05-4** dated August 28, 2009 (U7-C-STP-NRC-090123, ML092450155) clearly restates the minimum water level required to operate for 30 days on a consistent basis in the COL application. In this response, the applicant proposes changes to Figure 1.2-35 in Tier 2 Section 21 and Subsection 9.2.5.7.1. With these changes, the application consistently reports the same minimum water level for the UHS basin. Thus, the staff found the response acceptable and **RAI 09.02.05-4** is resolved. The incorporation of these proposed changes to the COL application that specify the UHS basin water level is being tracked as **Confirmatory Item 09.02.05-4**.

3. "The UHS is sized so that makeup water is not required for at least 30 days following an accident and design basis temperature and chemistry limits for safety-related equipment are not exceeded."

The COL application addresses the water temperature interface requirement but does not demonstrate that the water chemistry is acceptable after 30 days of water loss without makeup. The staff issued **RAI 09.02.05-5 (eRAI 3231)** requesting the applicant to address this interface requirement in the COL application.

The applicant's response to **RAI 09.02.05-5** dated August 28, 2009 (U7-C-STP-NRC-090123, ML092450155) states that through the procurement process the applicant will obtain UHS equipment that is designed to operate using the worst projected water that might exist in the UHS after 30 days of operation without makeup. The applicant also states that the heat loads will be lower at the end of this time period, so the potential fouling will not cause the system to operate without significant margin. The staff found this response inadequate because the

applicant included no calculations to demonstrate that the design can accommodate the potential change in the water chemistry. The applicant also fails to provide an estimate of the water chemistry that might be obtained after 30 days of evaporation. The staff issued **RAI 09.02.05-10** requesting the applicant to demonstrate that the final design can successfully operate with the worst possible water chemistry.

The applicant's response to **RAI 09.02.05-10** dated February 18, 2010 (U7-C-STP-NRC-00045, ML100550029) provides UHS water chemistry analysis results for 30 days of operation without makeup. The applicant states that their specifications will specify that RSW equipment are able to perform their safety function for the estimated chemistry conditions for the 30 days of operation. The staff reviewed the applicant's response and found it acceptable, because the applicant has provided the requested water chemistry information and is including it in the equipment procurement specification. The procurement of RSW equipment based on the applicant's water chemistry information will ensure that the RSW system is designed to successfully operate under the worst water chemistry case possible that might exist in the UHS after 30 days of operation. Therefore, **RAI 09.02.05-10** is resolved, and both **RAI 09.02.05-5** and **RAI 09.02.05-10** are closed.

4. "The UHS is designed to perform its safety function during periods of adverse site conditions, resulting in maximum water consumption and minimum cooling capability."

The COL applicant identifies from the Victoria, Texas, weather database the worst 30 consecutive days of meteorological data for use in determining the water usage rate of the UHS. The database covers a 45-year historical period and is consistent with the guidance in RG 1.27, "Ultimate Heat Sink for Nuclear Power Plants." The applicant has also identified two sources of water to supply the UHS past the initial 30 days, which is consistent with RG 1.27. The primary water source is well water, and the secondary water source is the main cooling reservoir. Therefore, the staff found the information acceptable and this interface requirement satisfied. The design of the UHS needs to enable operation under all anticipated conditions. The COL application addresses how the RSW pumps are protected from large debris that can end up in the service water basin, either from makeup water sources or due to basin or cooling tower degradation, and how clogging due to silt accumulation will be prevented in accordance with Information Notice 2006-017, "Recent Operating Experience of Service Water Systems Due to External Conditions," dated July 31, 2006. FSAR Subsection 9.2.5.5.2(5) states that the UHS basin includes a lip to minimize ingestion of silt from the basin. FSAR Subsection 9.2.5.5.2(7) states that a perforated plate is installed above the intake to prevent ingestion of large debris. However, FSAR Section 9.2.5 does not discuss the specific problems of biological fouling, corrosion, and erosion of the UHS components. These problem areas are specifically addressed in NRC Generic Letter 1989-013, "Service Water System Problems Affecting Safety-Related Equipment." The staff issued **RAI 09.02.05-6 (eRAI 3231)** requesting the applicant to address these issues.

The applicant's response to **RAI 09.02.05-6** dated August 28, 2009 (U7-C-STP-NRC-090123, ML092450155) identifies the various sections in the current COL application that address the specific problems of biological fouling, corrosion, and erosion of the UHS components. The applicant directs the staff to particular sections in Tier 2, Sections 9.2.5, 9.2.15, and 9.2.17, which discuss the testing programs and chemical treatments that are in place to address the issues raised in NRC Generic Letter 1989-013. The staff found this response acceptable, and no changes to the COL application are necessary. Therefore, **RAI 09.02.05-6** is resolved and closed.

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5. "The UHS is designed to withstand the most severe natural phenomenon or site-related event (e. g., Safe Shutdown Earthquake, tornado, hurricane, flood, freezing, spraying, pipe whip, jet forces, missiles, fire, failure of non-Seismic Category I equipment, flooding as a result of pipe failures or transportation accident), and reasonably probable combinations of less severe phenomena and/or events, without impairing its safety function."

FSAR Subsection 9.2.5.7.2 states that the UHS basin, cooling tower, and RSW pump house are designed to Seismic Category I and can thus withstand an SSE. The three cooling divisions are separated by concrete walls to prevent a common mode failure such as a fire. The heating, ventilation, and air conditioning (HVAC) inlets and outlets for the pump houses are protected from tornado-driven missiles. The UHS is protected from floods and from the failure of the main cooling reservoir embankment. The UHS is protected against freezing because the basins are partially below ground. The UHS operations allow for bypassing the cooling towers in the event of cold ambient temperatures. Because the UHS is in service under all operational modes, freezing is not possible with this bypass. Therefore, the staff concluded that this interface requirement is met.

6. "The safety-related portion of the UHS is designed to perform its required cooling function assuming a single active failure in any mechanical or electrical system."

As stated in DCD Section 9.2.5, the UHS is connected to three cooling divisions, and any two are sufficient to provide the required cooling after the DBA. Each division resides on a separate emergency electrical bus. Thus, the staff determined that the cooling system is demonstrated to perform its required cooling function assuming a single active failure in any mechanical or electrical system. Therefore, the staff concluded that this interface requirement is met.

7. "The UHS is designed to withstand any credible single failure of man-made structural features without impairing its safety function."

FSAR Subsection 9.2.5.7.2, "Effects of Severe Natural Events or Site-Related Events," states that in the case of a main cooling reservoir embankment breach, the UHS structure is designed to withstand the dynamic and hydrostatic forces caused by a flood wave propagating from the reservoir for the duration of the postulated accident. Also, FSAR Subsection 9.2.5.6 states that the UHS can withstand the failure of any single component. The UHS is arranged in three divisions, and only two are required to successfully operate after any accident. Thus, the staff concluded that this interface requirement is met.

8. "All safety-related heat rejection systems are redundant so that the essential cooling function can be performed even with the complete loss of one division. Single failures of components in electrical systems may lead to the loss of the affected pump, valve or other components and the partial or complete loss of cooling capability of that division but not of other divisions."

The staff reviewed the safety-related heat rejection systems described in the DCD and the COL application, including the RCW system, and the reactor service water (RSW) system. Both the RCW and RSW are composed of three mechanically and electrically independent divisions, each powered by a different division of the emergency safety features (ESFs) power system. Any two divisions are sufficient to provide the required cooling after the DBA. Therefore, in the event of a complete loss of one division of a safety-related heat rejection system, the system

remains capable of performing its design cooling function. Based on this review, the staff determined that this interface requirement is met.

9. "The UHS and any pumps, fans, valves, structures, or other components that remove heat from safety systems are designed to Seismic Category I and ASME Code, Section III, Class 3, Quality Assurance B, Quality Group C, IEEE-379, IEEE-603, and IEEE-308 requirements."

The proposed design meets the requirements of Seismic Category I quality group and ASME code requirements, as stated in DCD Tier 2 Table 3.2-1 and in COL FSAR Subsection 9.2.5.7.2. The COL application states that the UHS design will meet Institute of Electrical and Electronics Engineers (IEEE) Standard (Std)-308, "Criteria for Class 1E Power Systems for Nuclear Power Generation Stations," by using class 1E electrical supplies. The COL application also states that the UHS design will meet the single failure requirements, which are defined in IEEE Std-379, Standard Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems," and IEEE Std-603, "Criteria for Safety Systems for Nuclear Power Generating Stations." It should be noted that the ABWR DCD cites IEEE Std-279, "Criteria for Protection Systems for Nuclear Power Generating Stations," in this interface requirement, and the STP COL application replaces this standard with IEEE Std- 379 and IEEE Std-603. This replacement is discussed in STD DEP 1.8-1. Based on this review, the staff concluded that this update of the standard is appropriate. The staff found that this interface requirement.

10. "The safety-related portions of the UHS are mechanically and electrically separated. The UHS is arranged in three divisions. Active components within each division are powered by their respective Class 1E divisions. Each division is physically separated and electrically independent of the other divisions."

The staff's review of the COL application found that the UHS design satisfies this interface requirement and will be verified by ITAAC 3.0-1.3. The ITAAC items are reviewed in further detail below. Therefore, the staff found that this interface requirement is met.

- 11 "The UHS is designed to include the capability for full operational inspection and testing."

FSAR Subsection 9.2.5.3.1 states that the UHS system allows for periodic pressure and functional testing. Subsection 14.2.12.1.77 describes the Preoperational Test Program. COL application Part 9, "Inspection Tests Analysis and Acceptance Criteria," identifies additional tests. The drawings in FSAR Section 21, "Large Scale Drawings," indicate that sufficient space is available for the inspections and tests. Subsections 16.3.7.1 and 16.3.7.2 present surveillance requirements that require daily inspections in all modes (except for conditions when the reactor head is off, the water gate to the drier storage pool is open, and the reactor flange is covered by greater than 7 m of water). NRC staff found that this interface requirement is satisfied.

The COL applicant adds two additional interface requirements for the UHS design beyond what was specified in the Tier 2 ABWR DCD Subsection 9.2.5.1. These cover the aspects of the Tier 1 interface requirements in ABWR DCD Tier 1, Section 4.1 that are not explicitly covered in the above interface requirements.

12. "In the event of loss of preferred power source, the UHS is designed to be powered by the onsite emergency power system."

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FSAR Table 8.3-1 shows that the three diesel generator emergency power buses provide power to the three independent UHS trains (including the cooling tower fan, the HVAC fan, and the RSW pumps). Section 9.2.5 also states that the UHS is powered by the emergency power system. The staff found that this interface requirement is met.

13. "UHS System Divisions A and B components have control interfaces with the remote shutdown system (RSS) as required to support UHS operation during RSS design basis conditions."

FSAR Subsection 9.2.5.9 of the COL application states that Divisions A and B of the UHS will have controls available in the RSS, which is also required by ITAAC 3.0-1.4. Part 9 of the COL application states that Figure 3.0-1 illustrates where the controls are sent. FSAR Subsection 9.2.5.9 states that the controls for Divisions A and B are treated differently from the controls for Division C. However, Figure 3.0-1 does not specify where the displays and controls are sent. Because there is only a single figure, there is an implied assumption that all three divisions are treated in a similar fashion, which is not consistent with Tier 2 Section 9.2.5. Finally, the acceptance criteria for ITAAC 3.0-1.4 state that the controls will exist in the main control room, and does not validate their existence in the RSS. NRC staff issued **RAI 09.02.05-7 (eRAI 3231)** requesting the applicant to include more details in the ITAAC section, and to ensure that these details are consistent with the design presented in Tier 2 Section 9.2.5.

The applicant's response to **RAI 09.02.05-7** dated August 28, 2009 (U7-C-STP-NRC-090123, ML092450155) refers to ABWR DCD Tier 2 Figure 7.3-7, as showing that the controls for all three divisions of the UHS will be available in the main control room. The applicant's response identifies ABWR DCD Subsection 7.4.1.4.4 as defining the controls and instrumentation that are available in the RSS. Finally, the RAI response proposes modifications to ITAAC Item 4 of Table 3.01-1 in the COL application Part 9, Section 3 to more clearly define the locations of controls and displays of the various UHS divisions. The staff found that the RAI response clearly identifies where in the COL application the requested information can be found. The staff also found that the proposed modification to the ITAAC item clearly states that the displays and controls of the UHS system exist in the main control room for all three divisions, and the displays and controls for Divisions A and B exist in the remote shutdown system. Thus, **RAI 09.02.05-7** is resolved. The incorporation of the COL application revision into ITAAC Item 4 of Table 3.01-1 is a **Confirmatory Item 09.02.05-7**.

As stated above, Tier 1 ABWR DCD Section 4.1 provides additional interface requirements for the UHS that are incorporated by reference into the Tier 1 COL FSAR. They are reproduced here in quotes followed by an NRC staff review of each item:

- (a) "Provide cooling water to the RSW System for normal plant operation and to permit safe shutdown and cooldown of the plant and maintain the plant in a safe shutdown condition for design basis events."

This is equivalent to Item 1 in the COL FSAR Subsection 9.2.5.1 list provided above and is therefore acceptable.

- (b) "Makeup water for the UHS shall not be required for at least 30 days following a design basis accident."

This is equivalent to Item 3 in the COL FSAR Subsection 9.2.5.1 list provided above and is therefore acceptable.

- (c) “Any active safety-related system, structure, or components within the UHS shall have three divisions powered by their respective Class 1E divisions. Each division shall be physically separated and electrically independent of the other divisions.”

This is similar to Item 8 in the COL FSAR Subsection 9.2.5.1 list provided above and more specifically identifies the number of trains. The NRC staff’s review determined that the design in the COL application meets this interface requirement.

- (d) “UHS System Divisions A and B components shall have control interfaces with the Remote Shutdown System (RSS) as required to support UHS operation during RSS design basis conditions.”

This is equivalent to Item 13 in the COL application FSAR Subsection 9.2.5.1 list provided above and is therefore acceptable.

- (e) “Be classified as Seismic Category I.”

This is a subset of Item 9 in the COL application FSAR Subsection 9.2.5.1 list provided above and is therefore acceptable.

#### ITAAC

The ITAAC items for the UHS are discussed in Part 9 of the COL application. The first item in Table 3.0-1 requires the as-built UHS to conform to Figure 3.0-1 in Part 9, which is a functional arrangement diagram of the UHS. Item 2a requires an inspection to assure that the RSW pump suction line is correctly placed in the UHS basin. Item 2b requires the UHS basin to contain sufficient water above the RSW suction line to remove the anticipated heat loads for 30 days without makeup. Item 3 requires inspections and tests to assure that the three UHS divisions are physically separated and powered on independent electrical buses. Item 4 requires inspections to assure that the displays and controls for the UHS exist in the main control room and in the RSS. Item 5 requires a structural analysis to be performed to demonstrate that the UHS can withstand the design-basis loads. NRC found that these ITAAC items are sufficient to verify that the as built UHS is consistent with the approved UHS design with the following exception:

The acceptance criteria for Item 4 only require that the displays and controls be available in the main control room and does not specify any RSS operability of the UHS. This item also implies that all three trains of the UHS are treated identically, and yet the Tier 2 documentation indicates that the train C control is significantly different. The staff issued **RAI 09.02.05-7 (eRAI 3231)** requesting the applicant to include more details in the ITAAC section and to ensure that these details are consistent with the design described in Tier 2 Section 9.2.5.

As discussed above, the applicant’s response to **RAI 09.02.05-7** modifies Item 4 of Table 3.0-1 in the COL application Part 9 Section 3 to more clearly define the locations of controls and displays of the various UHS Divisions. Thus, **RAI 09.02.05-7** is resolved. The incorporation of the COL application revision into ITAAC Item 4 of Table 3.0-1 is being tracked as **Confirmatory Item 09.02.05-7**.

Based on a detailed review of FSAR Tier 1 Table 3.0-1, the staff found the proposed ITAAC appropriate because the ITAAC will adequately verify the capabilities, design features, and systems interfaces of the UHS design.

#### Tier 1 Departure

- STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

This departure results in the elimination of the flammability control system that was called for in the ABWR DCD. The staff reviewed STD DEP T1 2.14-1 and determined that the only impact of this departure on the UHS system is the removal of that system from the heat load required to be serviced. This is reflected in changes to Tables 9.2.4a through c. Therefore, the staff found this departure acceptable in regards to its impact on the UHS.

#### Tier 2\* Departure

- STD DEP 1.8-1 Tier 2\* Codes, Standards, and Regulatory Guide Edition Changes

The staff reviewed this departure updates the references to more current revisions/editions of codes and standards. In FSAR Section 9.2.5, "Safety Design Basis," the reference to IEEE Std-279 is replaced with a reference to IEEE Std-603. This change is a departure from Tier 2\* information and thus requires NRC review and approval. IEEE Std-279 addresses considerations such as design bases, redundancy, independence, single failures, qualifications, bypasses, status indication, and testing. IEEE Std-603, "Criteria for Safety Systems for Nuclear Power Generating Stations," has since superseded IEEE Std-279. The guidance in IEEE Std-603 is endorsed by RG 1.153 "Criteria for Safety Systems," and incorporates the guidance of IEEE Std-279. Therefore, the staff found the proposed departure acceptable.

#### Tier 2 Departures Not Requiring Prior NRC Approval

- STD DEP 9.2-1 Reactor Building Cooling Water System

The staff reviewed STD DEP 9.2-1 in accordance with 10 CFR 52 Appendix A, Section VIII.B.5.b. This departure increases the heat removal capabilities of the RCW system to account for fouling. These changes add margin to the system and are not safety-significant because they do not affect the performance requirements of the system.

The applicant's evaluation in accordance with Section VIII.B.5 of 10 CFR 52, Appendix A determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

- STD DEP 9.2-5 Reactor Service Water System

NRC staff reviewed STD DEP 9.2-5 in accordance with 10 CFR 52 Appendix A, Section VIII.B.5.b. This departure revises the RSW design flow rate specified in the ABWR DCD in order for the site-specific RSW system to accomplish its safety and power generation design basis. This departure is largely the result of Departure STD DEP 9.2-1, which increased the

capacity of the RCW heat exchangers to provide additional heat removal capability and an increased margin due to fouling and other requirements. The staff found this departure acceptable in terms of its impact on the UHS system. The impact of the departure on the RSW system is evaluated in Section 9.2.15 of this SER.

The applicant's evaluation in accordance with Item B.5 of Section VIII of Appendix D determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections

#### **9.2.5.5 Post Combined License Activities**

In addition to the site specific ITAAC items provided in Table 3.0-1 of Part 9 of the COL application, the applicant must also satisfy the acceptance criteria in Table 3.0-5.

#### **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 the UHS. With the exceptions of **Confirmatory Items 09.02.05-2, 09.02.05-4, 09.02.05-7, and 09.02.05-9**, there is no outstanding information expected to be addressed in the COL FSAR related to this section.

In addition, the staff compared the conceptual design information provided to address DCD interface requirements to the relevant NRC regulations, acceptance criteria defined in NUREG 0800, SRP Section 9.2.5, and other NRC regulatory guides. The staff's review confirmed that the applicant has provided the information specified by the referenced DCD relating to the UHS. The applicant has successfully met the requirements specified in 10 CFR 50 Appendix A, GDC 2, 5, 44, 45, and 46.

Further, the staff found it reasonable that the identified Tier 2 departures are characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5.

However, as a result of the above **confirmatory items**, the staff was unable to finalize its conclusions relating to the UHS in accordance with the NRC requirements.

#### **9.2.6 Condensate Storage Facility**

See SER Section 9.2.9, "Makeup Water Condensate System," of this report.

#### **9.2.7 Chilled Water System**

See SER Section 9.2.12, "HVAC Normal Cooling Water System" and Section 9.2.13, "HVAC Emergency Cooling Water System."

## **9.2.8 Makeup Water Preparation System**

### **9.2.8.1 Introduction**

The makeup water preparation system (MWPS) is a nonsafety-related system that supplies water to the makeup water (purified) (MUWP) system and other systems. The MWPS consists of both mobile and permanently installed water treatment systems. The permanently installed system consists of wells, filters, reverse osmosis (RO) modules, and demineralizers that prepare demineralized water from well water. Much of the MWPS is located in the makeup water preparation (MWP) building, which does not contain any safety-related systems, components, or structures (SSCs). Other parts of the MWPS are located in outdoor areas, including the well water storage tank/basin, the filtered water storage tank, the demineralized water prover tanks, and the demineralized water storage tanks.

### **9.2.8.2 Summary of Application**

Section 9.2.8 of the STP COL FSAR incorporates by reference Section 9.2.8 of the ABWR DCD Revision 4 referenced in 10 CFR 52 Appendix A.

In addition, in FSAR Section 9.2.8, the applicant provides the following:

#### *Tier 2 Departures Not Requiring NRC Approval*

- STP DEP 1.1-2 Dual Units at STP 3 & 4

This departure changes the design from a single unit to dual units (STP Units 3 and 4).

- STP DEP 9.2-2 Makeup Water Preparation System

This departure primarily involves increased flow rates and storage capacities to accommodate two units.

#### *COL License Information Items*

ABWR DCD Subsections 9.2.8.5 and 9.2.8.8 identify actions for COL applicants to complete. Although these actions are not cross-referenced in DCD Tier 2 Table 1.9-1, "Summary of ABWR Standard Plant COL License Information," STP FSAR Subsections 9.2.8.5 and 9.2.8.8 appropriately identify and address the specified actions as COL license information items.

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

- STP CDI – FSAR Subsection 9.2.8.3, "System Description"
- STP CDI – FSAR Subsection 9.2.8.4, "System Operation"

#### *Initial Test Program:*

Initial Test Program information is in FSAR Subsection 9.2.8.8.

## ITAAC

Plant-specific ITAAC are referred to in FSAR Subsection 9.2.8.8 and are described in Part 9 of the COL application, Section 3.0 Table 3.0-3.

### **9.2.8.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements of the Commission regulations for the MWPS, and the associated acceptance criteria, are in Section 9.2.3 of NUREG–0800.

In accordance with Section VIII, “Processes for Changes and Departures,” of “Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor,” the applicant identifies Tier 2 departures. Tier 2 departures not requiring prior NRC approval are subject to the requirements of 10 CFR 52 Appendix A, Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

### **9.2.8.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.2.8 of the certified ABWR DCD. The staff reviewed Section 9.2.8 of the STP COL application and checked the referenced DCD to ensure that the combination of the DCD and the information in the COL represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

#### Tier 2 Departures Not Requiring Prior NRC Approval

- STP DEP 1.1-2 Dual Units at STP 3 & 4

This departure changes the design from a single unit to dual units (STP Units 3 and 4).

- STP DEP 9.2-2 Makeup Water Preparation System

This departure primarily involves increased flow rates and storage capacities to accommodate two units.

The applicant’s evaluations of the above departures, in accordance with 10 CFR 52 Appendix A, Section VIII Item B.5, determined that these departures do not require NRC approval. Within the review scope of this section, the staff found it reasonable that these departures do not require prior NRC approval. The applicant’s process for evaluating departures and other changes to the DCD is subject to NRC inspections.

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<sup>1</sup> See “Finality of Referenced NRC Approvals” in SER Section 1.1.3 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

### COL License Information Items

- DCD Tier 2 Subsection 9.2.8.5 states that “the COL applicant shall analyze the raw water quality and availability and the required makeup water quality and amounts to assure that these requirements can be met. Any deficiencies in either quality or production capability shall be met with mobile water treating systems.”

This COL license information item is addressed in FSAR Subsection 9.2.8.5. This information describes to what extent a mobile water-treatment capability is needed to support full-power operation, which is not a regulatory consideration. Consequently, this information was not evaluated by NRC staff.

- DCD Tier 2 Subsection 9.2.8.8 states that the COL applicant shall prepare and perform a Preoperational Test Program and other tests in accordance with the requirements of Chapter 14.

This COL license information item is addressed in FSAR Subsection 14.2S.12.1.79, “Makeup Water Preparation Preoperational Test.” However, because the MWPS does not perform a safety function and is not important to safety, this information was not evaluated by NRC staff.

### Site-Specific Information Replacing Conceptual Design Information

- STP CDI – FSAR Subsection 9.2.8.3, “System Description”
- STP CDI – FSAR Subsection 9.2.8.4, “System Operation”

In FSAR Subsections 9.2.8.3 and 9.2.8.4, ABWR DCD conceptual design information for the MWPS was replaced with site-specific information. The MWPS does not perform a safety function and is not important to safety. The NRC staff’s evaluation primarily focuses on confirming that MWPS failures will not adversely impact safety-related SSCs. FSAR Subsection 9.2.8.3.6 states that MWPS failures, including those that result in flooding, will not result in the failure of safety-related SSCs. However, except for the provision to enclose much of the MWPS within the MWP building, which does not contain any safety-related SSCs, there is no discussion on what other design provisions are necessary to protect safety-related SSCs from MWPS failures that occur outside of the MWP building. For example, there are no descriptions of flood barriers and site-grading requirements that are necessary to prevent water resulting from tank/basin failures from impacting safety-related SSCs. Consequently, the staff was unable to conclude that the requirements specified by GDC 2 are satisfied. Therefore, the staff issued **RAI 09.02.04-05 (eRAI 3110)** requesting the applicant to fully describe in the FSAR system arrangements and design provisions for protecting safety-related SSCs from MWPS failures.

The applicant’s response to this RAI dated August 26, 2009 (ML092430133) indicates that the design basis flood is a failure of the main cooling reservoir embankment and that this event encompasses all other potential flooding events, including any potential flooding due to MWPS failures. As described in FSAR Subsection 3.4.1.1, the penetrations and doors that penetrate the exterior walls of Seismic Category I buildings located below the design-basis flood level are watertight. In addition, the staff verified that the MWPS water storage tank volume is significantly smaller than the failure of the main cooling reservoir embankment as estimated in Table 2.4S.4-5. Therefore the staff found the applicant’s response acceptable and **RAI 09.02.04-05** is resolved and closed.

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Based on the above information, the staff concluded that the MWP system meets the requirements of GDC 2 and the guidance of RG 1.29, Position C.2, with regard to the protection of safety-related equipment from natural phenomena.

Initial Test Program:

As discussed above for the COL license information item related to DCD Tier 2 Subsection 9.2.8.5, the MWPS does not perform a safety function and is not important to safety. Consequently, the Initial Test Program for the MWPS was not evaluated by NRC staff.

ITAAC:

In order to demonstrate that the interface requirements specified in DCD Tier 1 Section 4.3 have been met, the applicant establishes a site-specific ITAAC for the MWPS in Part 9 of COL application Section 3, "Site-Specific ITAAC." The description in Section 3 indicates that ITAAC for the MWPS are necessary due to their "safety-related, safety-significant, or risk significant function." The MWPS is a nonsafety-related system and is based on the description in Section 9.2.8 of the FSAR. The MWPS does not perform a safety-significant or risk-significant function. Therefore, NRC staff issued **RAI 09.02.04-06 (eRAI 3110)** requesting the applicant to revise Part 9 of COL application Section 3 accordingly.

The ITAAC specified in Part 9 of COL application Table 3.0-3, "Makeup Water Preparation System (MWP)," establishes a design requirement for the MWPS to provide a sufficient quantity and quality of makeup water to meet plant demands during normal operation. Because the MWPS is not safety-related and does not perform any functions that are important to safety, establishing an ITAAC to demonstrate the functional capability of the MWPS is not warranted or appropriate. The functional capability of nonsafety-related systems is typically confirmed by the Initial Test Program specified in Chapter 14 of the FSAR. However, in accordance with the requirements specified in 10 CFR 52.47(a)(26) and 10 CFR 52.80(a), ITAAC should be established to demonstrate that MWPS arrangement and design features that are necessary to ensure that MWPS failures will not impact safety-related SSCs are properly implemented. Therefore, the staff issued **RAI 09.02.04-07 (eRAI 3110)** requesting the applicant to revise Part 9 of COL application Table 3.0-3 accordingly.

In a letter dated December 28, 2009, (Letter U7-C-STP-NRC-0902204- ML093631615), the applicant provides revised responses to **RAI 09.02.04-06** and **RAI 09.02.04-07** regarding the site-specific ITAAC established for the MWPS. This response supersedes the previous responses provided in August 20, 2009 (ML092360771).

In the revised response to **RAI 09.02.04-06** and **RAI 09.02.04-07**, the applicant proposes to revise ITAAC in order to more closely align the ITAAC wording with the MWPS interface requirement wording in ABWR DCD Tier 1 Section 4.3. The response states that the site-specific ITAAC established in Part 9 of the COL application for the MWPS was intended to demonstrate that the interface requirements specified in ABWR DCD Tier 1 Section 4.3 are met. Thus, although the MWPS function to provide plant makeup water is not safety-related, important to safety, or risk significant, an ITAAC is retained for the MWPS because ABWR DCD Tier 1 Section 4.3 explicitly discusses the MWPS function as an interface requirement. Therefore, the applicant retained and revised the ITAAC established for the MWPS in Table 3.0-3 of Part 9 of the COL application, Revision 3. The staff determined that the revised ITAAC wording adequately addresses the MWPS interface requirement in ABWR DCD Tier 1 Section

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4.3 and that the revised ITAAC are adequate to ensure that STP Units 3 and 4 will provide demineralized water to the MUWP. Therefore, **RAI 09.02.04-06** and **RAI 09.02.04-07** are resolved. The confirmation that the proposed changes are incorporated in a future revision of COL application revision is being tracked as **Confirmatory Item 09.02.04-6**.

#### **9.2.8.5 Post Combined License Activities**

The applicant will satisfy the acceptance criteria in site specific ITAAC (Table 3.0-3) described in Part 9 of the COL application.

#### **9.2.8.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information relating to the MWPS. With the exception of the **Confirmatory Item 09.02.04-6**, no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the MWPS that were incorporated by reference have been resolved.

In addition, the staff compared the additional COL License information items and conceptual design information in the application to the relevant NRC regulations and acceptance criteria defined in NUREG-0800, Section 9.2.3.

The staff's review confirmed that the applicant has provided the information specified by the referenced DCD relating to the MWPS. The applicant has successfully met the requirements specified in 10 CFR 50 Appendix A, GDC 2, and 10 CFR 52.80(a)

Further, the staff found it reasonable that the identified Tier 2 departures are characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5.

However, as a result of **Confirmatory Item 09.02.04-6**, the staff was unable to finalize the conclusions relating to the MWPS, in accordance with the NRC requirements.

### **9.2.9 Makeup Water Condensate System**

#### **9.2.9.1 Introduction**

This section of the FSAR addresses the Makeup Water Condensate (MUWC) system which provides condensate quality water for the reactor core isolation cooling (RCIC) pumps, control rod drive (CRD) pumps, high pressure core flooders (HPCF) pumps, suppression pool cleanup (SPCU) pumps, and MUWC transfer pumps. In addition, the MUWC system serves as a receiver for excess water generated by the makeup water preparation (MWP) pumps, CRD system, radioactive waste disposal system, and condensate demineralizer system effluent. Normally information related to the condensate storage facilities is in Section 9.2.6, consistent with the numbering of SRP 9.2.6, "Condensate Storage Facilities." However, descriptive information related to the MUWC system is in Section 9.2.9 of the Tier 2 ABWR DCD and Section 9.2.9 of the Tier 2 STP COL FSAR. For consistency, the NRC evaluation of the MUWC system is described here in Section 9.2.9 of this SER.

### **9.2.9.2 Summary of Application**

Section 9.2.9 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.2.9 of the certified ABWR DCD Revision 4 referenced in 10 CFR 52 Appendix A with no departures or supplements. However, as explained below, there is a Tier 2 departure that is relevant to the evaluation of the MUWC system.

#### **Tier 2 Departures Not Requiring NRC Approval**

- STP DEP 1.1-2 Dual Units at STP 3 & 4

The ABWR DCD is based on a single-unit site; the STP COL represents a dual-unit project. As noted in Section 9.2.9 of NUREG–1503 and in accordance with SRP Section 9.2.6, an application for a multi-unit facility requires a review of the MUWC system design for compliance with GDC 5, “Sharing of Structures, Systems, and Components,” given that the ABWR is designed as a single-unit facility. The applicant addresses the dual-unit configuration by means of this departure.

### **9.2.9.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements of the Commission regulations for the MUWC, and the associated acceptance criteria, are in Section 9.2.6 of NUREG–0800.

