

## 14. VERIFICATION PROGRAMS

In this chapter of the Final Safety Analysis Report (FSAR) Revision 3, the combined license (COL) applicant provides information concerning the Initial Test Program (ITP) for structures, systems, and components (SSCs) and design features for both the nuclear portion of the facility and the balance of plant (BOP). The information addresses major phases of the test program including preoperational tests, initial fuel loading and initial criticality, low-power tests, and power-ascension tests. The COL applicant thus describes the scope of the ITP as well as general plans for accomplishing the ITP in sufficient detail to demonstrate that there is due consideration given to matters that normally require advance planning.

In accordance with Regulatory Guide (RG) 1.206, Cl.14, "Verification Programs," dated June 2007, the COL applicant should describe the technical aspects of the ITP in sufficient detail to show that (a) the test program adequately verifies the functional requirements of plant SSCs, and (b) the sequence of testing is such that the safety of the plant does not depend on untested SSCs. The COL applicant also describes measures to ensure that (1) the ITP will have adequate numbers of qualified personnel; (2) there will be adequate administrative controls established to govern the ITP; (3) the ITP will be used, to the extent practicable, to train and familiarize the plant's operating and technical staff in the operation of the facility; and (4) the adequacy of plant operating and emergency procedures will be verified, to the extent practicable, during the period of the ITP.

In this FSAR Chapter, the applicant also provides information on the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) to demonstrate that when the inspections, tests, and analyses are performed and the acceptance criteria are met, the facility has been constructed and will operate in conformance with the COL application, the Atomic Energy Act, and U.S. Nuclear Regulatory Commission (NRC) regulations.

### 14.0S Verification Programs

In this supplemental section of the FSAR, the applicant identifies the information to be included in the following sections of Chapter 14. This section is for information only and does not require an NRC staff technical evaluation.

#### 14.1 Specific Information To Be Included in Preliminary Safety Analysis Reports

This section is not applicable to the Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52 COL applicants.

#### 14.1S Specific Information To Be Addressed For The Initial Plant Test Program

##### 14.1S.1 Introduction

This section of the FSAR is a new section that was added in accordance with the guidance of RG 1.206. In this section, the applicant identifies the regulations applicable to the plant-specific ITP.

### **14.1S.2 Summary of Application**

In FSAR Section 14.1S, the COL applicant notes that the ITP was designed to address the relevant requirements of 10 CFR 30.53; 10 CFR 50.34(b)(6)(iii); 10 CFR Part 50, Appendix B, Section XI; 10 CFR Part 50, Appendix J, Section III.A.4; and 10 CFR 52.79. The COL applicant also notes that NRC regulatory guidelines used to develop the ITP are listed in Section 14.2.7 of the referenced Advanced Boiling-Water Reactor (ABWR) design control document (DCD).

### **14.1S.3 Regulatory Basis**

The applicable regulatory requirements for the ITP are as follows:

- 10 CFR 30.53, as it relates to testing radiation detection equipment and monitoring Instruments
- 10 CFR 52.79(a)(28), as it relates to preoperational testing and initial operations
- 10 CFR Part 50, Appendix B, Section XI, as it relates to test programs demonstrating that SSCs will perform satisfactorily
- 10 CFR Part 50, Appendix J, Section III.A.4, as it relates to preoperational leakage rate testing of the reactor's primary containment

### **14.1S.4 Technical Evaluation**

NRC staff determined that the South Texas Project (STP) Units 3 and 4 FSAR Section 14.1S identifies all of the regulations that were used to meet the plant-specific ITP. Therefore, the information is acceptable.

### **14.1S.5 Post Combined License Activities**

There are no post COL activities related to this section.

### **14.1S.6 Conclusion**

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 ITP regulations, and no outstanding information is expected to be addressed in the COL FSAR related to this subsection.

## **14.2 Specific Information To Be Included in the FSAR (Related to RG 1.206, Regulatory Position C.1.14.2, "Initial Plant Test Program")**

This section of the FSAR provides detailed information to address the following 12 areas associated with the initial plant test program:

Summary of test program and objectives  
Organization and staffing  
Test procedures  
Conduct of the test program  
Review, evaluation, and approval of test results

Test records  
Conformance of test program with regulatory guides  
Utilization of reactor operating and testing experience in the development of test program  
Trial use of plant operating and emergency procedures  
Initial fuel