In accordance with Section VIII, “Processes for Changes and Departures,” of “Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor,” the applicant identifies one Tier 2 departure not requiring prior NRC approval. This departure is subject to the requirements of 10 CFR 52 Appendix A, Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

### **9.2.9.4 Technical Evaluation**

As documented in NUREG–1503, the NRC staff reviewed and approved Section 9.2.9 of the certified ABWR DCD. The staff reviewed Section 9.2.9 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSA:

#### **Tier 2 Departures Not Requiring NRC Approval.**

As previously discussed, it is necessary to review the design for compliance with GDC 5, given that the application is for a multi-unit facility, whereas the certified ABWR design represents a single unit design.

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<sup>1</sup> See “Finality of Referenced NRC Approvals” in SER Section 1.1.3 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

- STP DEP 1.1-2

#### Dual Units at STP 3 & 4

NRC staff reviewed STP DEP 1.1-2, which refers to the dual unit configuration of the plant. In accordance with SRP Section 9.2.6, the staff's review focused on compliance with GDC 5. As described in Section 3.0 of the STP COL "Departures Report," each unit has a separate MUWC system, including a separate condensate storage tank (CST). A common MWP system provides the source of water for each unit's CST. Each CST has sufficient capacity to provide at least 8 hours of makeup inventory during a station blackout. The adequacy of the CST capacity is discussed in Section 9.2.9 of NUREG-1503.

The applicant's evaluation of this departure, in accordance with Item B.5 of Section VIII, determined that this departure does not require prior NRC approval. The staff reviewed the Departures Report regarding this departure, and was unable to determine whether it is reasonable for this departure not to require prior NRC approval. The STP COL FSAR does not explicitly indicate whether there are any cross-connections between the MUWC systems for each unit. If a cross-connection were to exist, it might be possible for a rupture of components (e.g., tank, piping) in one unit to drain condensate inventory from the other unit. Accordingly, the staff issued **RAI 09.02.06-01 (eRAI 2567)** requesting the applicant to describe any cross-connections between the separate MUWC systems, and if any cross-connections exist, to explain how it is assured that rupture of components in one unit will not drain condensate inventory from the other unit.

The applicant's response to **RAI 09.02.06-1** in a letter dated August 20, 2009 (ML092360771), states that the unit-specific MUWC systems for STP Units 3 and 4 do not have any cross-connections. The staff concurred with the applicant's confirmation that no cross-connections exist between the MUCW systems of the two units and the unit-specific MUWC systems are independent. The staff therefore found the departure acceptable with regard to the requirements of GDC 5, as it relates to the MUWC system design, and **RAI 09.02.06-1** is resolved.

The applicant's evaluation in accordance with 10 CFR Part 52 Appendix A, Section VIII Item B.5 determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that this departure does not require prior NRC approval. In addition, the applicant's process for evaluating departures and changes to the DCD is subject to NRC inspections.

#### **9.2.9.5 Post Combined License Activities**

There are no post COL activities related to this section.

#### **9.2.9.6 Conclusion**

NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the MUWC system that were incorporated by reference have been resolved.

The staff found it reasonable that the Tier 2 Departure STP DEP 1.1-2 is characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5. The staff concluded that the application conforms to the requirements of GCD 5 as it relates to the MUWC system design.

## **9.2.10 Makeup Water Purified System**

### **9.2.10.1 Introduction**

This section of the FSAR addresses information related to the ABWR Makeup Water Purified System.

### **9.2.10.2 Summary of Application**

Section 9.2.10 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.2.10 of the ABWR DCD, Revision 4.

In addition, in FSAR Section 9.2.10, the applicant provided the following:

#### Tier 1 Departure

- STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

This departure reflects the elimination of the requirement to maintain equipment needed to mitigate a design-basis LOCA hydrogen release.

### **9.2.10.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503.

In addition, the relevant requirements of the Commission regulations for the Makeup Water Purified System, and the associated acceptance criteria, are given in Section 9.2.6 of NUREG-0800.

In accordance with Section VIII, “Processes for Changes and Departures,” of “Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor,” the applicant identifies one Tier 1 departure. Tier 1 departures require prior NRC approval and are subject to the requirements of 10 CFR 52 Appendix A Section VIII.A.4.

### **9.2.10.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.2.10 of the certified ABWR DCD. The staff reviewed Section 9.2.10 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the

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<sup>1</sup> See “Finality of Referenced NRC Approvals” in SER Section 1.1.3 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information contained in the COL FSAR:

Tier 1 Departure

- STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

The applicant included Departure STD DEP T1 2.14-1 in Section 9.2.10. This departure has administrative impacts on Section 9.2.10 (figures, tables). The detailed technical evaluation of this Tier 1 departure is addressed in Section 6.2 of this SER.

**9.2.10.5 Post Combined License Activities**

There are no post COL activities related to this section.

**9.2.10.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the makeup water purified system that were incorporated by reference have been resolved.

**9.2.11 Reactor Building Cooling Water System**

**9.2.11.1 Introduction**

This section of the FSAR addresses the system that removes heat from plant auxiliaries and transfers it to the UHS through the RSW system. Essential equipment serviced by the reactor building cooling water (RCW) system includes residual heat removal (RHR), the emergency diesel generators, the HVAC emergency water cooling (HEWC) system. FSAR information and reviews associated with auxiliary cooling water systems are normally located in Section 9.2.2, consistent with the numbering of SRP Section 9.2.2, "Reactor Auxiliary Cooling Water System." However, descriptive information related to the RCW system is in Section 9.2.11, "Reactor Building Cooling Water System," of the Tier 2 ABWR DCD and in Section 9.2.11, "Reactor Building Cooling Water System," of the Tier 2 STP COL FSAR. For purposes of consistency, the NRC staff's evaluation of the RCW system is described here in Section 9.2.11 of this SER.

**9.2.11.2 Summary of Application**

Section 9.2.11 of the STP units 3 and 4 COL FSAR Revision 3, incorporates by reference Section 9.2.11 of the certified ABWR DCD, Revision 4, referenced in 10 CFR Part 52 Appendix A, with the following departures:

### Tier 1 Departure

- STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

This departure eliminates the flammability control system that was called for in the ABWR DCD.

### Tier 2\* Departure

- STD DEP 1.8-1 Tier 2\* Codes, Standards, and Regulatory Guide Edition Changes

This departure updates the references to more current revisions or editions of codes and standards.

### Tier 2 Departures Requiring Prior NRC Approval

The following departures affect TS and require prior NRC approval.

- STD DEP 16.3-16 LCO 3.7.1, Reactor Building Cooling Water (RCW) System, Reactor Service Water (RSW) System, and Ultimate Heat Sink (UHS) - Operating and LCO 3.7.2, RCW/RSW System and Ultimate Heat Sink (UHS) – Shutdown and LCO 3.7.3, RCW/RSW System and UHS Refueling
- STD DEP 16.3-46 LCO 3.7.2, RCW, RSW, and UHS Applicability

These departures eliminate some LCO items and alter some wording in the TS to be more consistent with other sections.

### Tier 2 Departure Not Requiring Prior NRC Approval

- STD DEP 9.2-1 Reactor Building Cooling Water System

This departure revises the design characteristics of the RCW system and corrects inconsistencies in the System Design Description in Subsection 9.2.11.2 of the ABWR DCD. This departure also clarifies that all heat exchanger pumps are normally placed in operation, rather than required for shutdown cooling as stated in Subsection 9.2.11.3.2 of the ABWR DCD. The major impact of this departure is an increase in heat removal capacity that results in higher performance margins.

#### **9.2.11.3 Regulatory Basis**

The regulatory basis for the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements of the Commission regulations for the RCW, and the associated acceptance criteria, are in Section 9.2.2 of NUREG–0800

In accordance with Section VIII, “Processes for Changes and Departures,” of, “Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor Design,” the applicant identifies Tier 1, Tier 2\* and Tier 2 departures. The Tier 1 and one Tier 2\* departure

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require prior NRC approval and are subject to the requirements of 10 CFR 52 Appendix A, Section VIII.A.4 and Section VIII.B.6, respectively. Tier 2 departures affecting Technical Specifications require prior NRC approval and are subject to the requirements of 10 CFR 52 Appendix A, Section VIII.C.4. Tier 2 departures not requiring prior NRC approval are subject to the requirements of 10 CFR 52 Appendix A Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

In particular, the regulatory basis and review criteria for the departures are specified in Section 9.2.2, "Reactor Auxiliary Cooling Water System," of NUREG-0800.

#### **9.2.11.4 Technical Evaluation**

As documented in NUREG-1503, NRC staff reviewed and approved Section 9.2.11 of the certified ABWR DCD. The staff reviewed Section 9.2.11 of the STP Units 3 and 4 COL FSAR, and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

##### Tier 1 Departure

- STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

The staff reviewed STD DEP T1 2.14-1 which eliminates the flammability control system that was called for in the ABWR DCD. The only impact of this departure on the RCW system is the removal of that system from the heat load required to be serviced by the system. The staff found the proposed departure acceptable in regards to the impact on the RCW system. This departure was also evaluated by the staff in Chapter 6 of this SER.

##### Tier 2\* Departure

- STD DEP 1.8-1 Codes, Standards, and Regulatory Guide Edition Changes

NRC staff reviewed this departure, which updates the references to more current revisions or editions of codes and standards. In FSAR Subsection 9.2.11.1.1, "Safety Design Basis," the reference to IEEE Std-279, "Criteria for Protection Systems for Nuclear Power Generating Stations," is replaced with a reference to IEEE Std-603, "Criteria for Safety Systems for Nuclear Power Generating Stations." This change is a departure from Tier 2\* information and thus requires prior NRC review and approval. IEEE Std-279 addresses considerations such as design bases, redundancy, independence, single failures, qualifications, bypasses, status indication, and tests. IEEE Std-603 has since superseded IEEE-279. The guidance in IEEE Std-603, as endorsed by RG 1.153, "Criteria for Safety Systems," incorporates the guidance of IEEE Std-279. Therefore, the staff found the proposed departure acceptable.

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

Tier 2 Departures Requiring Prior NRC Approval

- STD DEP 16.3-16 LCO 3.7.1, Reactor Building Cooling Water (RCW) System, Reactor Service Water (RSW) System, and Ultimate Heat Sink (UHS) - Operating and LCO 3.7.2, RCW/RSW System and Ultimate Heat Sink (UHS) – Shutdown and LCO 3.7.3, RCW/RSW System and UHS - Refueling

The staff reviewed STD DEP 16.3-16. This departure in part deletes LCO 3.7.1C.2 and LCO 3.7.2B.2 and claims that these items are redundant with other items that are retained. The staff found that eliminating the requirements for Condition C2 may result in an interpretation of the LCO that allows a division to be out of service for SSCs for 21 days (the 7-day period to fix the first disabled unit followed by a new 14-day period to fix the second disabled unit) instead of the 14 days that is specified by Condition C2 in LCO 3.7.1 of the ABWR DCD TS. Therefore, the staff issued **RAI 09.02.02-5 (eRAI 3217)** requesting the applicant to provide additional information confirming the validity of this departure or to remove the departure.

The applicant's response to this RAI dated August 28, 2009 (ML092450155), cites TS Section 1.3, "Compilation Times," which establishes the Completion Time Convention for the TS. The applicable citation is: "If situations are discovered that require entry into more than one condition at a time within a single LCO (multiple Conditions), the Required Actions for each Condition must be performed within the associated Completion Time." The staff found the citation and the applicant's interpretation applicable and correct. Therefore, **RAI 09.02.02-5** is resolved and closed.

- STD DEP 16.3-46 LCO 3.7.2, RCW, RSW, and UHS Applicability

The staff reviewed STD DEP 16.3-46, which alters the application of LCO 3.7.2 and 3.7.3. Because this departure clarifies the wording of the original TS, the staff found the proposed departure acceptable.

Tier 2 Departure Not Requiring Prior NRC Approval

Although there are no proposed Tier 2 departures requiring NRC review and approval, the applicant plans to implement a Tier 2 departure that does not require NRC review and approval as permitted by 10 CFR 52 Appendix A, Section VIII.B.5.b. This regulation allows the applicant to depart from ABWR DCD Tier 2 information without obtaining prior NRC approval if, among other considerations, the departure does not result in more than a minimal increase in (1) the likelihood of the occurrence or the consequences of a malfunction of a SSC important to safety, or (2) the consequences of an accident previously evaluated in the plant-specific DCD. However, in order to assure the proper implementation of this requirement, the staff evaluated the following Tier 2 departure:

- STD DEP 9.2-1 Reactor Building Cooling Water System

This departure revises the design characteristics of the RCW system and corrects inconsistencies in the System Design Description in Subsection 9.2.11.2 of the ABWR DCD. An additional clarification adds that all heat exchanger pumps are normally placed in operation rather than required for shutdown cooling as stated in Subsection 9.2.11.3.2 of the ABWR DCD.

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The major impact of this departure is an increase in heat removal capacity that results in higher performance margins.

The staff reviewed STD DEP 9.2-1 in accordance with 10 CFR 52 Appendix A, Section VIII.B.5.b. This departure does not appear to increase the likelihood or consequence of a malfunction or accident that was evaluated in the ABWR DCD within the RCW system. This conclusion results from review against the stated criteria in SRP Section 9.2.2, for compliance with GDCs 2, 4, 5, 44, 45, and 46. The primary impact of this departure on the ability of the RCW system to perform its required heat transfer function as required by GDC 44 is to increase the heat removal capability during the RHR for normal shutdown cooling and in response to a LOCA. This change is accomplished by increasing the capacity of the RCW heat exchangers. The ultimate effect of a higher heat transfer between the components being cooled and the UHS will be a smaller temperature differential. These changes add margin to the system and are not significant to safety because they do not affect the performance requirements of the system.

NRC staff reviewed the clarification that STD DEP 9.2-1 made to FSAR Subsection 9.2.11.3.2 regarding the use of heat exchanger pumps. The staff found that the revised wording indicating that all heat exchanger pumps are normally placed in operation—rather than required for shutdown cooling—to be acceptable, because only two of the three RCW/RSW system divisions are needed to meet plant safe shutdown requirements as discussed in FSAR Subsections 9.2.5.7.1 “Thermal Performance” and 9.2.11.2 “System Description.”

The applicant’s evaluation in accordance with Item B.5 of Section VIII of Appendix D determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it is reasonable that the departure does not require prior NRC approval. The applicant’s process for evaluating departures and other changes to the DCD is subject to NRC inspections.

#### **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’s finding related to information incorporated by reference is in NUREG–1503. The staff reviewed the application and checked the referenced DCD. The staff’s review confirmed that the applicant has addressed the relevant information relating to the RCW system and no outstanding information is expected to be addressed in the COL FSAR related to this subsection. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the RCW system that were incorporated by reference have been resolved.

In addition, the staff compared the application to the relevant NRC regulations, acceptance criteria defined in Section 9.2.2 of NUREG-0800, and other NRC RGs. The staff’s review confirmed that the applicant has adequately addressed the Tier 1, Tier2\*, and Technical Specification departures in accordance with Section 9.2.2 of NUREG–0800. The staff found it reasonable that the identified Tier 2 departure is characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5.

Based on the results of this evaluation, the staff determined that the STP Units 3 and 4 COL FSAR Revision 3 is acceptable with respect to the RCW system.

## **9.2.12 HVAC Normal Cooling Water System (Related to RG 1.206 Section 9.2.2, “Cooling System for Reactor Auxiliaries [Closed Cooling Water System]”)**

### **9.2.12.1 Introduction**

This section of the FSAR addresses the system that provides chilled water to the drywell cooler cooling coils and to other nonsafety-related air conditioners. The HVAC normal cooling water (HNCW) system is not a safety-related system, but it does penetrate the primary containment and does require isolation.

### **9.2.12.2 Summary of Application**

Section 9.2.12 of the STP COL FSAR, Revision 3 incorporates by reference Section 9.2.12 of the certified ABWR DCD Revision 4, referenced in 10 CFR 52, Appendix A.

In addition, in FSAR Section 9.2.12, the applicant provides the following:

#### **Tier 2 Departures Not Requiring Prior NRC Approval**

- STD DEP 9.2-9 HNCW Cooling Water System

This departure revises the design characteristics of the HNCW system by increasing the return water temperature from 12 °C to 14.7 °C.

- STD DEP 9.2-7 HVAC Normal Cooling Water System

This departure revises inconsistencies in the ABWR DCD and increases capacity and flow rates of the HNCW chiller.

### **9.2.12.3 Regulatory Basis**

The regulatory basis for reviewing the information incorporated by reference is in NUREG–1503 and in Supplement 1. In addition, the relevant requirements of the Commission regulations for the HNCW system, and the associated acceptance criteria, are given in Section 9.2.2 of NUREG-0800.

In accordance with Section VIII, “Processes for Changes and Departures,” of 10 CFR 52 Appendix A, the applicant identifies Tier 2 departures. Tier 2 departures not requiring prior NRC approval are subject to the requirements of 10 CFR 52 Appendix A Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

In particular, the regulatory basis and review criteria for the Tier 2 departures are specified in Section 9.2.2, “Reactor Auxiliary Cooling Water System,” of NUREG–0800.

### **9.2.12.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.2.12 of the certified ABWR DCD design. The staff reviewed Section 9.2.12 of the STP Units 3 and 4 COL

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FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

*Tier 2 Departures Not Requiring Prior NRC Approval*

- STD DEP 9.2-9 HNCW Cooling Water System
- STD DEP 9.2-7 HVAC Normal Cooling Water System

Section 9.2.12 of the FSAR identifies Tier 2 Departure STD DEP 9.2-9, which is identified as not requiring prior NRC review and approval as permitted by 10 CFR 52 Appendix A, Section VIII.B.5.b. The staff's review identified a second departure (STD DEP 9.2-7) in Chapter 3.0, "Departures Not Requiring Prior NRC Approval," of Part 7 of the COL application, which results in modifications to the HNCW system described in ABWR DCD Section 9.2.12. Departure STD DEP 9.2-7 is not referenced in FSAR Section 9.2.12, but STD DEP 9.2-9 of the Departure Report provides a reference to STD DEP 9.2-7, as applicable to the HNCW system.

- STD DEP 9.2-7, "HVAC Normal Cooling Water System," reflects a design change to correct inconsistencies in referenced ABWR DCD Tables 6.2-9, 9.2-6, 9.2-7, and 9.4-1 and Figure 9.2-2 so that the waterside heat removal rate of the nonsafety-related HNCW system is greater than or equal to the airside cooling duty heat loads. The capacity and flow rate for each HNCW chiller are also increased to include the revised heat loads. This design change from the ABWR DCD reflects changes to the HNCW system that ensure a sufficient heat removal capability for the revised heat loads.
- STD DEP 9.2-9, "HNCW Cooling Water System," revises the design characteristics of the HNCW system by increasing the return water temperature from 12 °C to 14.7 °C and by modifying HNCW equipment to reduce equipment, piping, valve sizing and electrical power for better maintainability.

The applicant's evaluations in accordance with 10 CFR 52 Appendix A Section VIII.B.5 determined that these departures do not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

**9.2.12.5 Post Combined License Activities**

There are no post COL activities related to this section.

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

### **9.2.12.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG–1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the HNCW system that were incorporated by reference have been resolved...

In addition, the HNCW design for STP Units 3 and 4 includes departures STD DEP 9.2-7 and STD DEP 9.2-9. The staff found it reasonable that the identified Tier 2 departures are characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5.

### **9.2.13 HVAC Emergency Cooling Water System (Related to RG 1.206 Section 9.2.2. "Cooling System for Reactor Auxiliaries [Closed Cooling Water System]")**

#### **9.2.13.1 Introduction**

This section of the FSAR addresses the system that provides cooling water to the main control room air conditioners, reactor building essential electrical room coolers, and control building essential electrical equipment room coolers. This system is required to operate during normal power, reactor shutdown, and after any postulated abnormal reactor conditions including a LOCA.

#### **9.2.13.2 Summary of Application**

Section 9.2.13 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.2.13 of the certified ABWR DCD, Revision 4, referenced in 10 CFR Part 52 Appendix A, with no departures. In addition, in FSAR Section 9.2.17, the applicant provides information to address COL Information Item 9.11 in the generic DCD:

#### *COL License Information Item*

- COL License Information Item 9.11 HECW System Refrigeration Requirements

This COL License Information Item addresses the applicant's request to provide HVAC emergency cooling water (HECW) system refrigerator requirements after procuring the refrigerators.

#### **9.2.13.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503.

In addition, the relevant requirements of the Commission regulations for the HVAC Emergency Cooling Water System, and the associated acceptance criteria, are given in Section 9.2.2 of NUREG-0800.

#### **9.2.13.4 Technical Evaluation**

As documented in NUREG–1503, the staff reviewed and approved Section 9.2.13 of the certified ABWR DCD. The staff reviewed Section 9.2.13 of the STP Units 3 and 4 COL FSAR

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and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to the HECW.

The staff reviewed the information in the COL FSAR:

COL License Information Items

- COL License Information Item 9.11 HECW System Refrigeration Requirements

COL License Information Item 9.11 addresses the HECW system refrigerator requirements. The DCD requests the applicant to provide specific information after procuring the refrigerators that addresses COL Information Item 9.11 and includes the following:

1. Means for adjusting refrigerator capacity to chilled water outlet temperature
2. Means for starting and stopping the pump and refrigerator in proper sequence
3. Means for reacting to a loss of electrical power for periods of up to 2 hours and for the automatic restarting of pumps and refrigerators, under the expected environmental conditions, during station blackouts when electrical power is restored
4. Means to minimize the potential for coolant leakage or release into the system or the surrounding equipment environs
5. An evaluation of transient effects on starting and stopping or prolonged stoppage of the refrigeration/chiller units; transient effects include items such as high restart circuit drawdowns on safety buses, coolant-oil interactions, degassing needs, coolant gas leakage or release in equipment areas along with flammability threats, and synchronized refrigeration swapping

NRC staff reviewed the applicant's proposal using the review procedures described in Section 9.2.2 of NUREG-0800.

With regard to item (1), the applicant commits (COM 9.2-2) to meet the design goal through technical requirements on the procured components. Because the design goal is not listed as an ITAAC design feature, there is no mechanism for assuring that the requirement has been met before fuel loading. Therefore, the staff issued **RAI 09.02.02-1 (eRAI 3184)** requesting the applicant to justify how this item has been satisfied.

The applicant's response to **RAI 09.02.02-1 (eRAI 3184)** in a letter dated August 28, 2009 (ML092450155), refers to RG 1.206 Section C.III.4.3, which gives the COL applicant the option of describing in the application the proposed approach for addressing the COL information item in sufficient detail to support the NRC finding. The applicant proposes that the information in the STP Units 3 and 4 FSAR, Revision 2, includes sufficient information to address item (1) from the

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

list above. The response also states that closure “can be accomplished by review of the refrigerator procurement documentation, including the procurement specification and certificate of conformance, as part of the NRC’s construction inspection program (CIP). The documentation would be available after refrigerator procurement, which is consistent with the COL information item as specified in the DCD.” The applicant’s response further states that the “schedule for procurement of equipment will be part of the master schedule, which NRC will have access to also through the CIP.”

The staff concurred that the RG 1.206, Section C.III.4.3 option (4) applies, but the applicant does not provide sufficient information in the FSAR to support the finding. The additional detail included in the response as to the CIP and the master schedule should be addressed in Section 9.2.13 of the FSAR. Therefore, the resolution of the staff’s concerns identified in **RAI 09.02.02-1 (eRAI 3184)** is being tracked by issuing RAI **09.02.02-6 (eRAI 3882)**.

With regard to item (2), the applicant commits (COM 9.2-2) to meet the design goal by producing detailed design documents that provide for starting and stopping the pump and refrigerator in the proper sequence. ITAAC Items 4, 5, and 6 in Table 2.11.6, “HVAC Emergency Cooling Water System,” of the ABWR Tier 1 DCD address this design feature. Because the applicant incorporates the ITAAC by reference, the staff found that the applicant has sufficiently addressed this item.

With regard to item (3), the applicant notes that alternate AC (AAC) power provides for the automatic restart of pumps and refrigerators. The applicant is relying on the safety evaluation of Subsection 9.2.13.3 of Tier 2 of the DCD, which outlines the response to power interruption. This section, however, indicates that the COL licensing information will assure that “Provisions will be made to assure prompt and reliable restart of the chiller units.” Clearly, the applicant needs to provide an independent assurance of the design goal. Therefore, the staff issued **RAI 09.02.02-2 (eRAI 3184)** requesting the applicant to justify how this item has been satisfied.

In reviewing the applicant’s response to **RAI 09.02.02-2 (ML092450155)**, the staff concurred that the RG 1.206, Section C.III.4.3 option (4) applies, but the applicant does not provide sufficient information in the FSAR to support the finding. The additional detail included in the RAI response as to the CIP and the master schedule should be addressed in the FSAR. Therefore, the resolution of the staff’s concerns identified in **RAI 09.02.02-2 (eRAI 3184)** is being tracked by issuing RAI **09.02.02-6 (eRAI 3882)**.

Also in regard to item (3), the applicant has taken an exception to the DCD COL license information item to provide an AAC design capable of reacting to the loss of electrical power for “periods up to two hours for automatic restarting of pumps and refrigerators, under the expected environmental conditions during station blackout when electrical power is restored.” **RAI 09.02.02-2 (eRAI 3184)** also requests the applicant to justify the proposed exception.

The applicant’s response proposes changing STP FSAR Subsection 9.2.17.1 by adding a technical requirement that the pumps and refrigerator units must be capable of automatically restarting after a loss of electrical power for up to two hours under the required conditions. Based on the earlier discussion, the staff found the applicant’s response acceptable because it corrects and resolves the proposed exception. The incorporation of the proposed markup in the next FSAR revision is being tracked as **Confirmatory Item 09.02.02-2**.

With regard to item (4), the applicant commits (COM 9.2-2) to meet the design goal through the technical requirements on the purchased components. Because the design goal is not listed as an ITAAC design feature, there is no mechanism to assure that the means to minimize leakage has been met before fuel loading. Therefore, the staff issued **RAI 09.02.02-3 (eRAI 3184)** requesting the applicant to justify how this item has been satisfied.

In reviewing the applicant's response to **RAI 09.02.02-3 (ML092450155)**, the staff concurred that the RG 1.206, Section C.III.4.3 option (4) applies, but the applicant does not provide sufficient information in the FSAR to support the finding. The additional detail included in the response as to the CIP and the master schedule should be addressed in the FSAR. Therefore, the resolution of the staff's concerns identified in **RAI 09.02.02-3 (eRAI 3184)** is being tracked by issuing **RAI 09.02.02-6 (eRAI 3882)**.

With regard to item (5), the applicant commits (COM 9.2-2) to meet the design goal through an evaluation of the procured equipment. Because the design goal is not listed as an ITAAC design feature, there is no mechanism for assuring that the requirement has been met before fuel loading. Therefore, the staff issued **RAI 09.02.02-4 (eRAI 3184)** requesting the applicant to justify how an assurance will demonstrate that this item has been satisfied.

In reviewing the applicant's response to **RAI 09.02.02-4 (ML092450155)**, the staff concurred that the RG 1.206, Section C.III.4.3 option (4) applies, but the applicant does not provide sufficient information in the FSAR to support the finding. The additional detail included in the response as to the CIP and the master schedule should be addressed in the FSAR. Therefore, the resolution of the staff's concerns identified in **RAI 09.02.02-4 (eRAI 3184)** is being tracked by issuing **RAI 09.02.02-6 (eRAI 3882)**.

In the response to **RAI 09.02.02-6 (eRAI 3882)** dated November 12, 2009 (ML093440180), and in the follow up supplemental response dated June 7, 2010 (ML101620285), the applicant proposes to address COL Information Item 9.11 by including additional descriptions in Subsection 9.2.17.1, Item (5) of the FSAR in regards to how this COL information item is met by the COM 9.2-2. The staff found the applicant's commitment to address the COL Information Item 9.11 acceptable, and **RAI 09.02.02-6** is resolved. Therefore, all issues associated with **RAI 09.02.02-6** are considered closed. The verification of the proposed FSAR revision is being tracked as **Confirmatory Item 09.02.02-6**.

There are no departures from the DCD ITAAC or the Technical Specifications.

### **9.2.13.5 Post Combined License Activities**

The applicant identifies the following commitment:

- Commitment (COM) 9.2-2- The following actions address COL License Information Item 9.11:
  - (1) Technical requirements will be provided in the procurement document for the refrigerators to ensure there are provisions for adjusting the refrigerator capacity to chilled water outlet temperature.
  - (2) Detailed design documents will be provided for starting and stopping the pump and refrigerator on proper sequence.

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- (3) Alternate AC power is provided for reacting to a loss of electrical power for automatic restarting of pumps and refrigerators.
- (4) Technical requirements in the procurement documents will include national standards for design, fabrication, and testing to minimize the potential for coolant leakage or release into system or surrounding equipment environs.
- (5) After procurement of equipment, transient effects on starting and stopping or prolonged stoppage of the refrigeration/chiller units will be evaluated. The evaluation will include such effects as high restart circuit drawdowns on safety buses, coolant-oil interactions, degassing needs, coolant gas leakage, or release in equipment areas along with flammability threats, synchronized refrigeration swapping.

### **9.2.13.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information relating to the HECW system. With the exceptions of **Confirmatory Items 09.02.02-2 and 09.02.02-6**, no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the HECW system that were incorporated by reference have been resolved.

In addition, the staff compared the application to the relevant NRC regulations; acceptance criteria defined in NUREG-0800, Section 9.2.2; and other NRC regulatory guides and concluded that the applicant is in compliance with NRC regulations. The staff's review determined that the applicant has not adequately addressed COL License Information Item 9.11. As a result of **Confirmatory Items 09.02.02-2 and 09.02.02-6**, the staff was unable to finalize the conclusions relating to the HECW system, in accordance with the NRC requirements.

## **9.2.14 Turbine Building Cooling Water System**

### **9.2.14.1 Introduction**

This section of the FSAR addresses the system that provides cooling water for various turbine island auxiliary equipment items. The turbine building cooling water (TBCW) system is a nonsafety-related system.

### **9.2.14.2 Summary of Application**

Section 9.2.14 of STP COL application FSAR Revision 3 incorporates by reference Section 9.2.14 of the certified ABWR DCD Revision 4, referenced in 10 CFR Part 52 Appendix A. In addition, in FSAR Section 9.2.14, the applicant provides the following:

Tier 2 Departure not Requiring Prior NRC Approval

- STP DEP 9.2-3 Turbine Building Cooling Water System

This departure increases the heat removal capacity of the three TBCW system heat exchangers from 68.7 GJ/h to 114.5 GJ/h (65.1 MBTU/h to 108.5 MBTU/h) and the flow rates of the three pumps from 3,405 m<sup>3</sup>/h to 4,550 m<sup>3</sup>/h (14,993 gpm to 20,035 gpm). These changes were made to accommodate larger heat loads due to additional pumps and a larger, nonessential chiller in the turbine building.

**9.2.14.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503.

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

In particular, the regulatory basis and review criteria that the staff used for the Tier 2 departure described above are specified in SRP Section 9.2.2, “Reactor Auxiliary Cooling Water System,” of NUREG–0800.

In accordance with Section VIII, “Processes for Changes and Departures,” of, “Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor Design,” the applicant identifies one Tier 2 departure not requiring prior NRC approval. This departure is subject to the requirements of Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

**9.2.14.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.2.14 of the certified ABWR DCD. The staff reviewed Section 9.2.14 of the STP Units 3 and 4 COL FSAR, and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to the TBCW.

The staff reviewed the information in the COL FSAR:

Tier 2 Departure Not Requiring Prior NRC Approval

- STP DEP 9.2-3 Turbine Building Cooling Water System

The applicant states that this departure does not require NRC review and approval, in accordance with the requirements of 10 CFR 52 Appendix A Section VIII.B.5. NRC staff reviewed STP DEP 9.2-3, which increases the heat removal capacity of each of the three TBCW system heat exchangers from 68.7 GJ/h to 114.5 GJ/h (65.1 MBTU/h to 108.5 MBTU/h)

<sup>1</sup> See “Finality of Referenced NRC Approvals” in SER Section 1.1.3 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

and the flow rates of each of the three pumps from 3,405 m<sup>3</sup>/h to 4,550 m<sup>3</sup>/h (14,993 gpm to 20,035 gpm). The TBCW system is not safety related, is not required for a safe shutdown, and provides no safety function used to mitigate the consequences of any accident. In addition, the proposed departure has no impact on the safety analysis of the plant.

The applicant's evaluation, in accordance with Item B.5 of Section VIII of Appendix D, determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found that determination reasonable. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections..

#### **9.2.14.5 Post Combined License Activities**

There are no post COL activities related to this section.

#### **9.2.14.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the TBCW system that were incorporated by reference have been resolved.

In addition, the applicant identifies departure STP DEP 9.2-3, and the staff found it reasonable that the departure is adequately characterized as not requiring prior NRC approval. In conclusion, the applicant has provided adequate information to satisfy the criteria specified in NUREG-0800 Section 9.2.2 and in 10 CFR 52 Appendix A, Section VIII.B.5.

### **9.2.15 Reactor Service Water System**

#### **9.2.15.1 Introduction**

This section of the FSAR addresses the system that provides cooling water to the reactor building cooling water (RCW) system (described in Section 9.2.11 of this SER) for distribution to numerous safety-related and non-safety related loads. The RSW system removes heat from the RCW and transfers it to the ultimate heat sink (UHS) (described in Section 9.2.5 of this SER). The RSW is required to operate at normal power, reactor shutdown, hot standby, and after a postulated LOCA. Under each of these conditions the RSW is required to function both with and without preferred AC power available and with a single active failure. FSAR information and reviews associated with station service water systems are normally located in Section 9.2.1, consistent with the numbering of the SRP Section 9.2.1, "Reactor Service Water System." However, information related to the STP COL RSW system are located in Section 9.2.15, of the Tier 2 STP COL FSAR and referenced to Section 9.2.15, "Reactor Service Water System," of the Tier 2 ABWR DCD. For purposes of consistency, this section (Section 9.2.15) of the SER describes the NRC staff's evaluation of the RSW system.

#### **9.2.15.2 Summary of Application**

The ABWR DCD includes only those portions of the RSW system in the control building (CB) in the scope of the ABWR Standard Plant. However, as required by 10 CFR 52, the DCD provides

a conceptual design and interface requirements for those portions of the RSW system considered to be site-specific. The COL applicant incorporates by reference Section 9.2.15 of the certified ABWR DCD, with several departures from the DCD for those portions of the design within the scope of the ABWR Standard Plant, described in FSAR Subsection 9.2.15.1, "Portions within the Scope of the ABWR Standard Plant." STP COL Revision 3, FSAR Subsection 9.2.15.2 provides the supplemental information, including interface requirements, related to the site-specific design of the RSW outside of the CB.

The COL application includes the following departures from the DCD:

Tier 2\* Departure

- STD DEP 1.8-1 Tier 2\* Codes, Standards, and Regulatory Guide Edition Changes

This departure updates the references to more current revisions or editions of codes and standards.

Tier 2 Departure Requiring Prior NRC Approval

The following departures affect TS and require prior NRC approval.

- STD DEP 16.3-16 LCO 3.7.1, Reactor Building Cooling Water (RCW) System, Reactor Service Water (RSW) System, and Ultimate Heat Sink (UHS) - Operating and LCO 3.7.2, RCW/RSW System and Ultimate Heat Sink (UHS) – Shutdown and LCO 3.7.3, RCW/RSW System and UHS- Refueling
- STD DEP 16.3-46 LCO 3.7.2, "RCW, RSW, and UHS Applicability

These departures eliminate some LCO items and alter some wording in the TS for consistency with other sections. The review of the above two TS departures is addressed in Section 9.2.11, "Reactor Building Cooling Water System," of this SER.

Tier 2 Departure Not Requiring Prior NRC Approval

- STD DEP 9.2-5 Reactor Service Water System

This departure revises the RSW design flow rate specified in the ABWR DCD in order for the site-specific RSW system to accomplish its safety and power generation design basis. This departure is largely the result of Departure 9.2-1, reviewed in Section 9.2.11 of this SER, which increases the capacity of the RCW heat exchangers to provide additional heat removal capability and increased margin allowances for fouling and other requirements..

### COL License Information Item

- COL License Information Item 9.12      Reactor Service Water System Requirements

In addition, in FSAR Subsection 9.2.17.2, the applicant addressed COL License Information Item 9.12, “Reactor Service Water Requirements,” identified in the DCD Tier 2, Table 1.9-1. COL License Information Item 9.12 was further detailed in DCD Subsection 9.2.17.2 with the following individual requirements:

- RSW/UHS water testing and visual inspection
- RSW pump operational rotation
- RSW biocide treatment
- Biocide treated potable water for RSW flushing
- RSW biocide treatment for layup of other systems
- Emergency procedure guidelines

### Interfaced Requirements

The applicant provides supplemental information to address RSW interface requirements with the certified design on safety design bases, power generation design bases, safety evaluation, instrumentation and alarms, and tests and inspections.

#### **9.2.15.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements of the Commission regulations for the RSW system, and the associated acceptance criteria, are in Section 9.2.1 of NUREG-0800.

In particular, the regulatory basis and review criteria that the staff used for the Tier 1 and Tier 2 departures COL license information item described above are specified in SRP Section 9.2.1, “Reactor Service Water System.” Within the scope of SRP Section 9.2.1, the staff’s acceptance of the RSW design is based on meeting the requirements of GDC 2, 4, 5, 44, 45, and 46.

In addition, in accordance with Section VIII, “Processes for Changes and Departures, of Appendix A to Part 52-- Design Certification Rule for the ABWR Design,” the applicant identified one Tier 2\* departure requiring prior NRC approval. This departure is subject to the requirements of 10 CFR 52, Appendix A, Section VIII.A.4, which are similar to the requirements of 10 CFR 50.98. Tier 2 departures not requiring prior NRC approval are subject to the requirements of 10 CFR 52 Appendix A, Section VIII.B.5, which are similar to the requirements of 10 CFR 50.59.

#### **9.2.15.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.2.15 of the certified ABWR DCD. The staff reviewed Section 9.2.15 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete

scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

Tier 2\* Departure

- STD DEP 1.8-1 Tier 2\* Codes, Standards, and Regulatory Guide Edition Changes

This departure updates the references to more current revisions/editions of codes and standards. In FSAR Subsection 9.2.15.1.1, "Safety Design Basis," the reference to IEEE Std-279, "Criteria for Protection Systems for Nuclear Power Generating Stations," is replaced with a reference to IEEE Std-603, "Criteria for Safety Systems for Nuclear Power Generating Stations." This is a departure of Tier 2\* information and thus requires prior NRC review and approval. IEEE Std-279 addresses considerations such as design bases, redundancy, independence, single failures, qualifications, bypasses, status indication, and tests. IEEE Std-603 has since superseded IEEE Std-279. The guidance in IEEE Std-603, as endorsed by RG 1.153, "Criteria for Safety Systems," incorporates the guidance of IEEE Std-279. Therefore, the staff found the proposed departure acceptable.

Tier 2 Departure Not Requiring Prior NRC Approval

Although no Tier 2 departures requiring prior NRC review and approval are proposed, the applicant plans to implement a Tier 2 departure that does not require prior NRC review and approval, as permitted by 10 CFR 52 Appendix A, Section VIII.B.5.b. This section of 10 CFR 52 contains eight criteria that, if satisfied, allow the applicant to depart from the ABWR DCD Tier 2 information without obtaining prior NRC approval. In order to assure that this requirement is being properly implemented, the staff evaluated the following Tier 2 departure:

- STD DEP 9.2-5 Reactor Service Water System

The primary reason for this departure is to increase the RSW design flow rate specified in the ABWR DCD, in order for the site-specific RSW system to accomplish its safety and power generation design basis. This departure is largely the result of Departure 9.2-1, which is reviewed in Section 9.2.11 of this SER. This departure increases the capacity of the RCW heat exchangers to provide additional heat removal capability and increases margin allowances for fouling and other requirements. Increasing the RSW flow rate increases RSW system pipe sizes, as shown in Tier 2 FSAR Figure 9.2-7, Sheets 1-3, "Reactor Service Water System P&ID," and increases the RSW flow rate per pump, as shown in Tier 2 Table 9.2-13, "Reactor Service Water System (Interface Requirements)." These increases in pipe size and flow rate per pump result in an increased flow to the RCW heat exchangers to accommodate the increased RCW heat removal requirements resulting from Departure 9.2-1.

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

This departure also provides additional site-specific information by adding or revising in-service testing (IST) requirements for several RSW system valves. These IST valve revisions are in Table 3.9-8, “In-Service Testing Safety-Related Pumps and Valves.”

This departure also changes the design parameters for the RSW pumps, piping, and valves (Table 9.2-13) due to the changes in configuration of the UHS, which is reviewed in Section 9.2.5 of this SER. These design parameters provide specific site information for the RSW system.

The increase in RSW pipe sizes and flow rates could also result in an increase in the amount of flooding in the CB should an RSW pipe fail in the CB. However, the applicant concludes that the existing separation of each RSW division and the design interlocks to trip the RSW pump and isolate the failed RSW piping can mitigate this impact. In addition, safety-design basis Interface Requirement 5 in COL FSAR Subsection 9.2.15.2.1 (reviewed below) requires an analysis of the flood level in the CB in the event of an RSW line break and a single active failure. A corresponding ITAAC requires the acceptance of the flooding calculation and verification by testing. In Section 3.4.1, “Flood Protection,” of this SER, the staff evaluates this departure against flooding criteria requirements. In the staff’s review of Section 3.4.1, the staff issued **RAI 03.04.01-4 (eRAI 10)** requesting the applicant to provide sufficient information to demonstrate that the RSW modifications will not result in more severe internal flooding consequences than previously assumed. The staff’s review of the applicant’s response to **RAI 03.04.01-4** is in Section 3.4.1 of this SER.

The applicant’s evaluation in accordance with Item B.5 of Section VIII of Appendix D determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant’s process for evaluating departures and other changes to the DCD is subject to NRC inspections.

### Interface Requirements

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.2.15 of the certified ABWR DCD. However, the certified ABWR DCD required the COL applicant to provide site-specific design information for those portions of the RSW system outside of the CB. The DCD also identified a number of interface requirements to be addressed by the COL applicant. FSAR Revision 3, Subsection 9.2.15.2 addresses the site-specific information, including the interface requirements evaluated by the staff (see below).

### **Safety Design Bases (Interface Requirements)**

In Tier 2 Subsection 9.2.15.2.1 of the COL FSAR, seven interface items address requirements from DCD Tier 2, Subsection 9.2.15.2.1, “Safety Design Bases (Interface Requirements).” The seventh item addresses requirements from DCD Tier 1 Section 2.11.9, “Reactor Service Water.” The NRC staff’s review of each interface item is provided below:

1. In this interface requirement, the Tier 2 DCD required the COL applicant to provide the temperature increase and pressure drop across the RCW heat exchangers, which receive cooling water from the RSW system. In FSAR Revision 2 Subsection 9.2.15.2.1, Item 1, the applicant references Table 9.2-4d, “Design Characteristics for Reactor Building Cooling Water System Components,” which only provides the heat exchanger design temperature

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(71 °C) and not the required temperature increase. However, this information (temperature increase) is in Table 9.2-17, "Design Data for Reactor Service Water," so the reference to Table 9.2-4d appears to be incorrect. Also, the applicant fails to provide the pressure drop across the heat exchangers, but does make a commitment to provide this information in Table 9.2-17 following procurement but before the installation of equipment. NRC staff issued **RAI 09.02.01-4 (eRAI 3211)** requesting the applicant to provide the required temperature increase and pressure drop across the RCW heat exchangers cooled by the RSW system.

The applicant's response to RAI **09.02.01-4** in a letter dated September 8, 2009 (U7-C-STP-NRC-090133, ML092530407) states that the referenced table for the temperature increase in the RSW heat exchanger was incorrect and should be (as stated in the above staff review), Table 9.2-17 rather than Table 9.2-4d. The applicant also provides a markup of Revision 2 of COL FSAR Subsection 9.2.15.2.1, "Safety Design Bases (Interface Requirements)," to include the correct table reference. Additionally, the applicant indicates that the required RCW heat exchanger pressure drop will be available after the award of the RCW heat exchanger procurement and the receipt of the final vendor drawings. The RCW heat exchanger pressure drop data will be available per the Current Design Report Date in Table 1 of **RAI 3.09.03-3**. The staff found both the proposed revision to Subsection 9.2.15.2.1 and the proposed future inclusion of the RCW heat exchanger pressure drop acceptable. Incorporation of the proposed change into the next FSAR revision is being tracked as **Confirmatory Item 09.02.01-04**.

The design parameters provided by the applicant and those to be provided in response to **RAI 09.02.01-4 (eRAI 3211)** will need verification through a site-specific ITAAC item before plant startup. The ABWR DCD, Tier 1 Section 2.11.9, provides the ITAAC within the certified design. The applicant provides additional site-specific ITAAC in Part 9 of the COL application to address site-specific design information. The staff reviewed the site-specific ITAAC in COL application Part 9, Section 3.0, "Site Specific ITAAC," Table 3.0-5, "Reactor Service Water." The performance of the RSW system will be validated through ITAAC 3.0-5, Item 3(d).

2. In this interface requirement, the Tier 2 DCD directs the COL applicant to provide the required and available NPSH data for the RSW pumps at the site-specific pump suction locations considering anticipated low water levels. Item 2 in Subsection 9.2.15.2.1 of the COL FSAR states that the available NPSH data referenced to the pump center line is approximately 17 meters (55.65 feet) considering all losses. The required NPSH data are not provided, but the applicant made a commitment (COM 9.2-1) to provide this information in Table 9.2.17 following RSW pump procurement, but before installation. NRC staff issued **RAI 09.02.01-5 (eRAI 3211)** requesting the applicant to provide the required NPSH for the RSW pumps.

The applicant's response to RAI **09.02.01-5** in a letter dated September 8, 2009 (U7-C-STP-NRC-090133, ML092530407) states that the RSW pump procurement documents will specify that for all RSW pump operating modes the NPSH at pump centerline shall be less than the available NPSH. This data will be available after receipt of final vendor drawings and data. No COL application change is proposed at this time but will be included as part of the response to **RAI 03.09.03-3**.

The staff found the applicant's response to **RAI 09.02.01-5** acceptable, because procurement specification will specify that the NPSH for the RSW pump will be less than the available NPSH to ensure that the available NPSH will be adequate for RSW pump operation. The staff also found the proposed inclusion of the RSW pump NPSH data in a future revision of the COL FSAR acceptable. The verification of the inclusion of this information in the COL FSAR is being tracked as **Confirmatory Item 09.02.01-05**.

The RSW pump NPSH, both required and available, will require verification through a site-specific ITAAC item before plant startup. The staff reviewed the site-specific ITAAC in COL application Part 9 Section 3.0, "Site Specific ITAAC," Table 3.0-5. The staff found no specific ITAAC item to assure that the pump design is adequate in regards to the NPSH. Therefore, the staff issued **RAI 09.02.01-6 (eRAI 3211)** requesting the applicant to provide the required ITAAC to verify, through an ITAAC test and verification, the NPSH requirements for the RSW pumps.

The applicant response to **RAI 09.02.01-6** in a letter dated September 8, 2009 (U7-C-STP-NRC-090133, ML092530407) adds a site-specific ITAAC item to verify, through tests and verification, the NPSH requirements for the RSW pumps. The proposed NPSH ITAAC is included in a Table 3.0-5 markup of COL Part 9, Section 3.0. The staff reviewed the proposed site-specific ITAAC and found it acceptable because it requires verification through inspection, testing, and analysis that the RSW pump NPSH requirements are met. The inclusion of the markup to Table 3.0-5 in the next FSAR revision is being tracked as **Confirmatory Item 09.02.01-06**.

3. In this interface requirement, the Tier 2 DCD directs the COL applicant to provide the location of the RSW pump house. Item 3 in Subsection 9.2.15.2.1 of the COL FSAR states that the STP Units 3 and 4 RSW pump houses are contiguous with the UHS basins that are located directly south of the reactor building. NRC staff found that this information adequately designates the location of the pump house. Site-specific ITAAC Item 1 in Tier 2 Table 3.0-5 will verify the configuration of the RSW pump house.
4. In this interface requirement, the Tier 2 DCD directs the COL applicant to address design features of the site-specific RSW system to meet the requirements in DCD Subsection 9.2.15.1.1 (3), approved by the NRC in NUREG-1503. These requirements are (1) each RSW division shall be mechanically and electrically separated from other divisions; (2) for structures housing RSW components, there shall be inter-divisional boundaries (walls, floors, doors, and penetrations) that have a 3-hour fire rating; and (3) each division is protected from flooding, spraying, steam impingement, pipe whip, jet forces, missiles, fire from other divisions, and the effects from the failure of any non-Seismic Category 1 equipment, as required.

Item 4 in Subsection 9.2.15.2.1 of the COL FSAR provides design information indicating that the site-specific RSW system components meet those specified interface requirements. NRC staff found this information acceptable.

The staff found that site-specific ITAAC Items 3a, b, c, and e in Part 9, Table 3.0-5 of the COL application address verification of the mechanical and electrical separation requirements, as well as the physical separation by structural boundaries with a three-hour fire rating.

5. In this interface requirement, the Tier 2 DCD directs the COL applicant to ensure by analysis that an RSW pipe break and a single active failure will not result in flooding that exceeds 5.0 meters (16.37 feet) in an individual RCW heat exchanger room of the CB.

Item 5 in Subsection 9.2.15.2.1 of the COL FSAR indicates that a calculation will be performed taking into account the longest distance from the RSW pump house and the CB, with an RSW line break in any RCW heat exchanger room and an active component failure, to show that the flood level in the CB will not exceed 5.0 meters (16.37 feet). The staff also verified that Item 2 in Part 9, Table 3.0-5 of the COL is a site-specific ITAAC that requires accurate sizing of each RSW division, in addition to acceptance of a flood calculation and testing of the RSW water level switches to verify actuation in the event of a pipe break with increasing water levels. Item 7 in Table 3.0-5 tests other components in each division that must actuate upon receipt of a signal indicating flooding in the tested division. NRC staff found that this interface requirement has been met and the ITAAC exists to verify through analysis and testing the flood control design of the RSW system.

6. In this interface requirement, the Tier 2 DCD directs the COL applicant to provide RSW system low point drains and high point vents. Additionally, all divisions are to be maintained full of water to prevent water hammer when not in service, except during maintenance. Item 6 in Subsection 9.2.15.2.1 of the COL FSAR meets the DCD requirement for low point drains, vents, and maintenance of the system full of water for water hammer prevention. The applicant however does not identify that operating procedures will be prepared and approved for filling, draining, and maintaining the RSW system full of water to prevent the occurrence of a water hammer event. SRP 9.2.1, Section III.5 recommends these operating procedures in addition to the design of drains and vents. Therefore, NRC staff issued **RAI 09.02.01-7 (eRAI 3211)** requesting the applicant to specify in the FSAR the development and use of specific operating procedures for draining, filling, and operating the RSW full of water, except when undergoing maintenance, to prevent the occurrence of a water hammer event in the system.

The applicant's response to **RAI 09.02.01-7** in a letter dated September 8, 2009 (U7-C-STP-NRC-090133, ML092530407) states that Subsection 13.5.3.4.5 of the COL FSAR specifies the development and use of operating procedures for filling, draining, and operating the RSW full of water. In order to clarify the use of these operating procedures for the prevention of water hammer events, the applicant proposes a markup of this section of the COL FSAR to show the intent to prevent the occurrence of water hammer. The proposed markup is included in the applicant's response to this RAI. The staff found that the proposed future inclusion of this update to the COL FSAR adequately addresses the concerns raised in this RAI. Therefore, **RAI 09.02.01-7** is resolved. The verification of inclusion of this markup in the next FSAR revision is being tracked as **Confirmatory Item 09.02.1-07**.

7. In this interface requirement, the applicant addresses additional interface items for the RSW beyond what is specified in Tier 2 ABWR DCD Subsection 9.2.15.2.1. The following interface requirements from DCD Tier 1, Section 2.11.9 are first listed in italics and then followed by an NRC staff evaluation:
  - (a) *Each RSW division is powered by its respective Class 1E division. In the RSW system, independence is provided between Class 1E divisions, and between Class 1E divisions and non-Class 1E equipment.*

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As stated in the COL FSAR Tier 2, Subsection 9.2.15.2.3, "System Description," each RSW system division is mechanically and electrically separated from other divisions and each division is powered from its respective Class 1E division. The RSW does not provide cooling to non-safety loads; therefore, there is no non-class 1E equipment in the RSW. The staff found that site-specific ITAAC Items 3 a, 3b, and 3c, in Part 9 Table 3.0-5 of the COL application address verification of the electrical separation requirements of the RSW.

- (b) *RSW System Divisions A and B components have control interfaces with the RSS as required to support RSW operation during RSS design basis conditions.*

Subsection 9.2.15.2.5, "Instrumentation and Alarms," describes the RSW system operating logic for design basis conditions. For a LOCA, all standby pumps and standby valves open and blowdown isolation valves close. If a loss of offsite power occurs during the LOCA, the pumps are momentarily stopped until transfer to the standby diesel-generator power is achieved. Site-specific ITAAC Items 4 and 5 of Part 9, Table 3.0-5 of the COL application address testing of these required actions and the control room displays and controls.

- (c) *If required by the elevation relationships between the UHS and the RSW system components in the CB, the RSW system shall have anti-siphon capability to prevent a CB flood after an RSW system break and after the RSW pumps have been stopped.*

The COL application in FSAR Subsection 9.2.15.2.1 states that the anti-siphon capability is not required for the STP. However, the COL application does not provide sufficient information support this conclusion. Although site elevation data in the DCD and COL application drawings were reviewed, NRC staff was unable to find sufficient data on these drawings to verify that elevations of the RCW heat exchanger room in the CB and the water levels in the UHS/RSW intake are in a configuration to prevent the siphoning that would lead to a CB flood after an RSW system pipe break. Therefore, the staff issued **RAI 09.02.01-8 (eRAI 3211)** requesting the applicant to provide a specific basis such as the listing of and evaluation of site elevations or other design features that would lead to the conclusion that anti-siphon capability is not required to prevent a CB flood after an RSW system break and after the RSW pumps have been stopped.

The applicant's response to **RAI 09.02.01-8** in a letter dated September 8, 2009 (U7-C-STP-NRC-090133, ML092530407) includes a rationale for not providing anti-siphon capability referencing various sections that form the technical basis for the applicant's decision. FSAR Section 19R4.4 indicates that drainage of the UHS through the RSW to the RSW/RCW rooms is possible as evidenced by the elevation relationships between the UHS/RSW pumps shown in Figures 1.2-35 and 1.2-36. Flood level detection, with redundant sensors, provides alarms and an automatic trip of the affected RSW pumps, as well as closure of the associated RSW isolation valves in the event that a pipe break occurs in an RSW division. The original concept in the DCD was for a vertical RSW pump configuration, in which case anti-siphon measures would be appropriate. However, the applicant's design for STP Units 3 and 4 utilizes horizontal centrifugal pumps below the water surface elevation of the UHS basin, negating the need for anti-siphon measures. The design for potential flood mitigation is further described in the applicant's COL FSAR, Chapter 3, and in Departure 19R-1.

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Upon review of the applicant's response to this RAI and the referenced design material in the COL FSAR, the staff concurred that anti-siphon measures are not required for the STP design. The staff found the response to **RAI 09.02-01-8** satisfactory, and this RAI is closed.

- (d) *Tunnel structures used to route RSW system piping to the CB shall be classified as Seismic Category I. Tunnel flooding due to site flood conditions shall be precluded.*

The COL application in FSAR Subsection 9.2.15.2.1 states that portions of the RSW system located outside of the CB, including tunnel structures used to route RSW system piping to/from the CB, will be designed for extreme natural phenomena such as earthquakes, tornados, and flooding (GDC 2).

### **Power Generation Design Bases (Interface Requirements)**

In Tier 2 Subsection 9.2.15.2.2 of the COL FSAR, four interface items address requirements from the DCD Tier 2 Subsection 9.2.15.2.2, "Power Generation Design Bases (Interface Requirements)."

1. In this interface requirement, Tier 2 DCD Subsection 9.2.15.2.2(1) requires the RSW system to be able to function during abnormally high or low water levels, and steps are taken to prevent organic fouling of the system, including trash racks and provisions for biocide treatment. Thermal backwashing will be provided where infestations of microbial growths can occur.

FSAR Subsection 9.2.15.2.2 provides the site-specific information related to this interface requirement, specifically for operations during abnormally high or low water levels and the use of biocide treatments. However, this section makes no statement concerning the inclusion of trash racks in the design. The staff noted that DCD Subsection 9.2.5.5.2 (7) states that a perforated plate is installed above the intake to prevent the ingestion of large debris. Subsection 9.2.15.2.2 of the COL FSAR should also have included a discussion of this design feature and how operations prevent the occurrence of organic fouling of the system. Therefore, the staff issued **RAI 09.02.01-9 (eRAI 3211)** requesting the applicant to provide further information addressing DCD power generation interface requirement (1) of Tier 2 DCD Subsection 9.2.15.2.2 concerning design features and activities to prevent organic fouling of the RSW system.

The applicant's response to **RAI 09.02.01-9** in a letter dated September 8, 2009 (U7-C-STP-NRC-090133, ML092530407) provides the technical basis for not including trash racks and thermal backwashing in the design. The applicant also proposes a COL revision to clarify the design. Because the primary makeup for the RSW/UHS cooling water is from wells and not from a river or other body of water, trash racks are not deemed necessary because well water will not contain debris that could damage the system. Additionally, in lieu of thermal backwashing, chemical treatment of the UHS basin water will be utilized to control microbial growth. The applicant attaches a proposed revision to Tier 2 Subsection 9.2.15.2.2(1) to clarify the STP Units 3 and 4 design regarding trash racks and thermal backwashing. The staff found the applicant's response acceptable. The verification of inclusion of this markup in the next FSAR revision is being tracked as **Confirmatory Item 09.02.01-09**.

2. In this interface requirement, Tier 2 DCD Subsection 9.2.15.2.2(2) requires system components and piping materials to be compatible with site cooling water to minimize corrosion. Adequate corrosion and safety factors are to be used to assure system integrity over the life of the plant. NRC staff reviewed the COL application and found that the applicant has adequately addressed this interface requirement.
3. In this interface requirement, Tier 2 DCD Subsection 9.2.15.2.2(3) states that heat removal requirements for the RCW system are in Table 9.2-4d. NRC staff reviewed the COL application and found that the applicant has adequately addressed this interface requirement.
4. In this interface requirement, Tier 2 DCD Subsection 9.2.15.2.2(4) requires that potable water be provided to flush the service water side of the RCW heat exchanges, whenever they are to be put into a wet standby condition. NRC staff reviewed the COL application and found that the applicant has adequately addressed the provision of potable water, as described in FSAR Subsection 9.2.4.1.3.

### **Safety Evaluation (Interface Requirements)**

FSAR Subsection 9.2.15.2.4 addresses interface requirements from DCD Tier 2 Subsection 9.2.15.2.4, "Safety Evaluation (Interface Requirements)." This interface requirement states that analyses shall show that requirements in Subsections 9.2.15.1.1(3) and 9.2.15.2.1(5) are met. These sections address the following:

- 9.2.15.1.1(3): This requirement is the same as the Safety Basis Interface Requirement (4) in FSAR Subsection 9.2.15.2.1, which the staff analyzes in the Safety Basis Interface Requirement evaluation of this SER section. This interface requirement states that each RSW division shall be mechanically and electrically separated from other divisions, for structures housing RSW components, there shall be interdivisional boundaries (walls, floors, doors, and penetrations) that have a three-hour fire rating, and each division is protected from flooding, spraying, steam impingement, pipe whip, jet forces, missiles, fire from other divisions, and the effect of failure of any non-Seismic Category 1 equipment, as required.
- 9.2.15.2.1(5): Analysis of the RSW pipe break with a single active component failure shows that maximum flooding will not exceed 5.0 m (16.4 ft) in any individual RCW heat exchanger room of the CB. This requirement is the same as the Safety Basis Interface Requirement (5) in FSAR Subsection 9.2.15.2.1, which NRC staff analyzes in the Safety Basis Interface Requirement evaluation of this SER section.

The staff found that the applicant has adequately addressed both of the above interface requirements in the FSAR Safety Basis Interface Requirements evaluation, including the site-specific ITAAC in Part 9 of the COL application.

### **Instrumentation and Alarms (Interface Requirements)**

FSAR Subsection 9.2.15.2.5 addresses interface requirements from DCD Tier 2 Subsection 9.2.15.2.5, "Instrumentation and Alarms (Interface Requirements)." This interface requirement states that all RSW pumps shall stop and all automatic isolation valves outside of the CB shall close upon receipt of a high water level signal in the RCW heat exchanger room in the affected division. Additionally, the requirement states that operators will periodically clean strainers to

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maintain low differential pressures and that high differential pressure is alarmed in the control room. The staff reviewed FSAR Subsection 9.2.15.2.5 and found that the applicant has adequately addressed this interface requirement.

### **Tests and Inspections (Interface Requirements)**

FSAR Subsection 9.2.15.2.6 addresses interface requirements from DCD Tier 2 Subsection 9.2.15.2.6, "Tests and Inspections (Interface Requirements)." This interface requirement states that tests shall assure, under conditions as close as is practical, the performance of the full operating sequence of the RSW system, including bringing the system into operation for a reactor shutdown and for a LOCA. This requirement also includes operation of the applicable portions of the reactor protection system and transfer between normal and standby power sources. NRC staff reviewed FSAR Subsection 9.2.15.2.6 and found the applicant's commitment to these test requirements. The staff found this commitment acceptable.

### **COL License Information Item**

- COL License Information Item 9.12      Reactor Service Water System Requirements

FSAR Subsection 9.2.17.2 provides the information to address COL License Information Item 9.12, "Reactor Service Water Requirements." NRC staff reviewed the application to determine the acceptability of this design information. Each of the six provisions of COL License Information Item 9.12 is addressed below:

1. Item 1 provides for periodically analyzing RSW water and substrate and/or periodically inspecting the intake structure for bio fouling and the removal of any accumulations detected. The staff found FSAR Subsection 9.2.17.2(1) acceptable.
2. Item 2 provides for full flow testing of redundant and infrequently used cooling loops. FSAR Subsection 9.2.17.2(2) indicates that there are no infrequently used cooling loops. The RSW pumps are to be rotated so that pumps will be in service at a frequency of no less than 3 months. Pump operations will be equalized over time, with full flow achieved for one pump in each cooling loop during normal operations. FSAR Subsection 9.2.15.2.3 indicates that the operating time of each RSW pump is monitored, allowing the operator to take actions to equalize the run time for pumps in the same division. NRC staff found that the FSAR adequately addresses this COL license information item.
3. Item 3 provides for continuous biocide treatment of the RSW system. The Tier 2 description of this feature indicates that biocide treatment is implemented using an intermittent injection upstream of the RSW pump. NRC staff found this information acceptable.
4. Item 4 provides for filling the RSW system cooling loops with biocide-treated water before layup. The staff found the Tier 2 provisions acceptable. The application indicates that the plant-specific provisions are to include biocide-treated potable water for flushing the RSW system cooling loops whenever they are to be put into a wet standby condition. Methods and procedures will be developed for these activities. NRC staff found that the FSAR adequately addresses this COL license information item.
5. Item 5 provides biocide treatments for other systems such as fire protection, which uses RSW as a source of water. The COL application states that because the RSW does not

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provide a source of water for any other systems, these provisions are not applicable. The staff found that the FSAR adequately addresses this COL license information item.

- Item 6 provides an Emergency Procedure Guideline (EPG) to backup the RSW system leak detection instrumentation and automatic actions by manual operator actions that include local and manual valve closures. The application commits (COM 9.2-4) to develop the appropriate EPG before fuel loading to identify the manual operator actions required if a leak is detected and the affected RSW division is automatically tripped and isolated. NRC staff found this information acceptable.

Under the ABWR DCD Technical Specifications in Section 16.1.1, "COL Information Required for Plant Specific Technical Specifications," where the detailed design is required to establish the information to be specified in Technical Specifications, a "[ ]" is noted and the COL applicant is to provide the required information to complete the plant-specific Technical Specifications. The staff reviewed the DCD Technical Specifications applicable to the RSW system. The applicable Technical Specification sections are LCOs 3.7.1, 3.7.2, 3.7.3, "Reactor Building Cooling Water System and Reactor Service Water and Ultimate Heat Sink for Modes 1, 2 & 3 (LCO 3.7.1), 4 and 5 (LCO 3.7.2) and Refueling (LCO 3.7.3)."

In the first two surveillance requirements (SR) associated with each of these three Technical Specification LCOs as noted by a "[ ]," the COL applicant is required to provide SR data on the required water level in the UHS spray pond, as well as the water level in each RSW pump well of the intake structure. The staff found that the COL application includes these data. The UHS water level is required to be  $\geq 19.28$  m (63.12 ft) and the water level in the RSW pump well is required to be  $\geq 0.91$  m (298 ft). The term "[spray pond]" and "[spray network]" in the DCD was identified for the COL application to clarify in the plant-specific Technical Specifications. The COL application also includes the appropriate terminology as required. The staff determined that the applicant has satisfactorily addressed RSW COL License Information Item 16.1.

During the review of the DCD and COL application Technical Specifications for each of the applicable RSW LCOs, the staff noted a discrepancy for which the COL applicant does not identify a supplement or departure in the COL application. The Technical Specifications in the COL application have an additional SR that is not found in the DCD Technical Specifications. COL Technical Specification SRs 3.7.1.4, 3.7.2.4 and 3.7.3.4 state, "Operate each cooling tower cell fan for  $\geq 15$  minutes" on a 31-day frequency. There does not appear to be an explanation for this additional SR in the COL application, nor is there a supplement or departure in the COL application Departures Report. This discrepancy was addressed in **RAI 16-8 (eRAI 3045)**, which was subsequently resolved and closed. Therefore, the staff does not identify a new issue related to this Technical Specification surveillance.

#### Initial Test Program

NRC staff reviewed the COL application Initial Test Program (ITP), Chapter 14.0, against the ABWR DCD ITP, including COL license information items. The COL application incorporates the ITP with no departures. There are no COL license information items related to the RSW system.

## ITAAC

NRC staff reviewed the COL application site-specific ITAAC using detailed review guidance and checklists from SRP Section 14.3. This review includes a review of the site-specific ITAAC information in Part 9 Section 3 of the COL application that was not included as part of the DCD. Additionally, the staff's review included verification that the ITAAC appropriately considered the interface requirements included in the referenced DCD.

The staff's review of DCD Tier 1 and Tier 2 identified interface requirements for the RSW in this section of the report and evaluated the site-specific ITAAC for each requirement. As noted above, one RAI requested the applicant to further address required ITAAC:

In **RAI 09.02.01-6 (eRAI 3211)**, the NRC staff asked the applicant to provide the required ITAAC to verify, through an ITAAC test and verification, the NPSH requirements for the RSW pumps. As noted above, this RAI was resolved by the applicant's response and includes **Confirmatory Item 9.2.15-06**.

Using SRP Section 14.3 Appendix D, "ITAAC Checklist Examples for Fluid Systems," the staff evaluated the DCD ITAAC combined with the site-specific ITAAC in COL application Part 9, Table 3.0-5, "Reactor Service Water System," to determine whether the applicant has provided acceptable ITAAC for the design. Other than the one RAI identified above, the staff determined that the ITAAC is sufficient for the RSW.

### **9.2.15.5 Post Combined License Activities**

The applicant identifies the following commitments:

- Commitment (COM 9.2-3) – Develop appropriate methods for biocide treatment of the layup following equipment procurement and develop applicable procedures before fuel loading.
- Commitment (COM 9.2-4) – Develop the appropriate EPG before fuel loading to identify the operator actions (manual) required if a leak is detected and the affected RSW division is automatically tripped and isolated.
- Demonstrate satisfactory compliance with acceptance criteria in ITAAC Table 3.0-5 for the Reactor Service Water System

### **9.2.15.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information relating to RSW system. With the exception of **Confirmatory Items 09.02.01-4 through 09.02.01-7, and 09.02.01-9**, no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the RSW system that were incorporated by reference have been resolved.

The staff compared the COL application to the relevant NRC regulations, the acceptance criteria defined in NUREG-0800, Section 9.2.15, and other NRC RGs. The staff concluded that the applicant is in compliance with the NRC regulations. The staff found it reasonable that the

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identified Tier 2 departures are characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5.

However, as a result of **Confirmatory Items 09.02.01-4 through 09.02.01-7, and 09.02.01-9**, the staff was unable to finalize the conclusions relating to the RSW system in accordance with the NRC requirements.

## **9.2.16 Turbine Service Water System**

### **9.2.16.1 Introduction**

This section of the FSAR addresses the nuclear power plant's turbine service water (TSW) system. The TSW system provides cooling water to the turbine cooling water (TCW) system heat exchangers to transfer heat from the TCW system to the power cycle heat sink. The TSW system is required to operate during normal and shutdown conditions. FSAR information and reviews associated with station service water systems are normally located in Section 9.2.1 and are consistent with the numbering in SRP Section 9.2.1, "Station Service Water System." However, information related to the STP COL TSW system is in Section 9.2.16, "Turbine Service Water System," of the Tier 2 STP COL FSAR and references Section 9.2.16, "Turbine Service Water System," of the Tier 2 ABWR DCD. For purposes of consistency, the NRC staff's evaluation of the TSW system is described in this SER section.

### **9.2.16.2 Summary of Application**

The ABWR DCD included only those portions of the TSW system in the turbine building that were within the scope of the ABWR standard plant design. However, as required by 10 CFR 52, the DCD provided a conceptual design and interface requirements for those portions of the TSW system considered to be site-specific.

Section 9.2.16 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.2.16 of the certified ABWR DCD, Revision 4.

In addition, in FSAR Revision 3 Section 9.2.16, the applicant provides the following:

#### *Tier 2 Departure Not Requiring Prior NRC Approval*

- STD DEP 9.2-10 Turbine Service Water System

This departure revises the TSW system design parameters to reflect the site-specific information and design information specific to the conceptual design of those parts of the system outside of the turbine building.

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

In Subsections 9.2.16.2.3.1 through 9.2.16.2.3.3, the applicant provides additional information regarding the description and operation of the TSW system to replace the conceptual design information in the ABWR DCD.

### Interface Requirements

The applicant provides supplemental information to address TCW interface requirements with the certified design on safety design bases, power generation design bases, safety evaluation, instrumentation and alarms, and tests and inspections.

#### **9.2.16.3 Regulatory Basis**

The regulatory basis for the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements for the Commission’s regulations and the associated acceptance criteria for reviewing supplemental information are in Section 9.2.1 of NUREG–0800.

In accordance with Section VIII, “Processes for Changes and Departures,” of 10 CFR 52 Appendix A, the applicant identifies Tier 2 departures. Tier 2 departures not requiring prior NRC approval are subject to the requirements of 10 CFR 52 Appendix A Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

In particular, the regulatory basis and review criteria that the staff used for the Tier 2 departure described above are specified in Section 9.2.1 of NUREG–0800.

#### **9.2.16.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.2.16 of the certified DCD for the ABWR design. The staff reviewed Section 9.2.16 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

In NUREG–1503, the staff reviewed the ABWR TSW system in accordance with SRP Section 9.2.1. Within the scope of SRP Section 9.2.1, the staff’s acceptance of the TSW system design is based on meeting the requirements of GDC 2, 4, 5, 44, 45, and 46. In NUREG–1503, the staff concluded that GDC 4, 44, 45, and 46 do not apply because the TSW system is a nonsafety-related system with no connections to safety-related systems. The STP FSAR provides supplemental information (interface requirements and a Tier 2 departure) on the TSW system. This information does not affect the system configuration, or operation. Therefore, the evaluation of the system’s compliance with GDC 2 in NUREG–1503 is unaffected and remains valid.

The staff reviewed the information in the COL FSAR:

#### Tier 2 Departure Not Requiring Prior NRC Approval

Although no Tier 2 departures requiring prior NRC review and approval are proposed, the applicant plans to implement a Tier 2 departure that does not require prior NRC review and

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<sup>1</sup> See “Finality of Referenced NRC Approvals” in SER Section 1.1.3, for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

approval as permitted by 10 CFR 52 Appendix A, Section VIII.B.5.b. This section of 10 CFR 52 contains eight criteria that if satisfied, allow the applicant to depart from ABWR DCD Tier 2 information without obtaining prior NRC approval. In order to assure that this requirement is being properly implemented, NRC staff evaluated the Tier 2 departure:

- STD DEP 9.2-10 Turbine Service Water System

This departure revises the TSW system design parameters to reflect the site specific information and design information specific to the conceptual design of those parts of the system outside of the turbine building. The changes include the TSW pump head and discharge flow, the TSW system design pressure, the location of the TSW pump house, the temperature increase and pressure drop across the TCW heat exchangers, and the number of TCW discharge lines. The departure also includes a change from the DCD conceptual design by adding a fill line for the circulating water system (CWS) from the TSW pump discharge. In addition the TSW inlet and outlet lines are modified to reflect that these lines come from and go to the main cooling reservoir, respectively. The design parameters affected by this departure are shown in FSAR Table 9.2-16, and Figure 9.2-8.

The TSW system is a nonsafety-related system. As such, there is no impact on any Tier 1, Tier 2\*, TS, TS Bases or other safety-related operational requirements. The proposed departure does not affect the design or function of any SSCs important to safety. There is no effect on the likelihood or consequences of any accidents or the likelihood or consequences of malfunctions of any SSC important to safety that was previously evaluated in the DCD. This departure also does not introduce the possibility of any new type of accident. There is no impact on fission product barriers.

The potential for flooding in the turbine building in the event that a TSW system piping failure occurs was evaluated in the DCD review by NRC staff in NUREG 1503, with a satisfactory finding. Additionally, in an interface requirement, reviewed by the staff (see the discussion below), the COL applicant demonstrates that a break in the TSW line will not result in the flooding of safety related SSCs.

The applicant's evaluation in accordance with 10 CFR Part 52, Appendix A, Section VIII item B.5 determined that this departure did not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that this departure does not require prior NRC approval. In addition, the applicant's process for evaluating departures and changes to the DCD are subject to NRC inspections.

#### GDC 5. Sharing of SSCs

NUREG-1503 concludes that for the ABWR the requirements of GDC 5 for sharing of SSCs do not apply because the ABWR is designed as a single unit plant. NUREG 1503 also states that any application for a multi-unit facility will require a review of the design for compliance with GDC 5. The COL application is for two units at the STP site. Therefore a review of the TSW system against GDC 5 requirements is appropriate. The STP COL application identifies a departure that addresses this issue for the facility: STP DEP 1.1-2, "Dual Units at STP 3 & 4." That departure identifies the shared set of STP systems between the units. The TSW system is not identified as a system that STP Units 3 and 4 share. Therefore the staff concluded that the site-specific design of the TSW system described in the COL application meets the GDC 5 requirements relative to the sharing of SSCs.

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### Interface Requirements

As documented in NUREG-1503, the staff reviewed and approved Section 9.2.16 of the certified the ABWR DCD design. However, the DCD required the COL applicant to provide site specific design information for those portions of the TSW system outside of the turbine building. Also in Subsection 9.2.16.2, the DCD identifies interface requirements to be addressed by the COL applicant in the following subsections:

- 9.2.16.2.2 Power Generation Design Bases (Interface Requirements)
- 9.2.16.2.4 Safety Evaluation (Interface Requirements)
- 9.2.16.2.5 Instrumentation and Alarms (Interface Requirements)
- 9.2.16.2.6 Tests and Inspections (Interface Requirements)

Tier 2, Subsection 9.2.16.2 of the STP COL FSAR Revision 3 addresses site-specific information that includes the DCD interface requirements evaluated by the staff (see below).

#### **Power Generation Design Bases (Interface Requirements)**

Tier 2 Subsection 9.2.16.2.2 of the COL application addresses five interface requirement items in DCD Tier 2 Subsection 9.2.16.2.2:

1. In this interface requirement the Tier 2 DCD requires the COL applicant to provide the temperature increase and pressure drop across the heat exchangers. The COL application documents the temperature increase as 6.0 °C (10.8 °F) and the pressure drop across the TCW system heat exchangers as 69 kPa (10 psi). NRC staff found that the applicant has adequately addressed this interface requirement.
2. In this interface requirement the Tier 2 DCD requires the COL applicant to provide the required and available NPSH for the TSW pumps at pump suction locations considering anticipated low water levels. The COL applicant's response provides an available NPSH at the pump suction locations with a consideration of anticipated low water levels at 99 kPa (14.4 psi). The applicant further indicates that the NPSH for the TSW pumps will be less than the available NPSH for all operating conditions. NRC staff found that the applicant has adequately addressed this interface requirement.
3. In this interface requirement the Tier 2 DCD required the COL applicant to identify the location of the TSW pump house. The COL applicant's response indicates that the TSW pump house is located south of the STP power block at the main cooling reservoir in the STP circulating water intake structure. NRC staff found that the applicant has adequately addressed this interface requirement.
4. In this interface requirement the Tier 2 DCD required the COL applicant to identify heat removal requirements from the TCW system. The staff reviewed Subsection 9.2.14.2 to verify that the TCW heat removal requirements are provided. COL applicant identifies three TCW heat exchangers each with a heat removal capacity of 114.5 GJ/h (108.5 MBTU/h) each (connected in parallel). NRC staff found that the applicant has adequately addressed this interface requirement.
5. In this interface requirement the Tier 2 DCD required the COL applicant to provide TSW system low point drains and high point vents in the design. All TSW system components are

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required to be maintained full of water to prevent water hammer when not in service except when undergoing maintenance. The COL applicant confirmed that these requirements are met. The staff found this interface requirement to have been addressed adequately.

Subsection 9.2.16.2.2 of COL application Revision 3 documents that Table 9.2-16 of the referenced ABWR DCD was also replaced to reflect site specific design information for the system, thus satisfying an additional interface requirement in this section.

### **Safety Evaluation (Interface Requirements)**

Tier 2 Subsection 9.2.16.2.4 of the COL application addresses the interface requirements in DCD Tier 2, Subsection 9.2.16.2.4. This interface requirement states that the COL applicant shall demonstrate that all safety related SSCs are protected from flooding in the event of a pipeline break in the TSW system. In COL application, Revision 3, Subsection 9.2.16.2.4, the applicant referenced COL Subsection 3.4.1.1.2.5 to demonstrate that a break in the TSW line will not flood safety related SSCs. The staff reviewed Tier 2, COL application, Subsection 3.4.1.1.2.5 and a departure related to the turbine building, STP DEP 1.2-2, which addresses the potential for a flooding in the turbine building resulting from a break in the TSW system piping.

In the COL application, Part 7, Departures Report, STP DEP 1.2-2, the applicant indicates that the CWS and the TSW systems are the only systems large enough to fill the condenser pit with water. Therefore, only these two systems are required to be addressed by the applicant to show that the turbine building design is adequate to prevent flooding into the adjacent reactor building and control building. As indicated in the evaluation of STP DEP 1.2-2, in the STP design, TSW system floods are limited by system isolation signals initiated by leak detectors in the TSW system equipment room. The increased area in the turbine building provides an adequate volume for storing the limited flood water from the TSW system to assure that the water level will remain below the access level to the reactor building and the control building via the service building.

Review of the Tier 2 Subsection 3.4.1.1.2.5 confirms that it is consistent with the COL applicant's evaluation of STP DEP 1.2-2. The TSW system pipe break could result in turbine building flooding below grade. Isolation of the system is accomplished through leak detectors in the TSW system equipment room. In the event that the system isolation fails, there are two other means to prevent the leak from crossing into adjacent safety related buildings. The first is a closed and alarmed door connecting the passage from the turbine building to the service building. The second is the radwaste tunnel seal at both ends of the tunnel to prevent water from entering the tunnel. In the event that a large hydrostatic head could occur in the turbine building, a large non-water tight truck door is at grade to provide a release point for any flood water.

Based on the review of STP DEP 1.2-2, COL application Tier 2 Subsection 3.4.1.1.2.5, and the multiple means for preventing major flooding in the turbine building, the staff found that the applicant has adequately addressed this interface requirement.

### **Instrumentation and Alarms (Interface Requirements)**

DCD Tier 2 Subsection 9.2.16.2.5, "Instrumentation and Alarms (Interface Requirements)," requires the following provisions to be addressed in the COL application:

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1. The TSW pump status shall be indicated in the main control room (MCR).
2. The TSW pump trip shall be alarmed and the automatic start of the standby pump shall be annunciated in the control room.
3. An alarm in the control room shall indicate high differential pressure on the duplex filter.

The COL applicant does not provide a corresponding section in the application to address these interface requirements, and the staff could not find this information in any other sections of the COL application. The staff therefore issued **RAI 09.02.01-1 (eRAI 3212)**, requesting the applicant to provide the required interface requirements information to address the TSW system MCR status indications and alarms.

The applicant responded to this RAI in a letter dated September 8, 2009 (U7-C-STP-NRC-090133, ML092530407). The applicant response states that the requested information concerning TSW instrumentation and alarms in the MCR was inadvertently omitted in Revision 2 of the COL application. The applicant thus provided a markup of the Revision 2 COL application to add Subsection 9.2.16.2.5, "Instrumentation and Alarms (Interface Requirements)." The markup includes the MCR TSW pump status, the TSW system trip alarm, an automatic startup annunciation, and the alarm of the high differential pressure across the duplex filters. The staff found that the proposed future inclusion of this update to the COL FSAR adequately addresses the concerns in **RAI 09.02.01-1**, and therefore this RAI is resolved. The applicant's proposed FSAR markup to add Subsection 9.2.16.2.5 is being tracked as **Confirmatory Item 09.02.01-01**.

### **Tests and Inspections (Interface Requirements)**

DCD Tier 2, Subsection 9.2.16.2.6, "Tests and Inspections (Interface Requirements)," specifies the following testing and inspection requirements for the TSW system:

- a. The major components of the TSW system are to be tested individually before installation and as an integrated system after installation. Preoperational tests are to be performed in accordance with Chapter 14 of the COL application.
- b. TSW system components and instrumentation are to be accessible for examination during plant operation. Periodic inspections are to take place during plant operations for operability and system integrity; the DCD specifies the types of measurements to be taken during periodic rounds.

The COL applicant does not provide a corresponding section in the application to address these interface requirements, and the staff could not find this information in any other sections of the COL application. The staff therefore issued **RAI 09.02.01-2 (eRAI 3212)** requesting the applicant to provide the required interface requirements information to address the TSW system testing and inspection interface requirements.

The applicant's response to **RAI 09.02.01-2** in a letter dated September 8, 2009 (U7-C-STP-NRC-090133, ML092530407) states that the requested information concerning TSW testing and inspections was inadvertently omitted in Revision 2 of the COL application. The applicant thus provided a markup of the Revision 2 COL application to add Subsection 9.2.16.2.6, "Tests and Inspections (Interface Requirements)." The staff found that the proposed markup adequately

addresses the TSW preoperational testing requirements, in accordance with DCD Chapter 14 as well as system accessibility and periodic inspections during normal operations. Therefore, **RAI 09.02.01-2** is resolved. The applicant's proposed FSAR markup to add Subsection 9.2.16.2.6 is being tracked as **Confirmatory Item 09.02.01-2**.

## **ITAAC**

NRC staff reviewed the COL application ITAAC using the detailed review guidance and checklists from SRP Section 14.3. This review included the site-specific ITAAC information in COL Part 9 Section 3, which was not included as part of the DCD. The TSW system is not identified as having additional site-specific ITAAC because the applicant's design indicates that the site-specific portions of the TSW system do not have a safety-related, safety-significant, or risk significant function. However, in the staff's evaluation of the "Safety Evaluation Interface Requirements" for the TSW system, Subsection 3.4.1.1.2.5 of the Tier 2 COL application was reviewed to determine whether a break in the TSW system piping could result in a flood affecting safety-related SSCs. As indicated in the evaluation of the TSW system floods, the design includes system isolation signals from leak detectors in the TSW system equipment room. In the event that the system isolation fails, there are two other means to prevent the leak from crossing into other safety-related buildings. The first is a closed and alarmed door connecting the passage from the turbine building to the service building. The second is the radwaste tunnel seal at both ends of the tunnel to prevent water from entering the tunnel. In the event that a large hydrostatic head could occur in the turbine building, a large non-watertight truck door is at grade to provide a release point for any flood water. The staff viewed these described measures as important design features that require verification through tests and inspections, thus ensuring that safety-related SSCs are protected from potential TSW system pipe breaks and a resulting flood. These design features and automatic logic meet the criteria in SRP Section 14.3 for system ITAAC. The staff issued **RAI 09.02.01-3 (eRAI 3212)** requesting the applicant to provide an ITAAC to verify through tests and inspections that the leak detection instrumentation, system isolation, and other described design features will provide the flood protection for the turbine building that the COL application identifies.

The applicant's response to **RAI 09.02.01-3** in a letter dated September 8, 2009 (U7-C-STP-NRC-090133, ML092530407) states that the description of the design for the turbine building in the ABWR DCD (Tier 1) Section 2.15.11 already specifies provisions to prevent potential impacts on safety-related SSCs from turbine building flood conditions. These provisions are also included in an existing Tier 2 DCD ITAAC that requires verification of the as-built turbine building configuration. The applicant also states that an additional ITAAC item is not warranted and would not be consistent with NRC provisions on the finality of standard design certifications in 10 CFR 52.63. The staff reviewed the applicant's response and found it acceptable. The COL does not warrant an ITAAC because DCD Tier 1 Section 2.15.11 already specifies provisions to prevent potential impacts on safety-related SSCs from turbine building flood conditions. Therefore, **RAI 09.02.01-3 (eRAI 3212)** is resolved and closed.

### **9.2.16.5 Post Combined License Activities**

There are no post COL activities related to this section.

#### **9.2.16.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG–1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information relating to TSW system. With the exception of **Confirmatory Items 09.02.01-1 and 09.02.01-2** no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A, Section VI.B.1, all nuclear safety issues relating to the TSW system that were incorporated by reference have been resolved.

The staff found it reasonable that the identified Tier 2 departures are characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5.

The staff's review confirmed that the applicant has adequately addressed the Supplemental Information in accordance with Section 9.2.1 of NUREG–0800 and other NRC regulatory guides. The staff concluded that the applicant is in compliance with NRC regulations. However, as a result of **Confirmatory Items 09.02.01-01 and 09.02.01-02**, the staff was unable to finalize the conclusions relating to the TSW system in accordance with the NRC requirements.



#### **9.3.2.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.3.2 of the certified ABWR DCD. The staff reviewed Section 9.3.2 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

##### *Tier 2 Departures Not Requiring Prior NRC Approval*

- STP DEP 9.3-3 Control Rod Drive System Sampling

The staff found this departure acceptable because the CRD water sample line and the reactor water cleanup inlet use the same instrumentation, making it possible to sample the CRD water.

The applicant’s evaluation determined that this departure does not require prior NRC approval in accordance with 10 CFR 52 Appendix A, Section VIII.B.5. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant’s process for evaluating departures and other changes to the certified ABWR DCD is subject to NRC inspections.

- STD DEP Admin

The staff found this departure acceptable because it references the correct ITAAC, and does not affect the technical evaluation of the process and post-accident sampling system documented in Section 9.3.2 of the ABWR FSER.

The applicant’s evaluation determined that this departure does not require prior NRC approval in accordance with 10 CFR 52 Appendix A, Section VIII.B.5. Within the review scope of this section, the staff found it reasonable that this departure does not require prior NRC approval.

#### **9.3.2.5 Post Combined License Activities**

There are no post COL activities related to this section.

#### **9.3.2.6 Conclusion**

The NRC staff’s finding related to information incorporated by reference is in NUREG–1503. NRC staff reviewed the application and checked the referenced DCD. The staff’s review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A, Section VI.B.1, all nuclear safety issues relating to

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<sup>1</sup> See “*Finality of Referenced NRC Approvals*” in SER Section 1.1.3 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

the process and post-accident sampling that were incorporated by reference have been resolved.

The staff found it reasonable that the identified Tier 2 departures are characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5.

The staff also found that the departures do not affect the conclusion of the process and post-accident sampling system documented in Section 9.3.2 of the ABWR FSER.

### **9.3.3 Non-Radioactive Drainage System**

#### **9.3.3.1 Introduction**

This section of the FSAR describes STP conformance with design features and considerations that were specified and approved by the NRC for the standard ABWR plant design. The non-radioactive drainage (NRD) system is designed to assure that waste liquids, valve and pump leakoffs and component drains and vents are directed to the proper area for processing.

#### **9.3.3.2 Summary of Application**

Section 9.3.3 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.3.3 of the certified ABWR DCD Revision 4, with no departures. In addition, in FSAR, Revision 3, Section 9.3.3, the applicant provides the following:

##### Site-Specific Supplement

FSAR Subsection 9.3.3.2.3 contains the site-specific system information used to replace the ABWR DCD conceptual design information and refers to the FSAR Figure 9.3-12 that shows the site-specific design.

#### **9.3.3.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements for the Commission’s regulations and the associated acceptance criteria for reviewing NRD system supplemental information is in Section 9.3.3 of NUREG–0800.

#### **9.3.3.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.3.3 of the certified ABWR DCD. The staff reviewed Section 9.3.3 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

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<sup>1</sup> See “Finality of Referenced NRC Approvals” in SER Section 1.1.3 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification

The staff reviewed the information in the COL FSAR:

Site Specific Supplement

The staff reviewed FSAR Subsection 9.3.3.2, “Non-Radioactive Drains (Interface Requirements),” and Subsection 9.3.3.3, “System Description,” which specifies the site-specific details regarding the NRD system from the standard ABWR plant buildings to the discharge outfall. These sections include a reference to Figure 9.3-12, that shows the system piping, pumps, valves and tanks that direct the effluent from selected plant buildings to the discharge areas. The staff compared this supplemental information to the requirements of GDC 60 as it relates to providing a means to control the release of radioactive materials in liquid effluent, including anticipated operational occurrences. The certified ABWR DCD states that the NRD system shall provide means for obtaining samples and analyzing them to ensure that no radioactive effluents are discharged. FSAR Figure 9.3-12 shows radiation monitoring at the discharge of the NRD system, before entering the main cooling reservoir through permitted outfall(s). In the event of high radiation levels, diverts the flow to the radioactive effluent portion of the radwaste system. In addition, FSAR Subsection 9.3.3.2.3 states that means are provided to perform any required tests or analyses required by the discharge permit. However, the provisions for obtaining samples are not specifically discussed in the FSAR or shown in Figure 9.3-12. The staff issued RAI **09.03.03-4 (eRAI 102)** requesting the applicant to provide a sampling and analysis program and to describe the sampling provisions for the NRD system.

The applicant’s response to RAI 09.03.03-4 (eRAI 102) dated June 12, 2008 (ML081710126), refers to ABWR DCD Subsection 9.3.3.2.5 and STP FSAR Subsection 9.3.3.2.3 that specify the means to perform any required tests or analyses to meet the requirements of the discharge permit. The staff reviewed the applicant’s response to RAI 09.03.03-4 (eRAI 102) and determined that the applicant’s response to RAI 09.03.03-5 evaluated below addresses the concern raised in this RAI. Therefore, **RAI 09.03.03-4 (eRAI 102)** is resolved and closed.

The staff issued **RAI 09.03.03-5 (eRAI 2554)** further requesting the applicant to provide details for a sampling, monitoring, and analysis program for the NRD system to determine the potential for carrying radioactive contamination into the environment. The applicant’s response to RAI 09.03.03-5 in a letter dated August 28, 2009 (U7-C-STP-NRC-090127, ML092450154), and the supplemental response in a letter dated December 28, 2009 (U7-C-STP-NRC-090224, ML093631615), states, “The program for monitoring and sampling of the non-radioactive waste system, including the determination of batch discharge limits, is in accordance with the Offsite Dose Calculation Manual (ODCM), IEN 80-10, and Regulatory Guide 1.21.” FSAR Subsection 13.5.3.4.3, “Radiation Control Procedures,” states, “procedures will be developed for handling discharge of effluents and dose calculations for STP units 3 and 4. These procedures will be issued 6 months before the Preoperational Test Program per FSAR Subsection 13.5.3.3.2, “Maintenance and Other Procedures.” Also, sufficient hold up capacity is provided by the main cooling reservoir and the 2.09E8 cubic meters (7.35E9 cubic feet) of dilution water, before any site environmental conditions that would release any liquid effluents to the environment, per GDC 60. The staff evaluated the applicant’s response and found it acceptable, because it complies with GDC 60. Therefore RAI **09.03.03-5** is resolved and closed.

**9.3.3.5 Post Combined License Activities**

There are no post COL activities related to this section.

### **9.3.3.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG–1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A, Section VI.B.1, all nuclear safety issues relating to the NRD system that were incorporated by reference have been resolved.

In addition, the staff compared the additional supplements within the application to the existing licensing basis the relevant NRC regulations and the acceptance criteria defined in NUREG-0800, Section 9.3.3, "Equipment and Floor Drainage System." The staff's review confirmed that the applicant has adequately addressed the supplemental information in accordance with Section 9.3.3 of NUREG–0800. The staff determined that the NRD system satisfies all NRC regulatory requirements.

### **9.3.4 Chemical and Volume Control System**

The ABWR does not include this system.

### **9.3.5 Standby Liquid Control System**

This section of the FSAR addresses the standby liquid control system (SLCS). Boiling-water reactor (BWR) plants include an SLCS that provides backup capability for reactivity control independent of the control rod drive system.

Section 9.3.5 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.3.5, "Standby Liquid Control System," of the ABWR DCD, Revision 4, referenced in 10 CFR Part 52 Appendix A, with no departures or supplements. NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remains for review.<sup>1</sup> The staff's review confirmed that there is no outstanding information outside of the DCD related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A, Section VI.B.1, all nuclear safety issues relating to SLCS have been resolved.

### **9.3.6 Instrument Air System**

This section of the FSAR discusses "Instrument Air System," which provides dry, oil-free, compressed air for valve actuators, for nonsafety-related instrument control functions, and for general instrumentation and valve services outside the containment.

Section 9.3.6 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.3.6, "Instrument Air System," of the ABWR DCD Revision 4 referenced in 10 CFR Part 52 Appendix A, with no departures or supplements. NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remains for review.<sup>1</sup> The staff's review confirmed that there is no outstanding information outside of the DCD related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A Section VI.B.1, all nuclear safety issues relating to the instrument air system have been resolved.

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<sup>1</sup> See "*Finality of Referenced NRC Approvals*" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

### **9.3.7 Service Air System**

#### **9.3.7.1 Introduction**

This section of the FSAR discusses the service air system (SAS), which provides a continuous supply of service air for general plant use and serves as a backup to the instrument air system on an as-needed basis.

#### **9.3.7.2 Summary of Application**

Section 9.3.7 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.3.7 of the certified ABWR DCD, Revision 4 referenced in 10 CFR 52 Appendix A, with the following departure:

##### *Tier 2 Departure Not Requiring Prior NRC Approval*

- STD DEP 9.3-2 Breathing Air System

This departure adds a stand-alone breathing air system to the SAS.

#### **9.3.7.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements of the Commission regulations for the SAS, and the associated acceptance criteria, are in Section 9.3.1 of NUREG–0800.

.In accordance with Section VIII, “Processes for Changes and Departures,” of, “Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor,” the applicant identifies one Tier 2 departure not requiring prior NRC approval. This departure is subject to the requirements of 10 CFR 52 Appendix A Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

#### **9.3.7.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.3.7 of the generic DCD for the ABWR design. The staff reviewed Section 9.3.7 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

##### *Tier 2 Departure Not Requiring Prior NRC Approval*

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<sup>1</sup> See “*Finality of Referenced NRC Approvals*” in SER Section 1.1.3 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

- STD DEP 9.3.2 Breathing Air System

NRC staff reviewed STD DEP 9.3.2, which adds a stand-alone breathing air system to the SAS.

The applicant's evaluation in accordance with Item B.5 of Section VIII of Appendix A determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it is reasonable that the departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

### ITAAC

Table 3.0-12 "Breathing Air System" provides an ITAAC in Part 9 of the STP COL application. The ITAAC requires the design to have one locked closed isolation valve inside and one locked closed isolation valve outside containment, and to ensure that the results of the pressure test of the ASME Code components of the BA system conform to the requirements in ASME Code Section III. The staff evaluated this information in Section 14.3 of this SER.

#### **9.3.7.5 Post Combined License Activities**

The applicant must satisfy the acceptance criteria in site specific ITAAC described in Table 3.0-12 in Part 9 of the COL application.

#### **9.3.7.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the SAS that were incorporated by reference have been resolved.

The staff found it reasonable that the identified Tier 2 departure is characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5.

Therefore, the staff's review confirmed that the applicant has adequately addressed the relevant information relating to the SAS.

### **9.3.8 Radioactive Drain Transfer System**

#### **9.3.8.1 Introduction**

This FSAR section describes the ability of the radioactive drain transfer system (DTS) to ensure that waste liquids, valve and pump leakoffs, and component drains and vents are directed to the proper area for processing. The NRC staff's evaluation of the applicant's request for a COL in this section addresses the radioactive DTS.

### **9.3.8.2 Summary of Application**

Section 9.3.8 of the STP COL FSAR Revision 3 incorporates by reference Section 9.3.8 of the certified ABWR DCD, Revision 4, referenced in 10 CFR 52 Appendix A. In addition, in FSAR Sections 9.3.8 and 9.3.12, the applicant provides the following:

#### *Tier 2 Departure Not Requiring Prior NRC Approval*

- STD DEP 9.3-1 Radwaste Drain Materials

This departure replaces carbon steel piping in the radwaste collection system with stainless steel piping. In addition, the applicant provides the following in Subsection 9.3.8.2.3, "Component Description":

Drain system components are as follows:

1. Collection Piping —In all areas of potential radioactivity contamination, the collection system piping for the liquid system is of stainless steel for embedded and chemical drainage and for suspended drainage. Offsets in the piping are provided, where necessary, for radiation shielding. In general, the fabrication and installation of the piping provide for a uniform slope that causes gravity to flow to the appropriate sump. During construction, equipment drain piping is terminated not less than 5 cm above the finished floor or drain receiver at each location where the discharge from equipment is to be collected. The connections to the individual equipment are made after the equipment is installed in its proper location.

#### *COL License Information Item*

- COL License Information Item 9.15 Radioactive Drain Transfer System

This COL license information item addresses the COL license information item in ABWR DCD Subsection 9.3.12.4, "Radioactive Drain Transfer System," which instructs the COL applicant to provide P&IDs for the radioactive DTS.

### **9.3.8.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG-1503. In addition, the relevant requirements of the Commission's regulations for the radioactive drain transfer system, and the associated acceptance criteria for reviewing COL license information, are in Section 9.3.3 of NUREG-0800.

In accordance with Section VIII, "Processes for Changes and Departures," of "Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor," the applicant identifies one Tier 2 departure not requiring prior NRC approval. This departure is subject to the requirements of 10 CFR 52 Appendix A, Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.



drawings whether motor-operated valve (MOV) 006 and MOV 007 in Sheet 1 of FSAR Figure 9.3-11 are containment isolation valves, or determine their safety class and quality group according to the notes in the P&IDs.

ABWR DCD Tier 2 Subsection 9.3.8.1.1, "Safety Design Bases," states that the radioactive drain transfer collection piping shall be non-nuclear safety class and Quality Group D, with the exception of the containment penetrations and piping in the drywell, which should be Seismic Category I and Quality Group B.

In part 1 of **RAI 09.03.03-1 (eRAI 103)**, the staff asked the applicant to clarify whether MOV 006 and MOV 007 in Sheet 1 of FSAR Revision 1, Figure 9.3 11, are containment isolation valves.

The applicant's response to part 1 of **RAI 09.03.03-1** dated June 12, 2008 (ML081710126), states that the valves numbered as MOV 0006 and MOV 0007 in Sheet 1 of Figure 9.3.11 are containment isolation valves. Sheet 5 of Figure 9.3.11 in the current FSAR revision incorrectly shows the containment isolation valves as ball valves (numbered 0057 and 0065). The applicant agrees to correct Sheet 5 in the next FSAR revision to show that both valves are motor-operated isolation valves.

In part 2 of **RAI 09.03.03-1 (eRAI 103)**, the staff indicates that given the low quality/resolution of the drawings, the staff was unable to verify the designations of Seismic Category 1 and Quality Group B portions of the system. In addition, the staff noted inconsistencies between FSAR Revision 2 Figure 9.3-11 and ABWR DCD Tier 2 Figure 1.7-1, "Piping and Instrumentation Diagram Symbols." For example, the piping identification format does not follow the convention described in Note 10 in Figure 1.7-1. Also, in Sheets 13, 15, and 17 of Figure 9.3-11, the symbols for some check valves are inconsistent with those of Note 6 in Figure 1.7-1.

The applicant's response to part 2 of **RAI 09.03.03-1** dated June 12, 2008 (ML081710126), states that the FSAR will be revised to provide P&IDs with a higher resolution and legible symbols that will be consistent with ABWR DCD Figure 1.7-1.

The staff reviewed the applicant's RAI response and determined that the applicant has provided sufficient information to satisfy GDC 2 criteria, as it relates to the capability of the safety-related system portions of the radioactive DTS to withstand the effects of natural phenomena. Therefore, **RAI 09.03.03-1** is resolved. The incorporation of these proposed FSAR markups into the next FSAR revision is being tracked as **Confirmatory Item 09.03.03-01**.

Upon reviewing Revision 2 of the FSAR, the staff was unable to confirm that the radioactive DTS meets the GDC 4 criteria. To meet GDC 4, the applicant needs to demonstrate the capability of important safety equipment to withstand the effects of and to be compatible with the environmental conditions (e.g., flooding) of normal operation, maintenance, testing, and postulated accidents. The FSAR needs to demonstrate that the radioactive DTS is capable of mitigating flood conditions that could adversely affect SSCs important to safety. In ABWR DCD Tier 2 Subsection 9.3.8.1.1, "Safety Design Bases," Item 5(a) states that backflow check valves should be included in the emergency core cooling system (ECCS) equipment room sumps. Item 5(b) states that floor drain piping in each divisional area of the ECCS pump rooms and in the control building shall be arranged so that flooding or backflow in one quadrant will not adversely affect other quadrants. However, the staff was unable to locate the ECCS equipment room sumps and associated check valves for each individual ECCS pump room in FSAR Figure

9.3-11. The staff issued **RAI 09.03.03-2 (eRAI 103)** requesting the applicant to provide P&IDs showing the check valves and sumps for each ECCS equipment room.

The applicant's response to **RAI 09.03.03-2** in a letter dated June 12, 2008 (ML081710126), states that the drains from ECCS equipment rooms A, B, and C are collected in the individual high conductivity waste (HCW) sumps located in each room. The sumps are HCW Sump 4A on Sheet 6 of Figure 9.3-11 and 4B and 4C on Sheet 7 of Figure 9.3-11. The sump pump is actuated on a high-water level signal to prevent flooding. The suction line of each of the relevant sump pumps has a check valve to prevent backflow. The check valve is located in the HCW sump in the individual ECCS equipment room. The applicant also states that Figure 9.3-11 will be revised accordingly in the next FSAR revision.

After reviewing the applicant's response, the staff determined that the applicant has provided sufficient information to satisfy GDC 4, as it relates to the capability of the system to withstand the effects of environmental conditions by preventing flooding that could adversely affect safety-related SSCs. Therefore, **RAI 09.03.03-2** is resolved. The incorporation of the proposed FSAR markup into the next revision of the FSAR is being tracked as **Confirmatory Item 09.03.03-02**.

#### **9.3.8.5 Post Combined License Activities**

There are no post COL activities related to this section.

#### **9.3.8.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information relating to the radioactive DTS. With the exception of **Confirmatory Items 09.03.03-01 and 09.03.03-02**, no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A, Section VI.B.1, all nuclear safety issues relating to the radioactive DTS that were incorporated by reference have been resolved.

In addition, the staff compared the standard departure and the additional COL license information in the application to the existing licensing basis and the relevant NRC regulations and acceptance criteria defined in NUREG-0800, Section 9.3.3, "Equipment and Floor Drainage System." The staff's review confirmed that the applicant has adequately addressed the COL license information item, and found it reasonable that the identified Tier 2 departure is characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5. However, as a result of **Confirmatory Items 09.03.03-01, and 09.03.03-02**, the staff was unable to finalize the conclusions relating to the radioactive DTS, in accordance with the NRC requirements.

#### **9.3.9 Hydrogen Water Chemistry System**

##### **9.3.9.1 Introduction**

ABWR DCD Section 9.3.9 addresses information related to the ABWR hydrogen water chemistry system (HWCS).

### **9.3.9.2 Summary of Application**

Section 9.3.9 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.3.9 of the certified ABWR DCD, Revision 4, referenced in 10 CFR Part 52, Appendix A.

In addition, in FSAR Section 9.3.9, the applicant provides the following:

#### **Tier 2 Departure Not Requiring Prior NRC Approval**

- STP DEP 1.1-2 Dual Units at STP 3 & 4

The applicant states that both hydrogen and oxygen supply systems will be site-dependent, and makes an editorial deletion to clarify the meaning of the sentence, in Subsection 9.3.9.2 of the COL FSAR.

### **9.3.9.3 Regulatory Basis**

The regulatory basis for the staff's evaluation of the ABWR HWCS is in Section 9.3.9 of NUREG-1503. There is no regulatory guidance in the SRP that directly applies to the HWCS review.

The applicable industry requirements for the HWCS that are endorsed by the NRC are as follows:

- Electric Power Research Institute (EPRI), "BWR Hydrogen Water Chemistry Guidelines," EPRI Report NP-4947-SR
- EPRI, "Guidelines for Permanent BWR Hydrogen Water Chemistry Installations," EPRI Report NP-5283-SR-A

In accordance with Section VIII, "Processes for Changes and Departures," of "Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor," the applicant identifies a Tier 2 departure. This departure does not require prior NRC approval and is subject to the requirements of Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

### **9.3.9.4 Technical Evaluation**

As documented in NUREG-1503, NRC staff reviewed and approved Section 9.3.9 of the certified ABWR DCD. The staff reviewed Section 9.3.9 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

### Tier 2 Departure Not Requiring Prior NRC Approval

- STP DEP 1.1-2 Dual Units at STP 3 & 4

The HWCS is composed of hydrogen and oxygen supply systems that inject hydrogen into the feedwater and oxygen into the offgas. Several monitoring systems track the effectiveness of the HWCS. The ABWR DCD requires the HWCS to utilize the guidance in the EPRI NP-4947-SR Report, which provides guidelines for operating the HWCS and for safely storing and handling hydrogen. Although the HWCS is nonsafety-related, given the potential for hydrogen combustion or detonation, the requirements state that the handling of hydrogen should be safe, reliable, and consistent with the requirements for using hydrogen gas. The ABWR DCD requires HWCS installations to include the capability of storing and handling hydrogen in accordance with the guidelines in the EPRI NP-5283-SR-A Report.

The applicant's evaluation in accordance with 10 CFR Part 52 Appendix A, Section VIII Item B.5 determined that this departure does not require prior NRC approval. NRC staff reviewed the Departures Report regarding this departure and Section 9.3.9 of the COL FSAR. The staff notes that the applicant does not indicate whether the HWCS will be used. The staff was unable to determine whether it is reasonable for this departure not to require prior NRC approval. Therefore, the staff issued **RAI 01.10 (eRAI 2522)** requesting the applicant to confirm whether the HWCS will be utilized. The applicant's response in a letter dated August 12, 2009 (ML092260197), states that the HWCS will be installed at STP Units 3 and 4. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the certified ABWR DCD is subject to NRC inspections. Therefore, **RAI 01.10** is resolved and closed.

#### **9.3.9.5 Post Combined License Activities**

There are no post COL activities related to this section.

#### **9.3.9.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the HWCS that were incorporated by reference have been resolved.

The staff found it reasonable that the identified Tier 2 departure is characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5.

#### **9.3.10 Oxygen Injection System**

The OIS is designed to add sufficient oxygen (20 to 50 ppb) for reducing corrosion and reducing the release of corrosion products into the condensate and feedwater systems. The EPRI NP-5283-SR-A Report specifies the requirements for the design, operation, maintenance, surveillance, and testing of the oxygen storage facility. The ABWR DCD requires every OIS installation to meet these requirements.

Section 9.3.10 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.3.10, "Oxygen Injection System," of the ABWR DCD, Revision 4, referenced in 10 CFR Part 52 Appendix A, with no departures or supplements. NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remains for review.<sup>1</sup> The staff's review confirmed that there is no outstanding information outside of the DCD related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A, Section VI.B.1, all nuclear safety issues relating to Oxygen Injection System have been resolved.

### **9.3.11 Zinc Injection System**

This section of the SER addresses the zinc injection system (ZIS).

#### **9.3.11.1 Summary of Application**

Section 9.3.11 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.3.11 of the certified ABWR DCD, with no departures or supplements.

#### **9.3.11.2 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG-1503. There is no regulatory guidance in the SRP that directly applies to the ZIS review.

#### **9.3.11.3 Technical Evaluation**

As documented in NUREG-1503, NRC staff reviewed and approved Section 9.3.11 of the certified ABWR DCD. The staff reviewed Section 9.3.11 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>2</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

Controlling the build-up of radiation in reactor systems is a concern in BWR plants. Laboratory testing and plant experience have shown that the presence of trace amounts of soluble zinc in reactor water reduces cobalt-60 (<sup>60</sup>Co) build-up in the corrosion films on primary system piping and components.

Provisions in the ABWR DCD permit the installation of a system for adding a zinc solution to the feedwater, but it wasn't clear in the COL FSAR whether the ZIS will be installed. Therefore, the staff issued **RAI 01.11** (eRAI 2780), requesting the applicant to clarify and confirm whether the ZIS will be utilized. The applicant's response to **RAI 01.11** (eRAI 2780) dated August 12, 2009 (ML092260197), clarifies that the ZIS will not be installed. Instead, the applicant will install the piping connections necessary to connect a ZIS in case operational experience in STP Units 3

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

<sup>2</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

and 4 indicate that injecting zinc will be beneficial. The staff found the applicant's response to **RAI 01.11** acceptable.

#### **9.3.11.4 *Post Combined License Activities***

There are no post COL activities related to this section.

#### **9.3.11.5 *Conclusion***

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the ZIS that were incorporated by reference have been resolved.

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

### **9.4.1 Control Building HVAC (Related to RG 1.206, Chapter C.I.9.4.1, “Control Room Area Ventilation System”)**

#### **9.4.1.1 Introduction**

The control building HVAC system is divided into two separate systems: (1) one HVAC system for the main control area envelope within two floors, and (2) one HVAC system for safety-related electrical and RCW heat exchange equipment.

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

Section 9.4.1 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.4.1 of the certified ABWR DCD Revision 4 referenced in 10 CFR 52, Appendix A. In addition, in Section 9.4.1, the applicant provides the following:

##### *Tier 2 Departures Not Requiring Prior NRC Approval*

- STD DEP 9.4-2 Control Building HVAC System

This standard departure changes the design of the smoke removal mode of operation of the control building HVAC system, as described in FSAR Subsections 6.4.4.2, 9.4.1.1.4, and 9.5.1.1.6. This change adds a main air supply duct bypass line around the control room AHU. When the recirculation damper is closed and the damper in the bypass duct around the ACU is opened, the air exhaust and supply are balanced. This balance means that the smoke is exhausted and is therefore not transported to other areas of the control building.

- STD DEP 9.4-6 Control Building HVAC System

This departure describes a proposed design change to install one flow switch on the discharge side of each of the four fans in the two redundant EFUs. As a result, a two-out-of-two logic signal is required to automatically initiate a switchover to the standby division.

- STD DEP 9.4-7 Control Building HVAC System

This standard departure modifies the design of the control building annex HVAC system to accommodate the relocation of motor generator (MG) sets from the control building to the control building annex. This modification changes the control building annex HVAC design to provide appropriate ventilation, filtering, cooling, and heating of the MG set rooms in the control building annex.

#### **9.4.1.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements of the Commission regulations for the control building HVAC and the associated acceptance criteria are in Section 9.4.1 of NUREG–0800.

In addition, in accordance with Section VIII, “Processes for Changes and Departures,” of, “Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor,”

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the applicant identifies Tier 2 departures. Tier 2 departures not requiring prior NRC approval are subject to the requirements of 10 CFR 52 Appendix A Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

#### **9.4.1.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.4.1 of the certified ABWR DCD. The staff reviewed Section 9.4.1 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

##### *Tier 2 Departures Not Requiring Prior NRC Approval*

- STD DEP 9.4-2 Control Building HVAC System
- STD DEP 9.4-6 Control Building HVAC System
- STD DEP 9.4-7 Control Building HVAC System

The applicant’s evaluation, in accordance with Item B.5 of Section VIII of Appendix A, determined that these departures do not require prior NRC approval. The staff reviewed the Departures Report regarding these departures, and was unable to determine whether it is reasonable for these departures to not require prior NRC approval. Therefore, the staff issued **RAI 09.04.01-1 (eRAI 3108)** requesting the applicant to address potential contamination issues in the HVAC systems in order to meet the objectives of 10 CFR part 20.1406. The staff also asked the applicant about the FSAR provisions for monitoring, collecting, and controlling any contaminated condensate and gaseous effluents that may form at the coolers or be carried through all of the underground HVAC ducts and piping. The applicant’s response to **RAI 09.04.01-1** dated September 8, 2009 (ML092530407), states that the ABWR design directs condensate from the cooling coils of the ventilation systems that are expected to be contaminated to floor drains associated with the radioactive drain system. For STP Units 3 and 4, the condensate drain from the control room area HVAC system cooling coils is non-contaminated and is directed to the non-radioactive drain system. There are no underground HVAC ducts or piping in STP Units 3 and 4. Both the radioactive and non-radioactive drain systems feature monitored effluent streams to meet 10 CFR 20.1406, in accordance with RG 4.21. The staff found this response acceptable, and **RAI 09.04.01-1** is resolved.

Based on the additional information in the applicant’s response, the staff found it reasonable that the departures do not require prior NRC approval. The applicant’s process for evaluating departures and other changes to the DCD is subject to NRC inspections.

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<sup>1</sup> See “Finality of Referenced NRC Approvals” in SER Section 1.1.3 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification

#### **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's finding related to information incorporated by reference is in NUREG–1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A Section VI.B.1, all nuclear safety issues relating to the control building HVAC system that were incorporated by reference have been resolved.

In addition, the applicant identifies three departures not requiring prior NRC approval. The staff found it reasonable that these departures are adequately characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5. In conclusion, the applicant has provided sufficient information to satisfy 10 CFR 52 Appendix A, Section VIII.B.5.

#### **9.4.2 Spent Fuel Pool Area HVAC System (Related to RG 1.206, Section 9.4.2, "Spent Fuel Pool Area Ventilation System")**

Section 9.4.2 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.4.2, "Spent Fuel Pool Area HVAC System," of the ABWR DCD Revision 4 referenced in 10 CFR Part 52 Appendix A, with no departures or supplements. Section 9.4.2 of the ABWR DCD states that the spent fuel pool area HVAC system is part of the reactor building secondary containment HVAC system described in Subsection 9.4.5.1. NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remains for review.<sup>1</sup> The staff's review confirmed that there is no outstanding information outside of the DCD related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A Section VI.B.1, all nuclear safety issues relating to the spent fuel pool area HVAC system have been resolved.

#### **9.4.3 Auxiliary Area HVAC System (Related to RG 1.206, Section C.I.9.4.3, "Auxiliary and Radwaste Area Ventilation System")**

Section 9.4.3 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.4.3, "Auxiliary Area HVAC System," of the ABWR DCD Revision 4 referenced in 10 CFR Part 52 Appendix A, with no departures or supplements. Section 9.4.3 of the ABWR DCD states that the auxiliary area HVAC system is part of the reactor building secondary containment HVAC system described in Subsection 9.4.5.1. NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remains for review.<sup>1</sup> The staff's review confirmed that there is no outstanding information outside of the DCD related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A Section VI.B.1, all nuclear safety issues relating to the auxiliary area HVAC system have been resolved.

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

#### **9.4.4 Turbine Island HVAC System (Related to RG 1.206, Section C.I.9.4.4, “Turbine Building Area Ventilation System”)**

##### **9.4.4.1 Introduction**

The turbine island HVAC system consists of the turbine building HVAC system and the electrical building HVAC system.

##### **9.4.4.2 Summary of Application**

Section 9.4.4 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.4.4 of ABWR DCD Revision 4 referenced in 10 CFR 52, Appendix A. In addition, in COL FSAR Section 9.4.4, the applicant provides the following:

##### *Tier 2 Departures Not Requiring Prior NRC Approval*

- STD DEP 9.4-4 Turbine Island HVAC System

This standard departure revises the design of the turbine island HVAC system cooling/heating load and flow rate to accommodate the changes in the turbine building general arrangement and in the systems located in the turbine building. Local chilled-water unit coolers and electric unit heaters are installed in high-load areas as a result of the cooling/heating load recalculation for the revised turbine building general arrangement and offgas system requirements.

This departure also changes the turbine island HVAC subsystem name in Section 9.4 from “Electrical Building (E/B) HVAC System” to “Turbine Building Electrical Equipment Areas (EEA) HVAC System.” This name change signifies a nonradioactive-controlled area of the turbine building where nonsafety-related electrical equipment is installed. The turbine building HVAC system and the turbine building electrical equipment areas (EEAs) HVAC system do not serve or support any safety function and have no safety design bases.

- STD DEP 9.4-9 Turbine Building HVAC System

This standard departure revises the turbine building HVAC design room temperature limits, system air flow, equipment layout, and main heating coil. The minimum air temperature in the turbine building is reduced from 15 °C to 10 °C; and the maximum air temperatures in the moisture separator compartment and steam tunnel area are increased from 49 °C to 60 °C. The departure changes the turbine building HVAC system from a recirculating air flow to a once-through supply of filtered and tempered air, thus minimizing contamination/exposure in controlled areas of the turbine building during all modes of normal plant operation. The departure redesigns this system to direct airflow from areas of low-potential radioactivity to areas of high-potential radioactivity, with independent ventilation to the EEAs. The turbine building HVAC main heating coil is changed from a hot-water coil to an electric-heater coil. Also, the ABWR DCD certified the location of the turbine building HVAC equipment rooms on two floors, whereas this departure locates those rooms on three floors.

### 9.4.4.3 *Regulatory Basis*

The regulatory basis for the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements of the Commission’s regulations for the turbine island HVAC system and the associated acceptance criteria are in Section 9.4.4 of NUREG–0800.

In accordance with Section VIII, “Processes for Changes and Departures,” of, “Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor,” the applicant identifies Tier 2 departures. Tier 2 departures not requiring prior NRC approval are subject to the requirements of 10 CFR 52 Appendix A Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

### 9.4.4.4 *Technical Evaluation*

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.4.4 of the certified ABWR DCD. The staff reviewed Section 9.4.4 of the STP Units 3 and 4 COL FSAR and checked the ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the relevant information related to the turbine island HVAC system.

The staff reviewed the information in the COL FSAR:

#### *Tier 2 Departures Not Requiring Prior NRC Approval*

- STD DEP 9.4-9 Turbine Building HVAC System

The applicant’s evaluation, in accordance with Item B.5 of Section VIII of Appendix A, determined that this departure does not require prior NRC approval. The applicant’s process for evaluating departures and other changes to the DCD is subject to NRC inspections.

STD DEP 9.4-9 modifies the Turbine Building HVAC design from a recirculating air flow system to a once-through system supplying filtered and tempered air, in order to minimize contamination/exposure for controlled areas inside the Turbine Building during all modes of normal plant operation. The departure also increases the maximum air temperature in the moisture separator compartments and the steam tunnel area from 49 °C (120.2 °F) to 60 °C (140 °F). In the Departure Report (Part 7 of the COL application), there is no discussion of the potential impact of this departure on the operational dose limits for the general public, radiation monitoring, heat stress, and equipment qualification. Therefore, the NRC staff conducted an audit of the STP VIII.B.5.b screening process to determine whether the applicant has performed an adequate evaluation to meet the requirements in 10CFR Part 52 Appendix A, Section VIII.B.5.b. The staff’s audit findings include the following:

- The applicant needs to furnish an analysis demonstrating that changing the recirculating HVAC system to a once-through system will not result in an increase in the operational dose to individual members of the public and will meet the 10 CFR Part 20 dose limits. The main

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<sup>1</sup> See “*Finality of Referenced NRC Approvals*” in SER Section 1.1.3 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.



#### **9.4.4.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG–1503. The staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the relevant information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A, Section VI.B.1, all nuclear safety issues relating to the turbine island HVAC system that were incorporated by reference have been resolved.

The staff found it reasonable that the identified Tier 2 departures are characterized as not requiring prior NRC approval, per 10 CFR 52 Appendix A, Section VIII.B.5. In conclusion, the applicant has provided sufficient information to satisfy SRP Section 9.4.4 of NUREG–0800.

#### **9.4.5 Reactor Building HVAC System (Related to RG 1.206 Chapter C.I.9.4.5, “Engineered Safety Feature Ventilation System”)**

##### **9.4.5.1 Introduction**

The safety-related and nonsafety-related equipment areas of the reactor building (R/B) are served by the reactor building HVAC system. This system is designed to provide an environment with a controlled temperature to insure the comfort and safety of plant personnel and the integrity of equipment and components. The reactor building HVAC system comprises the following subsystems:

- R/B Secondary Containment HVAC System
- R/B Safety-Related Equipment HVAC System
- R/B Nonsafety-Related Equipment HVAC System
- R/B Safety-Related Electrical Equipment HVAC System
- R/B Safety-Related Diesel Generator HVAC System
- R/B Primary Containment Supply/Exhaust System
- R/B Main Steam Tunnel HVAC System
- R/B Reactor Internal Pump ASD HVAC System

##### **9.4.5.2 Summary of Application**

Section 9.4.5 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.4.5 of the certified ABWR DCD Revision 4 referenced in 10 CFR 52, Appendix A. In addition, in FSAR Section 9.4.5, the applicant provides the following:

##### Tier 1 Departures

- STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

This standard departure eliminates the hydrogen recombinder requirements of the certified ABWR design. As a result, the ABWR flammability control system (FCS), which consists of two redundant hydrogen recombiners, is eliminated and its support systems are modified or eliminated. The departure is based on 10 CFR 50.44, “Combustible gas control for nuclear power reactors,” which was amended after the issuance of the design certification for the ABWR. The amended 10 CFR 50.44 eliminates the requirements for hydrogen control systems to mitigate a design-basis LOCA hydrogen release. Consequently, the containment hydrogen

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COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the relevant information related to the reactor building HVAC system.

The staff reviewed the information in the COL FSAR:

Tier 1 Departures

- STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

NRC staff reviewed this proposed standard departure with respect to Commission rules and regulations. The evaluation of the departure per Section VIII.A.4 of Appendix A to 10 CFR 52 shows that the design complies with the revisions to the regulations made after the issuance of the design certification for the ABWR to control combustible gases. This proposed elimination of the hydrogen recombinder requirements of the certified ABWR design is in accordance with 10 CFR 50.44, which was amended after the issuance of the design certification for the ABWR. The staff's evaluation of the ability of the ABWR design to meet the requirements of 10 CFR 50.44 is in Section 6.2.5 of this FSER. As this is a standard departure applicable to all COL applicants referencing the ABWR DCD, no loss of standardization will result from the departure. The staff determined that the standard departure is consistent with Commission rules and regulations and has no adverse impact on public health and safety.

- STD DEP T1 2.15-2 Reactor Building Safety-Related Diesel Generator HVAC

The applicant's evaluation in accordance with Section VIII.A.4 of Appendix A to 10 CFR 52 determined that the proposed revision in this departure of the maximum temperature limit for the reactor building safety-related DG engine room—from 50 °C (122 °F) to 60 °C (140 °F) during the DG operation—does not affect the DG HVAC system or any safety-related equipment in the DG engine rooms. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

Because an increase in temperature from 50 °C (122 °F) to 60 °C (140 °F) could have an impact on the environmental qualification of safety-related electrical equipment, the staff issued **RAI 08.03.01-12 (eRAI 2389)** requesting the applicant to clarify the potential impact of the proposed changes on the DG engine room equipment qualifications. The applicant's response to this RAI states that the resolution of elevated temperature on equipment qualification will be addressed in Chapter 8.3. The resolution regarding the operator's safe entry into the DG room's high-temperature environment is being tracked by the issuance of **RAI 09.04.05-1 (eRAI 4544)**. The resolution of this RAI is **Open Item 09.04.05-1**.

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

### Tier 2 Departure Not Requiring Prior NRC Approval

- STP DEP 9.4-8 Reactor Building HVAC

The applicant's evaluation, in accordance with Item B.5 of Section VIII of Appendix A, determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it is reasonable that the departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

#### **9.4.5.5 Post Combined License Activities**

There are no post COL activities related to this section.

#### **9.4.5.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the relevant information relating to the reactor building HVAC system. However, as a result of **Open Item 09.04.05-1**, the staff was unable to finalize the conclusions relating to the reactor building, according to the NRC requirements.

#### **9.4.6 HVAC system, in accordance with the NRC requirements. Radwaste Building HVAC System (Related to RG 1.206 Section C.1.9.4.3, "Auxiliary and Radwaste Area Ventilation System")**

##### **9.4.6.1 Introduction**

The radwaste building HVAC system is designed to provide an environment with controlled temperature and airflow patterns, which will insure both the comfort and safety of plant personnel and the integrity of equipment and components. A positive static pressure, with respect to the balance of the building and the atmosphere is maintained in the radwaste control room. The radwaste building HVAC system has no safety-related function, as defined in Section 3.2. The failure of the system does not compromise any safety-related system or component and does not prevent a safe reactor shutdown. There are provisions incorporated to minimize the release of radioactive substances into the atmosphere and to prevent operator exposure.

##### **9.4.6.2 Summary of Application**

Section 9.4.6 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.4.6 of the certified ABWR DCD Revision 4 referenced in 10 CFR 52 Appendix A. In addition, in FSAR Section 9.4.6, the applicant provides the following:

### Tier 1 Departures

- STP DEP T1 5.0-1 Site Parameters

This site-specific departure proposes two changes to the design of the radwaste building HVAC system certified in the referenced ABWR DCD:

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departures not requiring prior NRC approval are subject to the requirements of 10 CFR 52 Appendix A Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

The regulatory basis for reviewing the COL license information item is in Section 9.4.3 of NUREG-0800.

#### **9.4.6.4 Technical Evaluation**

As documented in NUREG-1503, NRC staff reviewed and approved Section 9.4.6 of the certified ABWR DCD. The staff reviewed Section 9.4.6 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the relevant information related to the radwaste building HVAC system.

The staff reviewed the information in the COL FSAR:

##### Tier 1 Departure

- STP DEP T1 5.0-1 Site Parameters

The applicant's evaluation of this departure, in accordance with Section VIII.A.4 of Appendix A to 10 CFR 52, determined that the proposed revision of the outdoor design temperatures and the deletion of the indoor design temperatures do not affect the radwaste building HVAC systems certified in the referenced ABWR DCD or any safety-related equipment.

Based on the information in the Departures Report (Part 7 of the COL application), the NRC staff was not able to determine whether the applicant's findings are acceptable. Therefore, the staff issued **RAI 08.03.01-12 (eRAI 3112)** requesting the applicant to clarify the proposed revision of the outdoor design temperatures and the deletion of the indoor design temperatures. In a letter dated September 8, 2009 (ML092530407), the applicant's response to **RAI 08.03.01-12** points out that the discussion of summer and winter indoor design temperature conditions for the redesigned (STP) radwaste building HVAC system was relocated to under STD DEP 9.4-5 in COL application Part 2, Tier 2 Subsection 9.4.6.1.2. STD DEP 9.4-5 was proposed by the applicant to redesign the radwaste building HVAC system to STP site-specific outdoor ambient temperatures. The radwaste building HVAC system is nonsafety-related and using 1 percent outdoor exceedance temperatures to design nonsafety-related HVAC systems is in accordance with the standard industry practice. Therefore, similar to other nonsafety-related HVAC systems at STP, the radwaste building HVAC system design is also based on 1 percent exceedance temperature conditions. The staff found this response acceptable, and this RAI is resolved and closed.

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

Tier 2 Departure Not Requiring Prior NRC Approval

- STD DEP 9.4-5 Radwaste Building Ventilation

The applicant's evaluation in accordance with Item B.5 of Section VIII of Appendix A determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

COL License Information Item

- COL License Information Item 9.17 Radwaste Building HVAC System

NRC staff reviewed COL License Information Item 9.17, which is related to the "Radwaste Building HVAC System" included under Section 9.4.10 of the STP Units 3 and 4 COL FSAR.

Per COL License Information Item 9.17 in ABWR DCD Revision 4, the applicant has provided site-specific equipment lists and system flow rates to comply with RG 1.140 for the radwaste building HVAC system in Subsection 9.4.6.2 of the STP Units 3 and 4 COL FSAR.

**9.4.6.5 Post Combined License Activities**

There are no post COL activities related to this section.

**9.4.6.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. The staff reviewed the application and checked the ABWR DCD. The staff's review confirmed that the applicant has addressed the relevant information, and no outstanding information is expected to be addressed in the COL FSAR related to this subsection. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A, Section VI.B.1, all nuclear safety issues relating to the radwaste building HVAC system that were incorporated by reference have been resolved.

The staff found it reasonable that the identified departure is characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5.

In conclusion, the applicant has provided sufficient information to satisfy Section 9.4.3 of NUREG-0800. COL License Information Item 9.17 provides detailed equipment lists and system flow rates, and complies with the RG 1.140 for the radwaste building HVAC system, which the staff found acceptable.

**9.4.7 Diesel Generator Area Ventilation System**

The diesel generator building ventilation system is part of the reactor building ventilation system, which is reviewed in Section 9.4.5 of this SER.

## **9.4.8 Service Building HVAC System (Related to RG 1.206, Section C.I.9.4.3, “Auxiliary and Radwaste Area Ventilation System”)**

### **9.4.8.1 Introduction**

This system serves all areas within the service building including locker rooms; men and women’s changing rooms; the laundry room, lunchroom, and instrument repair room; HVAC equipment rooms; and the Technical Support Center (TSC). This system operates during all normal station conditions. The service building HVAC system consists of two subsystems: the clean area HVAC system and the controlled area HVAC system.

### **9.4.8.2 Summary of Application**

Section 9.4.8 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.4.8 of the certified ABWR DCD Revision 4 referenced in 10 CFR 52, Appendix A. In addition, in FSAR Section 9.4.8, the applicant provides the following:

#### Tier 2 Departures Not Requiring Prior NRC Approval

- STP DEP 9.4-1 Service Building HVAC System

This site-specific departure modifies the design of the service building HVAC system. The departure revises the outdoor air inlet monitoring instrumentation design by removing the provisions for toxic gas monitors and the TSC alarm for high toxic gas concentration. The toxic gas monitors and the TSC alarm were deleted from the design based on the site-specific evaluation of the onsite and offsite mobile and stationary sources of toxic gases and in accordance with RG 1.78, as described in FSAR Section 2.2S.

- STD DEP 9.4-3 Service Building HVAC System

This standard departure revises the service building HVAC system design by deleting the two subsystems and consolidating them into a single HVAC system that supplies air to both the clean area and the controlled area. This change also makes it possible to operate the service building HVAC system using power from the combustion turbine generator, which can be manually loaded by the operator during a loss of offsite power conditions. This departure allows the TSC and Operations Support Center (OSC) to be habitable under accident conditions.

#### COL License Information Item

- COL License Information Item 9.16 Service Building HVAC System

Details in this COL license information item include the P&ID, system flow rates, an equipment list, toxic gas protection requirements, and a description of radiation monitors at the supply air inlet (if any) for the service building HVAC system, including the TSC and OSC.

Figure 9.4-11 depicts the service building HVAC system P&ID. Flow rates and component capacities are listed in Tables 9.4-3, 9.4-4h, 9.4-7a, and 9.4-7b. Radiation monitors at the supply air inlet are shown in Figure 9.4-11 and are discussed in Subsection 9.4.8.2 (7c). As discussed in Section 2.2S.3, the applicant does not identify any hazardous chemicals with quantities exceeding the criteria of RG 1.78. There is no instrumentation to detect and alarm a

hazardous chemical release in the STP Units 3 and 4 vicinity and to isolate the service building clean area from such releases.

The applicant states that the service building clean area emergency filter unit complies with all applicable provisions of RG 1.140 Revision 2, Section C.

#### **9.4.8.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements of the Commission regulations for the service building HVAC system, and the associated acceptance criteria, are in Section 9.4.3 of NUREG–0800.

In addition, in accordance with Section VIII, “Processes for Changes and Departures,” of, “Appendix A to Part 52--Design Certification Rule for the ABWR Design,” the applicant identifies Tier 2 departures that do not require prior Commission approval. These departures are subject to the requirements of Section VIII, which are similar to the requirements in 10 CFR 50.59.

The regulatory basis for reviewing the COL license information items is in SRP Section 9.4.3.

#### **9.4.8.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.4.8 of the certified ABWR DCD. The staff reviewed Section 9.4.8 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the relevant information related to the service building HVAC system.

The staff reviewed the information in the COL FSAR:

##### *Tier 2 Departures Not Requiring Prior NRC Approval*

- STP DEP 9.4-1 Service Building HVAC System

The applicant’s evaluation, in accordance with the requirements in B.5.b of Section VIII of 10 CFR 52 Appendix A, determined that this departure does not require prior NRC approval. The applicant’s process for evaluating departures and other changes to the DCD is subject to NRC inspections.

In FSAR Section 6.4, COL License Information Item 6.8 (in Subsection 6.4.7.1) concludes that “Instrumentation to detect and alarm a hazardous chemical release in the STP 3 & 4 vicinity and to isolate the main control area envelope from such releases is not required based on analyses in Subsection 2.2S.3...” NRC staff does not have sufficient information to reach the same conclusion. The staff will reach a finding for the SER input in Section 6.4 of the STP Units 3 and 4 COL application. **Open Item 06.04-2** will track the staff’s review of the applicant’s analyses of the onsite and offsite mobile and stationary sources of toxic gases to justify the removal of the

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<sup>1</sup> See “Finality of Referenced NRC Approvals” in SER Section 1.1.3 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

service building HVAC system toxic gas monitors and the TSC alarms, in accordance with RG 1.78 and as described in FSAR Section 2.2S. STP DEP 9.4-1 also removes ITAAC in Part 9 Table 3.0-10, "HVAC System. The resolution of **Open Item 06.04-2** will also support the removal of the ITAAC. The toxic gas issue will be tracked and resolved under Chapter 6 of this SER.

- STD DEP 9.4-3 Service Building HVAC System

The applicant's evaluation in accordance with Item B.5 of Section VIII of Appendix A determined that this departure does not require prior NRC approval. NRC staff found it reasonable that the departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

#### COL License Information Item

- COL License Information Item 9.16 Service Building HVAC System

NRC staff reviewed COL License Information Item 9.16 related to the "Service Building HVAC System," which is included under Section 9.4.10 of the STP Units 3 and 4 COL FSAR.

Per COL License Information Item 9.16 in ABWR DCD Revision 4, the COL applicant provides a site-specific service building HVAC system P&ID, system flow rates, and component capacities. There are radiation monitors at the supply air inlet. The applicant also establishes that the service building clean area emergency filter unit complies with all applicable provisions of RG 1.140 Revision 2, Section C. The applicant's process for evaluating compliance and other changes to the DCD is subject to NRC inspections.

In Section 2.2S.3, the applicant identifies no hazardous chemicals with quantities exceeding the criteria of RG 1.78. As a result, there is no instrumentation to detect and alarm a hazardous chemical release in the STP Units 3 and 4 vicinity and to isolate the service building clean area from such releases. The staff's review of the applicant's decision is tracked in SER Section 6.4, in conjunction with the applicant's screening of hazardous materials in Section 2.2.

#### **9.4.8.5 Post Combined License Activities**

There are no post COL activities related to this section.

#### **9.4.8.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information relating to the service building HVAC system. However, as a result of the **Open Item 06.04-2**, the staff was unable to finalize the conclusions relating to the service building HVAC system, in accordance with the NRC requirements.

#### **9.4.9 Drywell Cooling System**

Section 9.4.9 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.4.9, "Drywell Cooling System," of the certified ABWR DCD Revision 4 referenced in 10 CFR Part 52

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Appendix A, with no departures or supplements. NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remains for review.<sup>1</sup> The staff's review confirmed that there is no outstanding information outside of the DCD related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A Section VI.B.1, all nuclear safety issues relating to the drywell cooling system have been resolved.

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<sup>1</sup> See "*Finality of Referenced NRC Approvals*" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

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## **9.5 Other Auxiliary Systems**

### **9.5.1 Fire Protection System (Related to RG 1.206 Section 9.5.1, “Fire Protection Program”)**

#### **9.5.1.1 Introduction**

This section of the FSAR addresses how the Fire Protection Program provides assurance, through a defense-in-depth philosophy, that the following NRC fire protection objectives are satisfied:

- To prevent fires from starting.
- To detect rapidly, control, and extinguish promptly those fires that do occur.
- To provide protection for SSCs important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant.

In addition, fire protection systems must be designed to assure that their failure (or inadvertent operation) does not significantly impair the safety capability of the SSCs important to safety to perform their safety functions.

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

Section 9.5.1 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.5.1 of the certified ABWR DCD referenced in 10 CFR Part 52, Appendix A. The COL FSAR also incorporates by reference Appendix 9A and Appendix 9B of the certified ABWR DCD. In addition, the applicant includes Appendix 9E, which covers certain administrative controls and procedures to address COL License Information Item 9.35.

The applicant identifies and addresses the following Fire Protection Program-related departures from the ABWR certified design:

#### **Tier 2 Departures Not Requiring Prior NRC Approval**

- STP DEP 1.1-2 Dual Units at STP 3 & 4

This departure addresses issues of applying the single unit ABWR certified design to a two unit plant, which can affect systems such as the supply of fire water.

- STP DEP 1.2-2 Turbine Building

This departure addresses design changes to the turbine building.

- STD DEP 9.2-2 Makeup Water Preparation System

This departure addresses design changes to the makeup water preparation system.

- STD DEP 9.4-2 Control Building HVAC System

This departure addresses design changes to the HVAC system in the Control Building.

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The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

- STP DEP 1.2-2 Turbine Building

This departure addresses the design changes associated with the turbine building. The changes include a different turbine generator, a different power generation heat sink, and the replacement of the medium voltage system with a dual voltage system in the turbine building. The turbine building will house safety-related equipment to include the condensate pump motor trip circuit breakers and instrumentation associated with the reactor protection system. Consequently, these design changes do not result in any increase in the frequency of a malfunction of an SSC important to safety.

The applicant's evaluation determined that this departure does not require prior NRC approval, in accordance with 10 CFR 52 Appendix A, Section VIII.B.5. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

- STD DEP 9.2-2 Makeup Water Preparation System

This departure addresses design changes that increase the flow and storage capacities of the makeup water preparation (MWP) system, a system that is not important to safety. The MWP system can provide makeup water to the fire protection system as needed. The MWP makeup water is not required to satisfy the fire protection water supply storage requirements that are already adequately designed to meet the guidance of RG 1.189. In addition, this design change adds demineralized water prover tanks and sulfuric acid chemical feed tanks to reduce fouling and scaling in the reverse osmosis filter membranes. In the rare event that the MWP system is used to provide temporary makeup water to the fire protection system, these tanks will provide an acceptable level of quality water.

The applicant's evaluation determined that this departure does not require prior NRC approval, in accordance with 10 CFR 52 Appendix A, Section VIII.B.5. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

- STD DEP 9.4-2 Control Building HVAC System

This departure addresses the standard design changes to the smoke removal mode of the HVAC system in the control building. FSAR Section 6.4.2, Subsection 9.4.1.1.4, and Subsection 9.5.1.1.6 describe the air supply bypass line and fire damper arrangement. This arrangement is required to satisfy an air balance during the smoke removal mode and to ensure that smoke does not migrate to other areas of the control building. This design change will still meet the applicable National Fire Protection Association (NFPA) codes and the guidance of RG 1.189, Revision 1. The applicant commits to not increasing adverse consequences for SSCs important to safety with this design change.

The applicant's evaluation determined that this departure does not require prior NRC approval, in accordance with 10 CFR 52 Appendix A, Section VIII.B.5. Within the review scope of this

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shutdown and for access and egress routes to and from all fire areas. Safe shutdown areas include those required to be manned if the control room must be evacuated.

2. The plant has a program for provision of sealed-beam battery-powered portable hand lights for emergency use by the fire brigade and other operations personnel required to achieve safe shutdown of the plant.
- COL License Information Item 9.24      High Energy Piping Penetration Seals

Specific information required to address COL License Information Item 9.24 includes design data verifying that the applicant will provide 3-hour, fire-rated penetration seals tested and assembled in accordance with a nationally recognized laboratory for all high-energy piping. For those situations where this will not be the case, STP will provide a statement identifying those conditions when such seals cannot be provided and what will be installed as a substitute. For any substitute installations, the detailed design demonstrates a completely equivalent construction to tested wall assemblies or to provide testing to verify an equivalent performance to tested wall assemblies. Equivalency will be determined by a qualified fire protection engineer utilizing such codes as ASTM E 814 and NFPA 251. This provision is acceptable under the guidance in RG 1.189, Revision 1.

- COL License Information Item 9.26      Fire Protection Program for Protection of Special Fire Hazards Exposing Areas Important to Safety

Specific information required to address COL License Information Item 9.26 includes the following areas that are outside of the ABWR Standard Plant design scope for the Fire Protection Program, which are included in the applicant's Fire Protection Program.

- Main transformer
- Equipment entry lock
- Fire protection pump house
- UHS

The applicant's Fire Protection Program complies with SRP Section 9.5.1, the ability to bring the plant to a safe shutdown condition following a complete fire burnout of a fire area/division, without the need for recovery.

- COL License Information Item 9.27      HVAC Pressure Calculations

The STP Units 3 and 4 HVAC systems are designed for a dual purpose of HVAC and smoke control. Specific information required to address COL License Information Item 9.27 includes pressure calculation guidance, commitments, and preoperational testing acceptance criteria of the smoke control mode of the HVAC systems that confirm the following smoke control features:

1. Venting of fire areas to prevent the undue buildup of pressure due to a fire via the HVAC system in the smoke removal mode.
2. Pressure control across the fire barriers to assure that any leakage goes into the fire area experiencing the fire, in accordance with NFPA 92A.

3. Pressure control and purge air supply to prevent the backflow of smoke and hot gases when fire barrier doors are kept open and accessible for manual fire suppression activities.
4. Augmented and directed clean air supply to provide a clean air path to the fire area for fire suppression personnel.
5. Smoke control by the HVAC system external to the fire area experiencing the fire.
6. Removing smoke and heat from the fire using exhaust fans and operating supply fans to provide clean, cool air via the HVAC system in the smoke removal mode.

The applicant will utilize UL-listed fire-dampers and smoke-dampers listed under UL 555 and UL 555S, respectively.

Because the detailed design of the HVAC system is not complete at this time, the applicant commits (COM 9.5-10) to confirm the above DCD features with calculations and testing before fuel loading. Refer to the discussion below on RAI 09.05.01-10 (eRAI 2482) for further information. This commitment is acceptable under the guidance in RG 1.189, Revision 1.

- COL Information Item 9.32 Identification of Chemicals

Specific information required to address COL License Information Item 9.32 includes protective features for liquid-insulated transformers and identification of the types and locations of hazardous chemicals. The fire prevention procedures for the STP Units 3 and 4 reactor and control buildings allow small quantities of chemicals to be stored in listed or approved containers for immediate use only. This storage will be reflected in the final fire hazards analysis. This analysis is acceptable under the guidance in RG 1.189, Revision 1.

- COL License Information Item 9.35 Fire-Related Administrative Controls

The applicant provides specific information in FSAR Appendix 9E to address this COL license information item and includes the following:

1. Control of combustible materials such as combustible/flammable liquids and gases, fire retardant treated wood, plastic materials, and dry ion exchange resins.
2. Transient combustible materials and general housekeeping, including health physics materials.
3. Open-flame and hot-work permits and cutting and welding operations.
4. Quality assurance with respect to fire protection system components, installation, maintenance, and operation.
5. Qualification of fire protection engineering personnel, fire brigade members, and maintenance and testing personnel for fire protection systems.
6. Instruction, training, and drills provided to fire brigade members.

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The evaluation of single and multiple spurious operations that could adversely impact post-fire safe shutdown will be performed in a manner that is consistent with the methodology of NEI 00-01, Revision 2 as modified by the guidance of RG 1.189 Revision 2 as it applies to Single and Multiple Spurious Operation Analysis.

The staff found the applicant's revised response acceptable because the applicant commits to evaluating multiple spurious actuations in their fire hazards analysis, and is in accordance with RG 1.189. The verification of the FSAR markup is being tracked as **Confirmatory Item 09.05.01-8**.

In addition to the spurious actuation analysis, **RAI 09.05.01-8 (eRAI 2482)** also addresses details of the Final Safe-Shutdown Analysis. Based on the ABWR plant layout and design in which redundant portions of safety-related systems are located in different fire areas, the ABWR design has taken an exclusionary approach in the DCD fire hazard analysis. Each fire area is characterized by the inclusion of safety-related equipment and, if safety-related equipment is included, to which safety division the equipment is assigned. This approach assumes that all equipment within a given area is damaged by fire but does not necessarily identify and address the potential spurious operation of equipment. Additionally, where equipment assigned to one safety division is located within an area assigned to a different safety division, the failure of that equipment is also considered and deemed acceptable, as described in DCD Section 9A.2.5 and Table 9A.5-2. This approach is consistent with NEI 00-01, Revision 2. The applicant responded in letters dated October 29, 2009, and supplemented on January 13, 2010 (ML093430301 and ML100141737, respectively) and April 5, 2010 (ML100980065).

In the April 5, 2010 (ML100980065) response, the applicant provides an FSAR markup page stating:

The evaluation of single and multiple spurious operations that could adversely impact post-fire safe shutdown will be performed in a manner that is consistent with the methodology of NEI 00-01, Revision 2 as modified by the guidance of RG 1.189 Revision 2 as it applies to Single and Multiple Spurious Operation Analysis.

The staff found the applicant's revised response acceptable because the applicant commits to evaluating post fire safe shutdown analysis using a method consistent with NEI 00-01, Revision 2, and is in accordance with RG 1.189. The verification of the FSAR markup is being tracked as **Confirmatory Item 09.05.01-8**.

In the responses to RAI 09.05.01-8, the applicant also commits to update the Fire Hazards Analysis to include the as-built information and safe shutdown analysis. The applicant considers the Fire Hazards Analysis as an element of the Fire Protection Program to be completed and implemented per FSAR Section 9E.8.6. The staff found the applicant's response acceptable because the applicant commits to updating the Fire Hazards Analysis based on as-built information. **RAI 09.05.01-8** also addresses the applicant's departure from the DCD digital I&C system design, where the applicant will be using a digital system other than the de-multiplexer type described in the ABWR DCD. The applicant explains that although the system will not be the same, the design basis will be the same, and there will therefore be no change to the fire protection design criteria and no change in the potential for spurious

actuations. The staff found the applicant's response to this RAI acceptable concerning this DCD departure.

**RAI 09.05.01-8** also asks the applicant to evaluate the potential for adverse effects of smoke on the electrical design and to include effects on the digital equipment. The applicant's response explains that the ABWR design will not allow smoke to migrate from the fire area of origin to any of the other divisions, thus preserving at least one division for a safe shutdown. The applicant claims that effects from smoke on equipment within the fire area of origin are handled the same as effects from a fire. Effectively, the smoke effects analysis will be bounded by the analysis for fire effects. The staff found the applicant's response to this RAI acceptable concerning adverse smoke effects on the safe shutdown of SSCs.

- RAI 09.05.01-2 Fire Water Supply

**RAI 09.05.01-2** (eRAI 2352) requests the applicant to clarify several details concerning the fire water supply design and maintenance. The applicant's response dated August 12, 2009 (ML092260197), provides the following clarifications:

1. Consistent with ABWR DCD (Tier 1) Section 2.15.6 and DCD and FSAR (Tier 2) Subsection 9.5.1.3.5, a total of two dedicated fire protection water supply storage tanks will be provided and shared between STP Units 3 and 4. The capability exists to use the fire protection water supply as a diverse alternative supply for the alternating current (AC) independent water addition system mode of the residual heat removal (RHR) system for reactor vessel injection or drywell sprays. However, the use of the fire protection water supply for this purpose would only be necessary in an unlikely and extreme event in which other redundant normal and alternate sources of reactor vessel cooling or drywell spray were required but not available. For normal operating and postulated accident conditions, use of the fire protection water supply for the AC-independent water addition system mode of the RHR system is not required and is not relied upon to ensure public health and safety. This is consistent with the guidance in RG 1.189, Revision 1.
2. The applicant's detailed design has not yet progressed to a point where the required specific capacity of the two fire protection water supply storage tanks can be determined. However, each of the two fire protection water supply storage tanks for Units 3 and 4 will have a minimum capacity of 1,140 m<sup>3</sup> (300,000 gallons). One of these tanks will hold a minimum reserve of 456 m<sup>3</sup> (120,000 gallons) for use by the seismic-qualified fire suppression systems for the reactor and control buildings. This is consistent with the guidance in RG 1.189, Revision 1.
3. The design basis for the capacity of each fire protection water storage tank is the maximum anticipated flow rate for a period of 2 hours but not less than 1140 m<sup>3</sup> (300,000 gallons). The maximum anticipated flow rate is conservatively based on 1893 liters/min (500 gpm) for manual hose streams plus the largest design demand of any sprinkler or deluge system as determined in accordance with NFPA 13, "Standard for the Installation of Sprinkler Systems," or NFPA 15, "Standard for Water Spray Fixed Systems for Fire Protection."

As required in ABWR DCD (Tier 2), Subsection 9.5.1.3.5, the design basis for the capacity of the passively reserved 456 m<sup>3</sup> (120,000 gallons) fire protection water supply is the flow rate for two manual hose streams for a period of 2 hours. The 456 m<sup>3</sup> (120,000 gallons) capacity bounds the water volume that would be pumped in 2 hours by the diesel driven

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pump and motor-driven pump, each supplying this design-basis minimum flow of 1893 liters/min (500 gpm). As required in ABWR DCD (Tier 1), Section 2.15.6, both the diesel-driven pump and motor-driven pump each independently supply a minimum flow of 1893 liters/min (500 gpm) at a pressure greater than 448.2 kPa (65 psi) at the most hydraulically remote hose connection in either the reactor or control building. This is consistent with the guidance in RG 1.189, Revision 1.

4. The normal water supply to the fire protection water storage tanks is filtered. Consistent with NFPA 13, "Standard for the Installation of Sprinkler Systems," Sections 15.1.5 and A15.1.5 (Annex A), the intention is to treat the fire protection water as necessary using an approved biocide. However, in the unlikely event that the normal water supply is unavailable or not capable of meeting flow rate demands, an alternate flow path will be available to supply unfiltered groundwater to the fire protection water storage tanks directly from the main well water header. This is consistent with the guidance in RG 1.189, Revision 1. Subsection 9.2.8.2 of the COL FSAR will be revised to state that the normal water supply to the fire protection water storage tanks is filtered water. Verification of this FSAR update is being tracked as **Confirmatory Item 09.05.01-2**.
5. The available water supply pumping capacity is considerably greater than the 2366 liters/min (625 gpm) required to fill either fire protection water supply tank in 8 hours or less. This is consistent with the guidance in RG 1.189, Revision 1.
6. The applicant does not intend to construct Units 3 and 4 with the fire protection water supply cross-connected with that of Units 1 and 2. In the event that the cross-connection and sharing of the two systems is pursued in the future, an engineering evaluation will be necessary to ensure an adequate isolation capability between the two systems. This evaluation also will also address potential impacts of the proposed cross-connection on the functional performance of both systems (including potential system degradation issues) to ensure that the change will not have an adverse impact on the respective fire protection water supplies. This is consistent with the guidance in RG 1.189, Revision 1.
7. STP Units 3 and 4 fire protection system hose threads and other appropriate threaded connections (hydrants, standpipes, fire department connections, etc.) will be compatible with the equipment used by the local offsite fire departments by using National Hose (NH) thread, also known as National Standard Thread (NST). This thread is also the same thread used in STP Units 1 and 2. This is consistent with the guidance in RG 1.189, Revision 1.
8. The fire protection system and component maintenance will be in accordance with applicable NFPA codes. This is consistent with the guidance in RG 1.189, Revision 1.

NRC staff found the applicant's responses to all of the questions in **RAI 09.05.01-2 (eRAI 2352)** regarding the fire water supply acceptable under the guidance in RG 1.189, Revision 1.

- RAI 09.05.01-3 Fire Brigade Communications

RAI 09.05.01-3 (eRAI 2352) addresses fire brigade communications. The applicant commits to meet the guidance in Regulatory Positions C.5.g(3) and (4) of BTP SPLB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants (formerly BTP CMEB 9.5-1)." The two-way radio system will be designed and installed with a sufficient number of repeaters/antennas to ensure that direct portable radio communication with the control room is possible from at least one

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location in each fire area identified in the final as-built fire hazards analysis. A dedicated radio communications channel will be available for fire brigade purposes. Essential communication system components, including fixed repeaters, power cables, and antenna will be protected from exposure to fire damage. In the event of direct fire damage to a repeater or antenna, a talk-around channel is provided on control base stations, mobile units, and hand-held portables. This allows limited direct unit-to-unit communication between control bases, mobile units, and portables that would permit, for example, personnel fighting a fire in an area that had lost direct communication with the control room to relay information to the control room via personnel outside of but adjacent to the affected fire area. Personnel outside of any affected fire area will always be in direct portable communication with the control room. NRC staff found this response acceptable under the guidance of RG 1.189, Revision 1.

Communication system planning and design have not yet progressed to a point where specific locations of telephone/maintenance stations/handsets have been determined. As a minimum, fire areas with safe shutdown equipment will be provided with a fixed telephone and all fire areas will have at least one sound-powered phone jack. The staff found this acceptable under the guidance of RG 1.189, Revision 1. The applicant has committed to revise COL FSAR Subsection 9.5.13.14 to reflect the STP Units 3 and 4 telephone system design. Verification of this FSAR update is being tracked as **Confirmatory Item 09.05.01-3**.

- RAI 09.05.01-4 Multi-Unit Fire Brigades

**RAI 09.05.01-4 (eRAI 2352)** addresses having a single fire brigade for all four units. FSAR Subsection 13.1.2.3 states that a single fire brigade consisting of at least five personnel will be shared among the four STP units. However, the applicant's response to **RAI 09.05.01-4** dated August 12, 2009 (ML092260197), allows for the possibility of using two separate brigade shifts—one for the existing units and another for the new units. The guidance in RG 1.189, Revision 1 allows for a single fire brigade for multi-unit sites as well as multiple brigades per site.

FSAR Subsection 13.1.1.1 states that each fire brigade shift will have one fire brigade leader plus two other members with safe shutdown systems training. In addition, the applicant commits to ensuring that the fire brigade duties for Units 1 and 2 will not preclude the ability to fully implement fire brigade duties for Units 3 and 4. It is acceptable for the applicant to have one fire brigade shift serving both designs (i.e., all four units). However, each fire brigade shift will have a minimum of three members fully knowledgeable about and trained for the equipment and design of Units 1 and 2, per RG 1.189 Revision 1. In addition, the brigade will have a minimum of three members fully knowledgeable about and trained for the equipment and design of Units 3 and 4, per RG 1.189, Revision 1. NRC staff found it acceptable for members of the fire brigade to possess the knowledge and training required for both designs.

- RAI 09.05.01-5 Operator Manual Actions

**RAI 09.05.01-5 (eRAI 2352)** addresses operator manual actions and identifies the appropriate guidance. The applicant's response to **RAI 09.05.01-5** dated August 12, 2009 (ML092260197), states that there are no operator manual actions currently credited for a post-fire safe shutdown. However, the applicant has deferred to the final as-built fire hazards analysis for a final determination of whether operator manual actions will be required for any fire scenarios. The applicant does not clarify in the response dated August 12, 2009 or in the FSAR the guidance that will be used to examine and implement any operator manual actions. In the letter dated April 5, 2010 (ML100980065), the applicant provides a supplemental response including FSAR

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markup in which the applicant commits to identifying operator manual actions not previously identified in the DCD in accordance with RG 1.189, Revision 1. In addition the applicant commits to utilizing the guidance provided in NUREG-1852 to demonstrate that the operator manual actions are feasible and reliable. Therefore the staff found this response acceptable in accordance with RG 1.189, Revision 1. Verification of the FSAR updates is being tracked as **Confirmatory Item 09.05.01-5**.

- RAI 09.05.01-9 Change Process License Condition

In **RAI 09.05.01-9 (eRAI 2482)** the staff requested the applicant to provide information on the change process for the Fire Protection Program in STP FSAR Section 9E.1.8. In the applicant's response dated October 29, 2009 (ML093430301), the applicants provided an FSAR markup in which they deleted the license condition for Fire Protection Program changes/code deviations. The staff found this response unacceptable because they have not provided a change process license condition for the Fire Protection Program. The staff issued **RAI 09.05.01-11** requesting the applicant to provide the change process license condition for the FPP. In the letter dated May 27, 2010 (ML101530167), the applicant provides a supplemental response including FSAR markup in which the applicant commits to evaluating changes to the STP Units 3 and 4 Fire Protection Program in accordance with 10 CFR 52.98(c). The staff finds this change process evaluation approach acceptable under the guidance of RG 1.189, Revision 1. Verification of this FSAR update is being tracked as Confirmatory Item 09.05.01-11.

- RAI 09.05.01-10 HVAC and Smoke Removal

**RAI 09.05.01-10 (eRAI 2482)** addresses HVAC systems including the smoke removal mode, the use of NFPA 92A methodology, and the preoperational testing requirements. In the applicant's response dated October 29, 2009 (ML093430301), the applicants provided an FSAR markup in which the applicant commits to use NFPA 92A for the proper design and testing of the smoke removal mode of the HVAC system. The staff found the information in this RAI response acceptable under the guidance of RG 1.189, Revision 1. Verification of this FSAR update is being tracked as **Confirmatory Item 09.05.01-10**.

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

The post-COL activities are identified in the preceding COL license information items, RAI response letters, and Section 13.4, "Milestone Implementation," of the COL FSAR.

ABWR DCD Tier 1 Table 2-3-16, Item 9 commits the applicant to provide an as-built review of the final fire hazards analysis. A post-fire safe-shutdown analysis will be performed based on final plant cable routing and equipment arrangement. This analysis will include verification that purchased components required for post-fire safe shutdown are not impacted by indirect effects of fire such as smoke migration from one fire area to another. The post-fire safe-shutdown analysis will include an evaluation of single and multiple spurious operations that could adversely impact post-fire safe shutdown performed in a manner that is consistent with the methodology of NEI 00-01, Revision 2 as modified by the guidance of RG 1.189 Revision 2 as it applies to Single and Multiple Spurious Operation Analysis.

ABWR DCD Tier 1, Section 2.15.6 commits the applicant to inspect and test the as-built fire protection systems. Inspections to be performed include the MCR alarms and displays for the fire protection systems, the fire detection and alarm systems including the power supplies, the

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foam-water extinguishing systems, basic fire protection system configurations, and the Fire Hazards Report. Tests to be performed include operational tests of the fire detection and alarm systems for all fire areas, verification of the minimum water supply flow of 1893 l/min (500 gpm) and pressure of 448.2 kPa (65 psi) for the reactor and control buildings, and verification of the rated flow and pressure of the fire water supply pumps. Analyses to be performed include the as-built fire protection system seismic analyses.

ABWR DCD Tier 2, Subsection 14.2.12.1.48 commits the applicant to numerous preoperational tests of the fire protection system.

STP FSAR Subsection 9.5.1.5 commits (COM 9.5-1 and COM 9.5-2) the applicant to make available before construction for NRC staff to review a final plan for implementing the Preoperational and Post-Operational Inspection and Testing Program of the fire protection system. The scope of items for inspection includes fire protection system equipment and active and passive components such as fire barriers, fire dampers, fire doors, and fire-rated penetration seals. Preoperational and post-operational inspections and tests will comply with the applicable NFPA codes and standards.

STP FSAR Subsection 9.5.13.2 commits (COM 9.5-4) the applicant to develop before fuel loading the plant communication procedures to be used during emergencies, including procedures from the remote shutdown station.

STP FSAR Subsection 9.5.13.10 commits (COM 9.5-10) the applicant to confirm before fuel loading the required HVAC design criteria and pressure calculations. Also, this subsection commits (COM 9.5-17) the applicant to perform before fuel loading the preoperational testing to verify the smoke removal performance of HVAC systems.

STP FSAR Subsection 9.5.13.15 commits the applicant to identify before fuel loading the type and locations of chemicals and other consumables in the final fire hazards analysis. Also, this subsection commits (COM 9.5-12) the applicant to provide for those fire areas using liquid insulated transformers, features that prevent the insulating liquid from becoming an unacceptable health hazard to workers.

STP FSAR Table 13.4S-1 commits the applicant to implement the Fire Protection Program implementation milestones, which are those Fire Protection Program elements required for receiving fuel and the remaining Fire Protection Program elements required for fuel loading.

STP Commitment 07-13926-1: HVAC differential pressures for the smoke removal will be determined per NFPA 92A Appendix A.

STP Commitment 07-13934-1: Preoperational testing will be determined per NFPA 92A, Chapter 4 to confirm the capability of the smoke control mode of the HVAC systems.

#### **9.5.1.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information relating to the fire protection system. With the exceptions of **Confirmatory Items 09.05.01-02, -3, -5, -8, -10, -11,** no outstanding information is expected to be addressed in the COL FSAR related to this

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section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the fire protection system that were incorporated by reference have been resolved.

The staff compared the application to the relevant NRC regulations, the acceptance criteria defined in NUREG-0800, Section 9.5.1 and other applicable NRC RGs. The staff found it reasonable that the identified Tier 2 departures are characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5. However, as a result of **confirmatory items described above**, the staff was unable to finalize the conclusions relating to the fire protection system, in accordance with the NRC regulations.

## **9.5.2 Communication Systems**

### **9.5.2.1 Introduction**

This section of the FSAR addresses the communication systems used in intraplant and plant-to-offsite communications during normal operation, transients, fire, accidents, off-normal phenomena, and security-related events except for the interface with the offsite emergency communication systems, which is addressed in Part 5, “Emergency Plan,” of the COL application.

### **9.5.2.2 Summary of Application**

Section 9.5.2 of STP Units 3 and 4 COL FSAR incorporates by reference Section 9.5.2 of the certified ABWR DCD referenced in 10 CFR Part 52 Appendix A.

In addition, the applicant provides the following:

#### *Tier 2 Departure Not Requiring NRC Approval*

- STD DEP 1.1-2 Dual Units at STP 3 and 4

The referenced ABWR DCD is based on a single unit site. However, STP Units 3 and 4 are a dual unit project on an existing site. Some supporting systems described in the certified DCD are single systems that support two or more units. The systems shared by STP Units 3 and 4 include the fire protection water supply system, common nonsafety-related communication systems, the makeup water preparation, the hydrogen gas storage facility, a common plant grounding grid, and the potable water system. In addition, STP Units 3 and 4 share the main cooling reservoir with existing STP Units 1 and 2.

#### *COL License Information Items*

The applicant provides additional information to address the COL License Information Items 9.19, 9.20, 9.28, 9.31, and 9.34.

- COL License Information Item 9.19 Use of Communication System in Emergencies

This COL license information item addresses the use of communication system in emergencies (FSAR Subsection 9.5.13.2). The applicant commits (COM 9.5-4) to develop “procedure(s) for maintenance and testing of the plant communication systems” before fuel loading.

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- COL License Information Item 9.20 Maintenance and Testing Procedure for Communication Equipment

This COL license information item addresses maintenance and testing procedures for communications equipment (FSAR Subsection 9.5.13.3). The applicant commits (COM 9.5-5) to develop “procedure(s) for maintenance and testing of the plant communication systems” before fuel loading.

- COL License Information Item 9.28 Plant Security Systems Criteria

This COL license information item addresses communication requirements for the plant security systems (FSAR Subsection 9.5.13.11).

- COL License Information Item 9.31 Portable and Fixed Emergency Communication Systems

This COL license information item addresses the portable and fixed emergency communications systems (FSAR Subsection 9.5.13.14).

- COL License Information Item 9.34 Sound-Powered Telephone Units

This COL license information item addresses the sound-powered telephone units (FSAR Subsection 9.5.13.17). The applicant commits (COM 9.5-15) to provide the “sound-powered telephone units” before fuel loading.

#### Interface Requirement

Subsection 9.5.2.6.3 of the ABWR DCD requires the COL applicant to specify the design and power supply requirements for portable and fixed emergency communication systems, which are discussed in FSAR Subsection 9.5.2.6.3.

The applicant provides information in FSAR Section 13.3, “Emergency Planning,” which refers to Part 5 of the COL application, “Emergency Plan,” which addresses the ABWR DCD Tier 1 Section 2.12.16 interface requirement for the offsite emergency communications system.

#### **9.5.2.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503.

In addition, the relevant requirements of the Commission’s regulations for the communications systems, and the associated acceptance criteria, are in Section 9.5.2 of NUREG–0800; 10 CFR 50 Appendix E, Part IV.E(9); 10 CFR 50.47(a)(8); 10 CFR 73.45(g)(4)(i); 10 CFR 73.46(f); 10 CFR 73.55(e); 10 CFR 73.55(f); and 10 CFR 52.80(a).

In addition, in accordance with Section VIII, “Processes for Changes and Departures,” of Appendix A to Part 52--Design Certification Rule for the ABWR Design, the applicant identifies one Tier 2 departure not requiring prior NRC approval. This departure is subject to the requirements of 10 CFR 52 Appendix A, Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.



be created consistent with the plant operating procedure development plan in FSAR Section 13.5.

Based on the above discussion, the staff found the applicant's approach to resolving this COL license information item acceptable.

- COL License Information Item 9.28 Plant Security System Criteria

Specific information from the applicant in FSAR Subsection 9.5.13.11 that addresses COL License Information Item 9.28 includes the following:

The design of the security system includes an evaluation of its impact on plant operation, testing, and maintenance. This evaluation assures that the security restrictions for access to equipment and plant regions are compatible with required operator actions during all operating and emergency modes of operation (i.e., loss of offsite power, access for fire protection, health physics, maintenance, testing, and local operator).

In addition, this evaluation assures that:

1. There is a limited number of areas within the Nuclear Island, such as high radiation areas or inside the inerted primary containment, where communication is not possible. The applicant has committed (COM 9.5-16) to evaluate the communications coverage from all areas of the nuclear island to the central and secondary alarm stations.
2. Portable security radios will not interfere with plant monitoring equipment.
3. Minimum isolation zone and protected area illumination capabilities cannot be defeated by sabotage actions outside of the protected area.
4. Electromagnetic interference from plant equipment startups or power transfers will not create nuisance alarms or trip security access control systems. ITAAC Item 12.d (other microprocessor-based, software controlled systems or equipment) in Table 3.4 of the ABWR DCD Tier 1 has been assigned to address the EMC issue.

Based on the above discussion, the staff found the applicant's approach to resolving this COL license information item acceptable.

- COL License Information Item 9.31 Portable and Fixed Emergency Communications Systems

Specific information from the applicant in FSAR Subsection 9.5.13.14 that address COL License Information Item 9.31 includes information to verify that BTP CMEB 9.5-1, Positions C.5.g(3) and C.5.g(4) are met. The proposed site-specific portable and fixed emergency communication systems include the following systems, special equipment, and communication lines:

- Telephone system
- Portable radio communications system
- Microwave system interface
- Public addressing paging/alarm system
- Maintenance jack system (DC/sound-powered)

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- Refueling communication system
- Operator communications panel consoles (OCP)
- Special service telephone lines

This evaluation finds that the site-specific portable and fixed emergency communication systems are designed so that at any time, there are adequate onsite and offsite portable and fixed emergency communication systems available for both normal and emergency conditions. The NRC staff found that the applicant has adequately addressed COL License Information Item 9.31 and the portable and fixed emergency communication systems are acceptable.

*COL License Information in DCD Subsection 9.5.2.6.3, Design and Power Supply Requirements for Portable and Fixed Emergency Communication Systems:*

The specific information from the applicant in FSAR Subsection 9.5.2.6.3 addresses the COL license information on design and power supply requirements for portable and fixed emergency communication systems. NRC staff reviewed the applicant's information and found it acceptable.

*Power Supplies for Power-Actuated Paging Communication Systems:*

Figure 9.5-2 of FSAR shows that both power supplies for the power-actuated paging communication systems are for normal use. According to Section IV.E(9) of Appendix E to 10 CFR Part 50, a backup power source is required for communication systems. NRC staff issued **RAI 09.05.02-1 (eRAI 2639)** requesting the applicant to provide the information on backup power. The applicant's response to **RAI 09.05.02-1** (ML091540278) includes modifying Figure 9.5-2, which is incorporated in FSAR Revision 3. The staff reviewed the revised Figure 9.5-2 and found it acceptable. Therefore, **RAI 09.05.02-1** is resolved and closed.

- COL License Information Item 9.34      Sound Powered Telephone Units

In FSAR Subsection 9.5.13.17, the applicant commits (COM 9.5-15) to provide before fuel loading sound-powered telephone units to be used in conjunction with the sound-powered telephone system described in ABWR DCD Subsection 9.5.2.2.2.

Based on the above discussion, the staff found the applicant's approach to resolving this COL license information item acceptable

*Interface Requirement*

The applicant provides specific information in Part 5 of the COL application to address interface requirement in ABWR DCD Tier 1 Section 2.12.16 for offsite emergency communications. In addition, Section 13.3C.6 provides details on offsite emergency communication. See Section 13.3C.6 of the SER for the evaluation of emergency communication.

**9.5.2.5      *Post Combined License Activities***

The applicant identifies the following commitment:

- Commitment (COM 9.5-4) – Develop procedure(s) prior to fuel load for use of the plant communication system in emergencies including from RSS in the event of a main control

room fire. These procedures will be developed consistent with the plant operating procedure development plan in FSAR Section 13.5.

- Commitment (COM 9.5-5) – Develop maintenance and testing procedures for the communications equipment prior to fuel load. The procedures will be created consistent with the plant operating procedure development plan in FSAR Section 13.5.
- Commitment (COM 9.5-15) – In FSAR Subsection 9.5.13.17 to providing sound-powered telephone units prior to fuel load to be used in conjunction with the sound-powered telephone system described in the ABWR DCD Subsection 9.5.2.2.2.
- Commitment (COM 9.5-16) – Evaluating the communications coverage from all areas of the nuclear island to the central alarm stations and secondary alarm stations (CAS/SAS).

### **9.5.2.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the communication systems that were incorporated by reference have been resolved.

In addition, the staff has compared the application to the relevant NRC regulations, the acceptance criteria defined in NUREG-0800, Section 9.5.2, and other NRC RGs. The staff found it reasonable that the identified Tier 2 departure is characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5. The staff's review concluded that the applicant has adequately addressed COL license information items 9.19, 9.20, 9.28, 9.31, and 9.34.

## **9.5.3 Lighting and Servicing Power Supply System**

### **9.5.3.1 Introduction**

This section of the FSAR addresses plant lighting, which is comprised of four independent lighting systems: (1) normal AC lighting system, (2) standby AC lighting system, (3) emergency DC lighting system, and (4) guide lamp lighting systems. The normal AC lighting system is non-Class 1E. The other three lighting systems are comprised of Class 1E (guide lamps only), associated, and non-Class 1E subsystems.

### **9.5.3.2 Summary of Application**

Section 9.5.3 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.5.3 of the ABWR DCD, Revision 4, referenced in 10 CFR Part 52 Appendix A. In addition, in FSAR Section 9.5.3, the applicant provides the following:

### Tier 2 Departures Not Requiring NRC Approval

- STD DEP 9.5-4 Lighting and Servicing Power Supply System

This departure changes mercury lamps to high-pressure sodium (HPS) wherever mercury lamps are being used.

- STD DEP Admin

This departure corrects a referenced subsection number.

### Supplemental Information

The applicant provides the following supplemental information detailing a description of the lighting and servicing power supply system at STP Units 3 and 4:

- Lighting and Servicing Power Supply System

The applicant, in Section 9.5.3, provides supplemental information regarding emergency lighting and the emergency lighting distribution system.

- General Design Bases

The applicant, in Subsection 9.5.3.1.1, provides supplemental information regarding lighting fixtures, control switches for lighting fixtures, and high-efficiency electronic ballasts.

- Normal (Non-Class 1E) Lighting

The applicant, in Subsection 9.5.3.2.1, provides supplemental information regarding yard lighting.

#### **9.5.3.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503.

NUREG–0800, Section 9.5.3 states that there is no GDC or RG that directly applies to the performance requirements for the lighting system. However, the plant's lighting system is used to support accident mitigation (e.g., Fire Protection Program) as well as safety-related maintenance and operating activities, and must have the capability to (1) provide adequate lighting during all plant operating conditions; (2) provide adequate emergency lighting during all plant operating conditions including fire, transient, and accident conditions; and (3) address the effect of the loss of all alternating current (ac) power (i.e., during a station blackout) on the emergency lighting system.

Additionally, NRC staff followed the guidance of Illuminating Engineering Society of North America (IESNA) Lighting Handbook, as related to systems design for illumination levels recommended for industrial facilities.

In addition, in accordance with Section VIII, "Processes for Changes and Departures," of, "Appendix A to Part 52--Design Certification Rule for the ABWR Design," the applicant identifies

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Tier 2 departures that do not require prior NRC approval. These departures are subject to the requirements of 10 CFR 52 Appendix A, Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

#### **9.5.3.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.5.3 of the certified ABWR DCD. The staff reviewed Section 9.5.3 of the STP Units 3 and 4 COL FSAR and checked the reference DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

##### *Tier 2 Departures Not Requiring NRC Approval*

- STD DEP 9.5-4 Lighting and Servicing Power Supply System

In Section 9.5.3, the applicant addresses the plant lighting and servicing power supply system and provides the information regarding the STP departure from the ABWR DCD below:

Plant AC lighting systems are generally of the fluorescent type, with High-Pressure Sodium (HPS) lamps (or equivalent) provided for high ceiling. Incandescent lamps are used for DC lighting systems and above the reactor, and fuel pool.

NRC staff reviewed the departure described above and determined that the departure pertains to a change from mercury lamps in the ABWR DCD to high-pressure sodium lamps. The staff's review also observed that the applicant has deleted the DCD reference to mercury lamps, indicating that these lamps are "Not Used," in Subsection 9.5.3.1.1(-5), "General Design Bases," Subsection 9.5.3.1.2(1), "Safety-Related Design Bases," and Subsection 9.5.3.2, "System Description." Additionally, in Subsection 9.5.3.1.1, the applicant has deleted the reference to mercury lamps.

The staff's review of FSAR Subsection 9.5.3.1.1, "General Design Bases," noted that the subsection numbering was modified with respect to the DCD. For instance, Subsections (4) (-5) and (5) (-3) (-2) corresponding to DCD Subsections (4)(l) and (5)(a)(ii), respectively, do not agree. Therefore, the staff issued **RAI 09.05.03-1 (eRAI 2671)** requesting the applicant to clarify these discrepancies. The applicant's response to **RAI 09.05.03-1** dated August 12, 2009 (ML092260197), states that the discrepancies are typographical errors that will be corrected. The staff found the applicant's response acceptable, and **RAI 09.05.03-1** is resolved. The verification that these changes are incorporated in the next FSAR revision is being tracked as **Confirmatory Item 09.05.03-01**.

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

The applicant's evaluation in accordance with Item B.5 of Section VIII of Appendix A determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that the departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

- STD DEP Admin

In Subsection 9.5.3.3, "Inspection and Testing Requirements," the applicant addresses testing and inspecting emergency lighting:

Since the normal standby and emergency lighting circuits are energized and maintained continuously, they require no periodic testing. However, periodic inspection and bulb replacement will be performed (Subsection 8.3.4.25). The guide lamps are capable of being tested and will be inspected and tested periodically to ensure operability of lights and switching circuits.

The applicant corrected the reference subsection number in the ABWR DCD from "8.3.4.2.5" to "8.3.4.25".

The applicant defines administrative departures as minor corrections, such as editorial or administrative errors in the referenced ABWR DCD (i.e., misspellings, incorrect references, table headings, etc.). Administrative departures do not affect the presentation of any design discussion or the qualification of any design margin.

The applicant's evaluation determined that this departure does not require prior NRC approval in accordance with 10 CFR 52 Appendix A, Section VIII.B.5. Within the review scope of this section, the staff found it reasonable that this departure does not require prior NRC approval.

#### Supplemental Information

- Lighting and Servicing Power System

In Section 9.5.3, the applicant provides the following site-specific supplemental information regarding emergency lighting:

Emergency lighting comprised of emergency DC lighting and guide lamp lighting system is provided throughout the plant as necessary to support fire suppression actions and safe-shutdown operations, including access and egress pathways to safe-shutdown areas during a fire event.

The emergency lighting power distribution system contains protective devices necessary to preclude a fire in one area from causing a loss of emergency lighting in any unaffected area required for safe-shutdown operations.

NRC staff's review of the applicant's supplemental information regarding emergency lighting found that the additional design features enable adequate emergency lighting during all plant operating conditions including fire, transient, and accident conditions.

- General Design Bases

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In Subsection 9.5.3.1.1, “General Design Bases,” the applicant addressed lighting in high ceiling areas and in the yard and provided the following plant-specific supplemental information:

- (-4) Control switches for lighting fixtures inside the drywell or containment are installed both inside and outside of the drywell/containment.
- (-1) High-efficiency electronic ballasts are not used in a high radiation environment.
- (0) Lighting fixtures for yard lighting are 1000 W HPS lamps mounted on 100-foot (30.48 meter) lighting poles with retractable/lowering devices.

The NRC staff’s review of the applicant’s supplemental information in this subsection found that the plant design meets the lighting design criteria specified in the IESNA’s Lighting Handbook.

- Normal (non-Class 1E) Lighting

In Subsection 9.5.3.2.1, “Normal (non-Class 1E) Lighting,” the applicant provides the following site-specific supplemental information pertaining to yard lighting:

Yard lighting is supplied at 480V from non-Class 1E sources. If this power is not available, power for the yard lighting will be automatically provided from the non-Class 1E Combustion Turbine Generator (CTG).

NRC staff reviewed the applicant’s supplemental information regarding Non-Class 1E power source for yard lighting and found that additional design features enhance the function of subject equipment and are therefore acceptable.

#### **9.5.3.5 Post Combined License Activities**

There are no post COL activities related to this section.

#### **9.5.3.6 Conclusion**

The NRC staff’s finding related to information incorporated by reference is in NUREG–1503. NRC staff reviewed the application and checked the referenced DCD. The staff’s review confirmed that the application has addressed the relevant information relating to the lighting and servicing power supply system. With the exception of **Confirmatory Item 09.05.03-01**, no outstanding information is expected to be addressed in the COL FSAR related to this subsection. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the lighting and servicing power supply system that were incorporated by reference have been resolved.

In addition, the staff compared the standard departure and the supplemental information in the application to the relevant NRC regulations, the acceptance criteria defined in NUREG–0800, Section 9.5.3, and other NRC RGs and industry standards. Based on this review, the staff concluded that the design of the lighting system for STP Units 3 and 4 conforms to the applicable regulatory guidance and industry standards. The staff also found it reasonable that the identified Tier 2 departures are characterized as not requiring prior NRC approval per 10 CFR 52 Appendix A, Section VIII.B.5. The staff also concluded that the lighting system is in accordance with the lighting levels recommended in NUREG–0700, which is based on the IESNA Lighting Handbook. However, as a result of **Confirmatory Item 09.05.03-01**, the staff

was unable to finalize the conclusions relating to the lighting and servicing power supply system, in accordance with the NRC requirements.

## **9.5.4 Diesel Generator Fuel Oil Storage and Transfer System**

### **9.5.4.1 Introduction**

This section of the FSAR addresses the fuel oil storage and transfer system for the diesel engines that provide emergency 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. In addition, this section discusses the quality and the quantity of fuel oil stored onsite and the availability and procurement of additional fuel from offsite sources.

### **9.5.4.2 Summary of Application**

Section 9.5.4 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.5.4 of the certified ABWR DCD, Revision 4, referenced in 10 CFR Part 52, Appendix A. In addition, in the COL FSAR the applicant provides the following:

#### Tier 2 Departure Not Requiring Prior NRC Approval

- STP DEP 9.5-6 Diesel Generator Fuel Oil Storage and Transfer System Description

This is a site-specific departure that introduces several design changes in the ABWR DCD. The applicant classifies this departure as not requiring prior NRC review and approval, in accordance with 10 CFR 52 Appendix A, Section VIII.B.5.

#### COL License Information Item

- COL License Information Item 9.22 Vendor Specific Design of Diesel Generator Auxiliaries

This COL license information item is related to ABWR DCD Subsection 9.5.4.2 and requires the applicant to update the STP FSAR to include as-built design information.

- COL License Information Item 9.30 Diesel Fuel Refueling Procedures

This COL license information item is related to ABWR DCD Subsection 9.5.4.2 and requires the applicant to establish procedures for ensuring that the day tank is full before refilling the storage tank.

The ABWR DCD describes a single unit plant. Although this STP RCOL application is for a two unit plant, there is no sharing of diesel generator functions between the two new STP reactor units. Each emergency diesel generator (EDG) is supported by an independent train that stores and supplies fuel for its respective diesel engine. There are no cross-ties among any of the six trains provided for the two STP reactor units, and each train is powered from an independent Class 1E power supply fed from the associated EDG. The failure of any one train will not cause a failure of any of the other EDGs on the site.

### 9.5.4.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements of the Commission’s regulations for the diesel generator fuel oil storage and transfer system, and the associated acceptance criteria, are in Section 9.5.4 of NUREG-0800.

In particular, the regulatory basis and review criteria that the staff used for COL License Information Items 9.22 and 9.30 and the Tier 2 departure described above, as they relate to the protection of the SSCs important to safety, are specified in SRP Section 9.5.4. The NRC staff’s review of the application is also based on 10 CFR 50 Appendix A GDC 5, “Sharing of Structures, Systems and Components.” Although the ABWR DCD is based on a single-reactor unit plant, STP DEP 1.1-2 describes systems and facilities that are shared between STP Units 3 and 4. Because the EDGs are not cross-tied between the two units, the diesel generator fuel oil storage and transfer system does not affect the compliance of STP Units 3 and 4 to GDC 5.

In addition, in accordance with Section VIII, “Processes for Changes and Departures,” of, “Appendix A to 10 CFR 52--Design Certification Rule for the U.S. Advanced Boiling-Water Reactor,” the applicant identifies a Tier 2 departure that does not require prior staff approval. This departure is subject to the requirements in Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

### 9.5.4.4 *Technical Evaluation*

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.5.4 of the certified ABWR DCD. The staff reviewed Section 9.5.4 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

#### *Tier 2 Departure Not Requiring Prior NRC Approval*

The applicant determined that the following Tier 2 departure does not require NRC review and approval in accordance with 10 CFR 52, Appendix A, Section VIII.B.5 requirements.

- STP DEP 9.5-6 Diesel Generator Fuel Oil Storage and Transfer System

NRC staff reviewed STP DEP 9.5-6, which modifies the basic design of the diesel generator fuel oil storage and transfer system in the following ways:

1. The storage tank vent line is extended to an elevation that exceeds the local maximum flood level.

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<sup>1</sup> See “*Finality of Referenced NRC Approvals*” in SER Section 1.1.3, for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

2. The fuel oil storage tanks are located in underground concrete vaults with bottom gravity drain and stick gauge access. The fuel oil piping is routed underground in concrete tunnels from the storage tanks to the reactor building, thus removing the requirement for cathodic protection for any directly buried components.
3. Locked closed isolation valves are added to the storage tank sample and fill lines.
4. As a result of the local flood level at STP Units 3 and 4, the fuel oil transfer pumps are relocated to the inside of the 7-day storage tanks.
5. A gravity drain is provided at the bottom of each storage tank to periodically remove water accumulation and sediment from the tanks. The suction of the fuel oil transfer pumps is elevated two to three inches above the tank's low points to allow space for water to settle below the pump suction.

The applicant states that these design changes are considered necessary because of the potential flood level at STP Units 3 and 4. The applicant declares that this departure does not require prior NRC review and approval because the changes comply with the requirements of 10 CFR 52 Appendix A, Section VIII.B.5.

The applicant addresses compliance with GDC 5 in COL FSAR Subsection 3.1.2.1.5.2, "Evaluation Against Criterion 5." This section of the COL does not identify any sharing of the diesel generators among the reactor units at the site, including the structures in which the system is located.

The applicant's evaluation in accordance with 10 CFR Part 52 Appendix A Section VIII, Item B.5 determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff found it reasonable that this departure does not require prior NRC approval. In addition, the applicant's process for evaluating departures and changes to the DCD is subject to NRC inspections.

#### COL License Information Items

- COL License Information Item 9.22      Vendor Specific Design of Diesel Generator Auxiliaries

NRC staff reviewed COL License Information Item 9.22 in STP FSAR Subsection 9.5.13.5. Information provided by the applicant to address COL License Information Item 9.22 indicates that the applicant has committed (COM 9.5-6) to update the STP FSAR to provide specific as-built information about the DG fuel oil storage and transfer system. The development and availability of this procedure for use by operations personnel is a post-COL activity.

- COL License Information Item 9.30      Diesel Fuel Refueling Procedures

NRC staff reviewed COL License Information Item 9.30 in STP FSAR Subsection 9.5.13.13. Information provided by the applicant to address COL License Information Item 9.30 indicates that the COL applicant has committed (COM 9.5-11) to develop procedures for verifying that the day tank is full before refilling the fuel oil storage tank. These procedures will be provided before fuel loading but following the procurement of affected equipment. The applicant states

that this procedure “will reduce the possibility of sediment obstruction of fuel lines and harmful impacts on the DG operation.”

The development and availability of this procedure for use by operations personnel is a post-COL activity.

#### Technical Specification Considerations

NRC staff reviewed the TS for site-specific supplements applicable to the DGs in Chapter 16 of the STP COL application. TS 3.8.3 was reviewed for its relevance to the DG fuel oil storage and transfer system. The application incorporates the ABWR DCD section by reference with one departure, STD DEP 16.3-51, which modifies the DG operating condition for starting air receiver pressure but does not affect the fuel oil storage and transfer system. However, Revision 3 to the STP FSAR adds specific values for applying operating conditions. In the case of the fuel oil system, LCO 3.8.3-A allows a depleted DG fuel oil inventory condition between 380,000 liters and 350,000 liters for a period of 48 hours before requiring the DG to be declared inoperable. The applicant states that this condition provides a remaining capacity of more than 6 days of continuous operation under a full load, and the 48-hour period is considered a sufficient amount of time to complete the restoration of the required volume.

SR 3.8.3.1 requires verification that the fuel oil inventory for each DG is greater than 380,000 liters on a 31-day frequency. The applicant states that this requirement ensures that each DG has a sufficient fuel oil inventory to support at least 7 days of a full load operation.

SR 3.8.3.3 lists the specific ASTM Standards for performing the series of tests to determine that the new fuel oil is the correct grade, and it is not contaminated. The specified standards are ASTM D4057-06, D975-08, D4176-04, D1552-07, D2622-08, and D2276-06.

The staff evaluated the implications of these changes in the ABWR DCD TS. The staff determined that because these changes do not involve changes to the design of the fuel oil system and do not change the allowed LCO completion times or surveillance frequencies, the findings documented in NUREG-1503 regarding whether the system design meets the requirements of GDC 2, 4, 5, and 17 have not been affected and are thus maintained.

Therefore, the staff concluded that these changes from the ABWR DCD TS are acceptable.

#### ITAAC Considerations

The EDG system ITAAC requirements specified in Tier 1 Section 2.12.13 of the ABWR DCD are incorporated by reference in the STP FSAR.

#### Initial Plant Test Program

The DG preoperational tests specified in Tier 2 Subsection 14.2.12.1.45.3 of the ABWR DCD are incorporated by reference in the STP FSAR.

#### **9.5.4.5 Post Combined License Activities**

The applicant identifies the following commitment:

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- Commitment 9.5-6 – Update the FSAR to provide specific as-built information about the DG fuel oil storage and transfer system, in accordance with COL License Information Item 9.22 in DCD Subsection 9.5.13.5.
- Commitment 9.5-11 – Develop procedures for verifying that the day tank is full before refilling the fuel oil storage tank, in accordance with COL License Information Item 9.30 in DCD Subsection 9.5.13.13.

#### **9.5.4.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG–1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A, Section VI.B.1, all nuclear safety issues relating to the diesel generator fuel oil storage and transfer system that were incorporated by reference have been resolved.

In addition, the staff compared the additional COL information in the application to the relevant NRC regulations and acceptance criteria defined in NUREG–0800, Section 9.5.4. The staff determined that the DG fuel oil storage and transfer system design is acceptable and complies with NRC regulations, as stated in the general design criteria of Appendix A to 10 CFR Part 50. This conclusion is based on the staff's technical evaluation that determined the DCD meets the criteria in GDC 2, 4, and 17; 10 CFR 52.47(b)(1); and NUREG/CR-0660. The staff's technical evaluation for the STP RCOL concluded that the STP design meets the criteria in GDC 5.

The staff also found that the applicant has adequately addressed the TS, ITAAC, interface requirements, and Initial Test Program considerations related to this area of review.

### **9.5.5 Diesel Generator Jacket Cooling Water System**

#### **9.5.5.1 Introduction**

This section of the FSAR addresses how the emergency diesel engine cooling water system (EDECWS) provides cooling water to the station emergency diesel engines. The review covers EDECWS portions housed within their respective diesel engine compartments receiving heat from components that are essential for the proper operation of the diesel engines and additional parts of the system transferring the heat to a heat sink. The system includes all valves, heat exchangers, pumps, and piping up to the engine interface.

#### **9.5.5.2 Summary of Application**

Section 9.5.5 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.5.5 of the certified ABWR DCD, Revision 4, referenced in 10 CFR Part 52 Appendix A. In addition, in FSAR Sections 9.5.5 and 9.5.13, the applicant provides the following:

Tier 2 Departure Not Requiring Prior NRC Approval

- STD DEP 9.5-1 Diesel Generator Jacket Cooling Water System

This departure addresses the changes to the regulatory conformance basis for inspection and testing guidance from RG 1.108, which was withdrawn in 1993, to RG 1.9, Revision 3, which addresses the qualifications, preoperational, and periodic testing of diesel generators. The applicant classifies this departure as not requiring prior NRC review and approval, in accordance with 10 CFR 52 Appendix A, Section VIII.B.5.

COL License Information Item

- COL License Information Item 9.23 Diesel Generator Jacket Cooling Water System As-built Information

This COL license information item is related to DCD Subsection 9.5.5.2. It addresses the requirement for the applicant to update the STP FSAR to provide design flow and heat removal capabilities of the as-built diesel generator cooling water system. The applicant commits (COM 9.5-7) to update the FSAR in accordance with 10 CFR 50.7(e) to provide as-built information on the design and heat removal requirements for the diesel generator cooling water system.

The ABWR DCD describes a single-unit plant. Although this STP COL application is for a two-unit plant, there is no sharing of diesel generator functions between the two new STP reactor units. Each emergency diesel is supported by an independent train that provides cooling for its respective diesel engine. There are no cross-ties among any of the six trains provided for the two STP reactor units, and each train is powered from an independent Class 1E power supply fed from the associated EDG. The failure of any one train will not cause a failure of any of the other redundant EDGs.

**9.5.5.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG-1503. In addition, the relevant requirements of the Commission regulations for the emergency diesel engine cooling water system, and the associated acceptance criteria, are in Section 9.5.5 of NUREG-0800.

In particular, the regulatory basis and review criteria that the staff used for COL License Information Item 9.23 and the Tier 2 departure described above, as they relate to the protection of the SSCs important to safety are specified in SRP Section 9.5.5.

The staff's review of the application is also based on 10 CFR 50 Appendix A, GDC 5, "Sharing of Structures, Systems and Components." Although the ABWR DCD is based on a single reactor plant, STP DEP 1.1-2 describes systems and facilities that are shared between STP Units 3 and 4. Because the emergency diesel generators are not cross-tied between the two units, the diesel generator jacket cooling water system does not affect the compliance of STP Units 3 and 4 with GDC 5.

In addition, in accordance with Section VIII, "Processes for Changes and Departures," of "Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling-Water Reactor," the applicant identifies a Tier 2 departure that does not require prior Commission approval. This

departure is subject to the requirements of 10 CFR 52 Appendix A, Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

#### **9.5.5.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.5.5 of the certified ABWR DCD. The staff reviewed Section 9.5.5 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

##### *Tier 2 Departure Not Requiring Prior NRC Approval*

The applicant determined that the following DCD Tier 2 departure does not require NRC review and approval in accordance with 10 CFR 52 Appendix A, Section VIII.B.5 requirements.

- STP DEP 9.5-1 Update Applicable Regulatory Guide Reference

NRC staff reviewed STD DEP 9.5-1, which updates the reference to NRC guidance for inspection and testing specifically by deleting the reference to an obsolete regulatory guide and replacing it with the current regulatory guide. Section 3 of the Departures Report indicates that this departure was evaluated and the staff determined that it complies with the requirements of 10 CFR 52 Appendix A, Section VIII.B.5. STP DEP 9.5-1 deletes the reference to RG 1.108, which was withdrawn in August 1993, and specifies that scheduled inspection and testing of equipment is performed in accordance with RG 1.9, as part of the overall engine performance checks. The diesel generator jacket cooling water system was evaluated using RG 1.9 and determined that it conforms to the current guidance. There is no change to any design or function of an SSC important to safety as a result of this departure from the certified ABWR design. Therefore, this change is acceptable to the staff with respect to the review criteria established in SRP Section 9.5.5. Within the review scope of this section, the staff found that this departure does not require prior NRC approval with respect to the diesel generator jacket cooling water system. The applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

The STP FSAR addresses compliance with GDC 5 in Subsection 3.1.2.1.5.2, "Evaluation Against Criterion 5." This section of the STP FSAR does not identify any sharing of the diesel generator system among reactor units at the site, including the structures in which the system is located.

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

### COL License Information Item

- COL License Information Item 9.23 Diesel Generator Jacket Cooling Water System As-built Information

NRC staff reviewed COL License Information Item 9.23 in FSAR Subsection 9.5.13.6. The applicant's information that addresses COL License Information Item 9.23 indicates that the COL applicant has committed to update the STP FSAR to provide specific as-built information about the diesel generators (COM 9.5-7). The following as-built information related to the diesel generator jacket cooling water system will be provided in the update to STP FSAR in accordance with 10 CFR 50.71(e):

- Design flow and heat removal requirements and heat removal capacities for all coolers and heat exchangers in the system.
- The type of cooling water circulating pumps and motive sources (i.e., motor-driven or others).
- NPSH of the cooling water circulating pumps.
- Type of temperature sensors (the "Amot" brand or an equivalent type of temperature sensing element recommended in NUREG/CR-0660, page V-17, Item 4).
- The capacity of the expansion tank.
- Cooling water loss estimates.

The incorporation of this proposed revision in the STP FSAR is a post COL activity.

### Technical Specification Considerations

The staff reviewed the TS applicable to the diesel generators in Chapter 16 of the application. TS 3.8.3 was reviewed for its relevance to the diesel generators. No specific LCOs or SRs directly related to the diesel generators are provided. However, as stated in Tier 2 Subsection 9.5.5.1 of the ABWR DCD, the diesel engine will be capable of operating at full load without secondary cooling for an amount of time in excess of the time needed to restore the secondary cooling water systems following a loss of preferred power. Thus, no LCOs or SRs are required.

### ITAAC Considerations

The EDG system ITAAC requirements specified in Tier 1 Section 2.12.13 of the ABWR DCD are incorporated by reference in the STP FSAR.

### Initial Plant Test Program

The DG preoperational tests specified in Tier 2 Subsection 14.2.12.1.45.3 of the ABWR DCD are incorporated by reference in the STP FSAR.

#### **9.5.5.5 Post Combined License Activities**

The applicant identifies the following commitments:

- Commitment 9.5--7 – Update the STP FSAR to provide specific as-built information about the diesel generators in accordance with COL License Information Item 9.23 in DCD Subsection 9.5.13.6.
- Test and Inspection – Perform inspections and tests of the system equipment in accordance with RG 1.9 and RCOL Subsection 9.5.5.4.

#### **9.5.5.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG–1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to this section that were incorporated by reference have been resolved.

In addition, the staff compared the additional COL License information in the application to the relevant NRC regulations and acceptance criteria defined in NUREG–0800, Section 9.5.5.

The staff found it reasonable that Tier 2 Departure STP DEP 9.5-1 is characterized as not requiring prior NRC approval in accordance with 10 CFR 52, Appendix A, Section VIII.B.5.

Based on the results of this evaluation, the staff determined that the diesel generator jacket cooling water system design is acceptable and complies with the regulations as stated in the GDC of Appendix A to 10 CFR Part 50. This conclusion is based on the staff's technical evaluation determining that the DCD meets GDC 2, 4, 17, 44, 45, and 46, as well as 10 CFR 52.47(b)(1) and NUREG/CR-0660. The technical evaluation for the STP COL concluded that the STP design meets GDC 5.

The staff also found that the applicant has adequately addressed the TS, ITAAC, interface requirements, and Initial Test Program considerations related to this area of review.

### **9.5.6 Diesel Generator Starting Air System**

#### **9.5.6.1 Introduction**

This section of the FSAR addresses how the emergency diesel engine (DG) starting system covers system features necessary for reliable emergency diesel engine starting following a loss of offsite power. The review includes the system air compressors, air dryers, air receivers, devices to crank the diesel engine, valves, piping up to the connection to the engine interface, filters, and ancillary instrumentation and control systems..

### **9.5.6.2 Summary of Application**

Section 9.5.6 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.5.6 of the certified ABWR DCD Revision 4 referenced in 10 CFR Part 52, Appendix A, with no departures.

In addition, in Revision 3 of STP FSAR Section 9.5.13, "COL License Information," the applicant provides the following:

#### *COL License Information Items*

- COL License Information Item 9.22 Vendor Specific Design of Diesel Generator Auxiliaries

This COL item requires the applicant to update the STP FSAR to provide as-built diesel generator starting air system design information.

- COL License Information Item 9.25 Diesel Generator Requirements

This COL license information item directs the applicant to review the vendor-specific design for dust-tight protection of relays and contactors.

The ABWR DCD describes a single-unit plant. Although this STP RCOL application is for a two-unit plant, there is no sharing of diesel generator functions between the two new STP reactor units. Each emergency diesel is supported by an independent train that provides starting air for its respective diesel engine. There are no cross-ties among any of the six trains provided for the two STP reactor units, and each train is powered from an independent Class 1E power supply fed from the associated emergency diesel generator. The failure of any one train will not cause a failure of any of the other redundant EDGs.

### **9.5.6.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG-1503. In addition, the relevant requirements of the Commission regulations for the diesel generator starting air system, and the associated acceptance criteria, are in Section 9.5.6 of NUREG-0800

In particular, the regulatory basis and review criteria that the staff used for COL License Information Items 9.22 and 9.25 described above, as they relate to the protection of the SSCs important to safety, are specified in SRP Section 9.5.6, "Emergency Diesel Engine Starting System."

The staff's review of the application is also based on 10 CFR 50, Appendix A, GDC 5, "Sharing of Structures, Systems and Components." Although the ABWR DCD is based on a single reactor unit plant, STP DEP 1.1-2 describes systems and facilities that are shared between STP Units 3 and 4. Because the emergency diesel generators are not cross-tied between the two units, the diesel generator starting air system does not affect the compliance of STP Units 3 and 4 to GDC 5.

#### 9.5.6.4 *Technical Evaluation*

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.5.6 of the certified ABWR DCD. The staff reviewed Section 9.5.6 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

##### COL License Information Items

- COL License Information Item 9.22      Vendor Specific Design of Diesel Generator Auxiliaries

NRC staff reviewed COL License Information Item 9.22 in STP FSAR Subsection 9.5.13.5. Information provided by the applicant to address COL License Information Item 9.22 indicated that the COL applicant has committed (COM 9.5-6) to update the STP FSAR to provide specific as-built information about the diesel generator starting air system. The following as-built information will be provided in the updated STP FSAR in accordance with 10 CFR 50.71(e):

- A description of engine cranking devices for the starting air system.
- Duration of a cranking cycle and number of engine revolutions per start attempt.
- Volume and design pressure of air receivers sufficient for five start cycles per receiver.
- Air compressor size and discharge flow required to recharge the system in 30 minutes or less.

The incorporation of this proposed revision in the STP FSAR is a post-COL activity (COM 9.5-6).

SRP 9.5.6.II.4.F, “Acceptance Criteria,” states that starting air should be dried to a dew point of not more than 10 °C (50 °F) when installed in a normally controlled 21 °C (70 °F) environment; otherwise, the starting air dew point should be controlled to at least 5.5 °C (10 °F) less than the lowest expected ambient temperature. The ABWR DCD FSER Section 9.5.6 notes that the staff will determine whether the system’s air quality complies with this acceptance criterion on a plant-specific basis.

- COL License Information Item 9.25      Diesel Generator Requirements

The staff reviewed COL License Information Item 9.25 in STP FSAR Subsection 9.5.13.8. The applicant’s information addressing COL License Information Item 9.25 indicates that the COL applicant has committed (COM 9.5-9) to review the vendor-specific design of the diesel generator starting air system to assure that the design meets the recommendations for dust-tight enclosures for all relays and contactors as follows:

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<sup>1</sup> See “*Finality of Referenced NRC Approvals*” in SER Section 1.1.3 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

The vendor-specific design for the starting air system will be reviewed to assure that it meets NUREG/CR-0660 Recommendations 2.a and 2.b, that all contactors and relays will have dust-tight, enclosed contacts of the bifurcated type manufactured by Struthers-Dunn or an equivalent type, and that all contactors and relays for the DG equipment will be enclosed in dust-tight steel cabinets with fully gasketed doors and other openings.

The STP COL FSAR addresses compliance with GDC 5 in Subsection 3.1.2.1.5.2, "Evaluation Against Criterion 5." This section of the application does not identify any sharing of the emergency diesel among reactor units at the site, including the structures in which the system is located.

### Technical Specification Considerations

The staff reviewed the TS applicable to the diesel generators in Chapter 16 of the application. TS Section 3.8.3 was reviewed for relevance to the diesel generator starting air system. The application incorporates the ABWR DCD section by reference with one departure, STD DEP 16.3-51, which modifies the diesel generator operating condition for starting air receiver pressure and requires the pressure in at least one (not both) of the starting air receivers to be within specified limits. The stated basis for this departure is that as long as one of the air receivers for each diesel generator has the capacity for five successive start attempts without recharging, the diesel generator starting system for that unit satisfies the operability requirements.

The applicant states that this departure is a change to the wording of the generic TS and does not change the intent, nor is it associated with a design change. However, because the departure changes the TS it requires prior NRC approval. Otherwise, it would normally meet the definition of an administrative departure. The applicant further states that this departure complies with the requirements in Section VIII.C.4 of Appendix A to 10 CFR 52.

The staff evaluated the implications of this departure from the generic TS. The staff determined that because the departure does not involve changes to the design of the starting system, the findings documented in the ABWR FSER, (NUREG-1503) regarding whether the system design meets the requirements of GDC 2, 4, and 5 have not been affected and are thus maintained.

The staff then considered six specific SRP acceptance criteria listed in Section II of SRP 9.5.6 for meeting the requirements of GDC 17. Item B specifies that each diesel generator should have a dedicated air start system consisting of a compressor, an air dryer, *one or more* air receivers (emphasis added), piping, lines and valves, and devices to crank the engine. STD DEP 16.3-51 does not change the redundancies in the basic system design, thus this feature is not impacted. Item C specifies that the air starting system should be capable of cranking a cold diesel engine five times without recharging the receiver(s). In addition, each cranking cycle should (i) be approximately three seconds in duration, (ii) consist of two or three engine revolutions, or (iii) meet the air start requirements provided by the engine manufacturer. As described in Subsection 9.5.6.1 of the ABWR DCD, and incorporated by reference in Revision 3 of the STP FSAR, each starting air subsystem is capable of performing five consecutive starts of the engine, thus meeting its required safety function.

Therefore, the staff found that this departure from the generic TS is acceptable.

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In Revision 3 of STP FSAR Section B 3.8.3, under the sub-heading “Actions, E.1,” reference is made to “starting air receiver pressure < [3,000] MPaG.” Similarly, in the next sentence the units specified for the lower pressure limit are also given as MPaG. These large pressure values conflict with TS for air receiver pressure limits provided in LCO 3.8.3; namely, [3,000] kPaG and [2,700] kPaG. Therefore, the staff issued RAI 09.05.06-1 (eRAI 2501- Question 10242) requesting the applicant to revise the STP FSAR to correctly identify the pressure values associated with the starting air receivers. The applicant’s response to this RAI dated August 20, 2009 (ML092360771), notes that the MPaG units should kPaG. This correction will be made in the next revision to the STP FSAR. This revision will be tracked as **Confirmatory Item 09.05.06-1**.

#### ITAAC Considerations

The EDG system ITAAC requirements specified in Tier 1 Section 2.12.13 of the ABWR DCD are incorporated by reference in the STP FSAR.

#### Initial Plant Test Program

The diesel generator preoperational tests specified in Tier 2 Subsection 14.2.12.1.45.3 of the ABWR DCD are incorporated by reference in the STP FSAR.

#### **9.5.6.5 Post Combined License Activities**

The applicant identifies the following commitments:

- Commitment (COM 9.5-6) – Update the STP FSAR to provide specific as-built information about the emergency diesel generator in accordance with COL Information Item 9.22 in DCD Subsection 9.5.13.5.
- Commitment (COM 9.5-9) – Review the vendor-specific design of the diesel generator starting air system to assure it conforms with the Recommendations 2.a and 2.b of NUREG/CR-0660 for dust-tight enclosures for all relays and contactors. In addition, Recommendations 2.d and 5 of NUREG/CR-0660 for control of dust in the diesel generator rooms will be adhered to.

#### **9.5.6.6 Conclusion**

The NRC staff’s finding related to information incorporated by reference is in NUREG–1503. NRC staff reviewed the application and checked the referenced DCD. The staff’s review confirmed that the applicant has addressed the required information relating to the diesel generator starting air system. With the exception of **Confirmatory Item 09.05.06-1**, no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A, Section VI.B.1, all nuclear safety issues relating to the diesel generator starting air system that were incorporated by reference have been resolved.

In addition, the staff compared the additional COL License information items in the application to the relevant NRC regulations and acceptance criteria defined in NUREG–0800, Section 9.5.6.

Based on the results of this evaluation, the staff found the diesel generator starting air system design is acceptable and complies with regulations in the GDC of Appendix A to 10 CFR Part 50. This conclusion is based on the technical evaluation that the DCD meets GDC 2, 4, and 17; 10 CFR 52.47(b)(1); and NUREG/CR-0660. The NRC staff also found that the applicant has adequately addressed the TS, ITAAC, interface requirements, and Initial Test Program considerations related to this area of review.

However, as a result of the **Confirmatory Item 09.05.06-1**, the staff was unable to finalize the conclusions relating to the DG starting air system, in accordance with the NRC requirements.

## **9.5.7 Diesel Generator Lubrication System**

### **9.5.7.1 Introduction**

This section of the FSAR addresses how the emergency diesel engine lubrication system provides essential lubrication to emergency diesel engine components. The review includes system piping, pumps, components, and auxiliary equipment essential for system operation up to the engine interface.

### **9.5.7.2 Summary of Application**

Section 9.5.7 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.5.7 of the certified ABWR DCD Revision 4, referenced in 10 CFR Part 52, Appendix A, with no departures.

In addition, in Revision 3 of STP FSAR Section 9.5.13, "COL License Information," the applicant provides the following:

#### COL License Information Item

- COL License Information Item 9.22 Diesel Generator Lubrication System As-built Information

This COL license information item is related to ABWR DCD Subsection 9.5.7.2. It directs the applicant to update the STP FSAR to provide as-built design information.

The ABWR DCD describes a single-unit plant. Although this STP COL application is for a two-unit plant, there is no sharing of diesel generator functions between the two new STP reactor units. Each emergency diesel is supported by an independent train that provides lubrication for its respective diesel engine. There are no cross-ties among any of the six trains provided for the two STP reactor units, and each train is powered from an independent Class 1E power supply fed from the associated EDG. The failure of any one train will not cause a failure of any of the other redundant EDGs.

### **9.5.7.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG-1503. In addition, the relevant requirements of the Commission's regulations for the diesel generator lubrication system, and the associated acceptance criteria, are in Section 9.5 of NUREG-0800.

In particular, the regulatory basis and review criteria that the staff used for COL License Information Item 9.22, as it relates to the protection of the SSCs important to safety, are specified in SRP Section 9.5.7, "Emergency Diesel Engine Lubrication System."

The NRC staff's review of the application is also based on 10 CFR 50, Appendix A, GDC 5, "Sharing of Structures, Systems and Components." Although the ABWR DCD is based on a single-reactor unit plant, STP DEP 1.1-2 describes systems and facilities that are shared between STP Units 3 and 4. Because the emergency diesel generators are not cross-tied between the two units, the diesel generator lubrication system does not affect the compliance of STP Units 3 and 4 with GDC 5.

#### **9.5.7.4 Technical Evaluation**

As documented in NUREG-1503, NRC staff reviewed and approved Section 9.5.7 of the certified ABWR DCD. The staff reviewed Section 9.5.7 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

##### COL License Information Item

- COL License Information Item 9.22 Vendor Specific Design of Diesel Generator Auxiliaries

NRC staff reviewed COL License Information Item 9.22 in STP FSAR Subsection 9.5.13.5. The applicant's information addressing COL License Information Item 9.22 indicates that the COL applicant has committed (COM 9.5-6) to update the STP FSAR to provide specific as-built information about the diesel generator lubrication system. The following as-built information related to the diesel generator lubrication system will be included in the updated STP FSAR, in accordance with 10 CFR 50.71(e):

- Lubricating oil pump flows
- System operating pressure
- Temperature differentials
- Cooling system heat removal capabilities
- Electric heater characteristics

The incorporation of this proposed revision in the STP FSAR is a post COL activity.

The applicant addresses compliance with GDC 5 in FSAR Subsection 3.1.2.1.5.2, "Evaluation Against Criterion 5." The applicant does not identify any sharing of the emergency diesel among reactor units at the site, which includes the structures in which the system is located,

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

### Technical Specification Considerations

The staff reviewed the TS applicable to the DG in Chapter 16 of the application. TS Section 3.8.3 was reviewed for relevance to the diesel generator lubrication system. The application incorporates by reference the ABWR DCD section with one departure, STD DEP 16.3-51, which modifies the diesel generator operating condition for starting air receiver pressure but does not affect the lubrication system. However, Revision 3 to the STP FSAR adds specific values for applying operating conditions. In the case of the lubrication system, LCO 3.8.3-B allows a depleted diesel generator lube oil inventory condition between 7,300 liters and 6,700 liters for a period of 48 hours before requiring the diesel generator to be declared inoperable. The applicant states that this condition provides a minimum remaining capacity of more than 6 days of continuous operation under a full load, and the 48-hour period is considered a sufficient amount of time to complete a restoration of the required volume.

SR 3.8.3.2 requires verification that the lubricating oil inventory for each diesel generator is greater than 7,300 liters on a 31-day frequency. The applicant states that this requirement ensures that each diesel generator has a sufficient lubricating oil inventory to support at least 7 days of a full load operation.

The staff evaluated the implications of these changes in the ABWR DCD TS. The staff determined that because the changes do not involve changes to the design of the lubrication system, the findings documented in the NUREG-1503 regarding whether the system design meets the requirements in GDC 2, 4, 5 and 17 are not affected and are thus maintained.

Item H in the SRP acceptance criteria specifies that the on-site lubricating oil storage capacity for each diesel generator is sufficient for 7 days of operation following any design-basis event and a continuous loss of offsite power. The incorporation of specific volumes as part of the Technical Specifications is intended to ensure that the lubricating oil system is capable of allowing the diesel generator to operate continuously under a full load for a period of at least 7 days.

Therefore, the staff found that this change from the ABWR DCD TS is acceptable.

### ITAAC Considerations

The EDG system ITAAC requirements as specified in Tier 1 Section 2.12.13 of the ABWR DCD, are incorporated by reference in the STP FSAR.

### Initial Plant Test Program

The diesel generator preoperational tests specified in Tier 2 Subsection 14.2.12.1.45.3 of the ABWR DCD are incorporated by reference in the STP FSAR.

#### **9.5.7.5 Post Combined License Activities**

The applicant identifies the following commitment:

- Commitment (COM 9.5-6) – Update the STP FSAR to provide specific as-built information in accordance with COL License Information Item 9.22 in DCD Subsection 9.5.13.5.

### **9.5.7.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A, Section VI.B.1, all nuclear safety issues relating to this section that were incorporated by reference have been resolved.

In addition, the staff compared the additional COL license information item in the application to the relevant NRC regulations and acceptance criteria defined in NUREG-0800, Section 9.5.7.

Based on the results of this evaluation, the staff determined that the diesel generator lubrication system design is acceptable and complies with regulations as stated in the GDC in Appendix A to 10 CFR Part 50. This conclusion is based on the staff's technical evaluation that determined the DCD meets GDC 2, 4, and 17; 10 CFR 52.47(b)(1); and NUREG/CR-0660. The technical evaluation of the STP COL concluded that the STP design meets GDC 5.

The staff also found that the applicant has adequately addressed the TS, ITAAC, interface requirements, and Initial Test Program considerations related to this area of review.

### **9.5.8 Diesel Generator Combustion Air Intake and Exhaust System**

#### **9.5.8.1 Introduction**

This section of the FSAR addresses how the diesel engine combustion air intake and exhaust system supplies combustion air of reliable quality to the diesel engines and exhausts combustion products from the diesel engines to the atmosphere. The system is reviewed from the outside air intake to the combustion air supply lines connected to the diesel engine interface and from the exhaust connections at the diesel engine interface to the discharge point outside the building.

#### **9.5.8.2 Summary of Application**

Section 9.5.8 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.5.8 of the certified ABWR DCD, Revision 4, referenced in 10 CFR Part 52 Appendix A, with no departures.

In addition, in FSAR Section 9.5.13, "COL License Information," the applicant provides the following:

#### COL License Information Items

- COL License Information Item 9.18 Contamination of Diesel Generator Combustion Air Intake

This COL license information item is related to ABWR DCD Subsection 9.5.8.1. It requires the applicant to take measures to limit contaminating materials from the plant site that may be accessible to the diesel generator air intakes.

- COL License Information Item 9.22 Diesel Generator Combustion Air Intake and Exhaust System As-built Information

This COL license information item is related to ABWR DCD Subsection 9.5.8.2. It requires the applicant to update the STP FSAR to provide as-built design information.

The ABWR DCD describes a single-unit plant. Although this STP Units 3 and 4 FSAR application is for a two-unit plant, there is no sharing of diesel generator functions between the two new STP reactor units. Each emergency diesel is supported by an independent train that provides combustion air intake and exhaust for its respective diesel engine. There are no cross-ties among any of the six trains provided for the two STP reactor units, and each train is powered from an independent Class 1E power supply fed from the associated EDG. The failure of any one train will not cause a failure of any of the other redundant EDGs.

### **9.5.8.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements of the Commission’s regulations for the diesel generator combustion air intake and exhaust system, and the associated acceptance criteria, are in Section 9.5.8 of NUREG–0800.

In particular, the regulatory basis and review criteria that the staff used for COL license information items 9.18 and 9.22 , as they relate to the protection of the SSCs important to safety, are specified in SRP Section 9.5.8, “Emergency Diesel Engine Combustion Air Intake and Exhaust System.”

The staff’s review of the application is also based on 10 CFR 50, Appendix A, GDC 5, “Sharing of Structures, Systems and Components.” Although the ABWR DCD is based on a single-reactor unit plant, STP DEP 1.1-2 describes systems and facilities that are shared between STP Units 3 and 4. Because the emergency diesel generators are not cross-tied between the two units, the diesel generator combustion air intake and exhaust system does not affect the compliance of STP Units 3 and 4 with GDC 5.

### **9.5.8.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 9.5.8 of the certified ABWR DCD. The staff reviewed Section 9.5.8 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.<sup>1</sup> The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to this section.

The staff reviewed the information in the COL FSAR:

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<sup>1</sup> See “*Finality of Referenced NRC Approvals*” in SER Section 1.1.3 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

### COL License Information Items

- COL License Information Item 9.18      Contamination of Diesel Generator Combustion Air Intake

The staff reviewed COL License Information Item 9.18 in STP FSAR Subsection 9.5.13.1. The applicant's information addressing COL License Information Item 9.18 indicates that the COL applicant has committed (COM 9.5-3) to take measures before and subsequent to testing the diesel generators to restrict contaminating substances from the STP site that may be available to the diesel generator air intakes.

- COL License Information Item 9.22      Vendor Specific Design of Diesel Generator Auxiliaries

NRC staff reviewed COL License Information Item 9.22 in STP FSAR Subsection 9.5.13.5. The applicant's information addressing COL License Information Item 9.22 indicates that the COL applicant has committed (COM 9.5-6) to update the STP FSAR to provide specific as-built information. The following as-built information will be included in the updated FSAR, in accordance with 10 CFR 50.71(e):

- Selection of a combustion air flow capacity sufficient for complete combustion in the diesel generator combustion air intake and exhaust system.

The incorporation of this proposed revision in the STP FSAR is a post-COL activity.

The applicant addresses compliance with GDC 5 in FSAR Subsection 3.1.2.1.5.2, "Evaluation Against Criterion 5." The applicant does not identify any sharing of the emergency diesel generators among reactor units at the site, including the structures in which the system is located.

### Technical Specification Considerations

The staff reviewed the TS applicable to the DGs in Chapter 16 of the application. The staff also reviewed TS 3.8.3 for its relevance to the diesel generator combustion air intake and exhaust system. There are no specific LCOs or SRs directly related to the diesel generator combustion air intake and exhaust system.

### ITAAC Considerations

The EDG system ITAAC requirements specified in Tier 1 Section 2.12.13 of the ABWR DCD are incorporated by reference in the STP FSAR.

### Initial Plant Test Program

The diesel generator preoperational tests specified in Tier 2 Subsection 14.2.12.1.45.3 of the ABWR DCD are incorporated by reference in the STP FSAR.

#### **9.5.8.5 Post Combined License Activities**

The applicant identifies the following commitments: items were identified as the responsibility of the COL license applicant:

- Commitment (COM 9.5-3) – Update the STP FSAR to describe the means for ensuring and verifying that measures for limiting contaminating materials from the plant site that may be accessible to the diesel generator air intakes are completed before and subsequent to diesel generator testing in accordance with COL License Information Item 9.18 in ABWR DCD Subsection 9.5.13.1.
- Commitment (COM 9.5-6) – Update the STP FSAR to provide specific as-built information about the diesel generator combustion air intake and exhaust system in accordance with COL License Information Item 9.22 in ABWR DCD Subsection 9.5.13.5.

#### **9.5.8.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG–1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A, Section VI.B.1, all nuclear safety issues relating to this section that were incorporated by reference have been resolved.

In addition, the staff compared the additional COL license information items in the application to the relevant NRC regulations and acceptance criteria defined in NUREG–0800, Section 9.5.8.

Based on the results of this evaluation, the staff determined that the diesel generator combustion air intake and exhaust system design is acceptable and complies with regulations in the GDC of Appendix A to 10 CFR Part 50. This conclusion is based on the staff's technical evaluation that determined the DCD meets GDC 2, 4, and 17; 10 CFR 52.47(b)(1); and NUREG/CR-0660. The technical evaluation of the STP COL concluded that the STP design meets GDC 5.

NRC staff also found that the applicant has adequately addressed the TS, ITAAC, interface requirements, and Initial Test Program considerations related to this area of review.

#### **9.5.9 Suppression Pool Cleanup System**

This section of the FSAR addresses information related to the ABWR Suppression Pool Cleanup System.

Section 9.5.9 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.5.9, "Suppression Pool Cleanup System," of the ABWR DCD, Revision 4, referenced in 10 CFR Part 52 Appendix A, with no departures or supplements. NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remains for review.<sup>1</sup> The staff's review confirmed that there is no outstanding information outside of the

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

DCD related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52 Appendix A, Section VI.B.1, all nuclear safety issues relating to the Suppression Pool Cleanup System have been resolved.

#### **9.5.10 Motor Generator Set**

See SER Section 8.3.1, "AC Power System."

#### **9.5.11 Combustion Turbine/Generator**

See SER Section 8.4S, "Station Blackout."

#### **9.5.12 Drywell Flooder**

##### **9.5.12.1 Introduction**

The function of the lower drywell flooder (LDF) system is to flood the lower drywell with water from the suppression pool in the unlikely event of a severe accident where the core melts and causes a subsequent vessel failure.

##### **9.5.12.2 Summary of Application**

Section 9.5.12 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 9.5.12 of the certified ABWR DCD, Revision 4, referenced in 10 CFR 52, Appendix A.

In addition, in FSAR Section 9.5.12, the applicant provides the following:

##### *Tier 2 Departure Not Requiring Prior NRC Approval*

- STD DEP 9.5-2 Lower Drywell Flooder Fusible Plug Valve, (Figure 19E.2-24)

The applicant proposes the following Tier 2 departure from the ABWR DCD. The flooder system is comprised of 10 piping lines. Each line originates in 1 of the 10 vertical pipes that are part of the drywell to wetwell connecting vent system. The vents are arranged symmetrically around the perimeter of the lower drywell. The flow through each flooder line will be initiated by melting a temperature-sensitive fusible plug (or fusible link) that, in turn, triggers the fusible plug valve to fully open and remain open.

##### *Supplemental Information*

The applicant provides the following supplemental information describing the lower drywell flooder system at STP Units 3 and 4.

#### **General Design Bases**

In Subsection 9.5.12.1, the applicant provides supplemental information regarding air temperature in the drywell air space and discusses flow distribution.

## System Description

In Subsection 9.5.12.2, the applicant clarifies how the system operates, including the incorporation of the Tier 2 departure design changes.

### 9.5.12.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1503. There is no regulatory guidance in the NUREG-0800, in the GDC in 10CFR Part 50, Appendix A, or in the RGs that directly apply to the performance requirements for the LDF system.

In addition, in accordance with Section VIII, "Processes for Changes and Departures," of "Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor," the applicant identifies one Tier 2 departure not requiring prior NRC approval. This departure is subject to the requirements of Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

### 9.5.12.4 Technical Evaluation

As documented in NUREG-1503, NRC staff reviewed and approved Section 9.5.12 of the certified ABWR DCD. The staff reviewed Section 9.5.12 of the STP Units 3 and 4 COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the information in the COL represents the complete scope of information relating to this review topic.<sup>1</sup> The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to the drywell flooders.

The staff reviewed the information in the COL FSAR:

#### Tier 2 Departure Not Requiring Prior NRC Approval

- STD DEP 9.5-2 Lower Drywell Flooder Fusible Plug Valve

NRC staff reviewed Departure STD DEP 9.5-2 included in Section 9.5-2 of the STP Units 3 and 4 COL FSAR and Part 7, "Departures," of the COL application. The text changes do not reflect any changes to the design concept, but instead allow for greater flexibility in implementing the design. In particular, a temperature-sensitive fusible plug (or fusible link) would be melted after molten core debris had entered the lower drywell, thus enabling the fusible plug valve to open and to remain open. The staff agreed that this concept would enable water to enter the lower drywell and cover the core debris. There is a concern, however, that the containment liner failure may not be averted for 24 hours after core damage, even with water on top of the debris. Accordingly, in Chapter 19 the staff issued **RAI 19-1 (eRAI 2754)** and **RAI 19-28 (eRAI 3820)** requesting the applicant to submit the results of the MAAP calculations that show liner integrity during this period for the more likely severe accident scenarios. These results are being used to support the staff's confirmatory assessment using MELCOR 1.8.6. The resolution of this analysis is being tracked as **Open Item 19-13** in Section 19E.4 of this SER.

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<sup>1</sup> See "Finality of Referenced NRC Approvals" in SER Section 1.1.3 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

### Supplemental Information

The supplemental information in Subsections 9.5.12.1 and 9.5.12.2 provides additional insights related to LDF operation and is reviewed under Departure STD DEP 9.5-2.

#### **9.5.12.5 Post Combined License Activities**

There are no post COL activities related to this section.

#### **9.5.12.6 Conclusion**

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant had addressed the required information relating to the drywell floodler system. However, as a result of **Open Item 19-13**, the staff was unable to finalize the conclusions related to the drywell floodler system, in accordance with the NRC requirements.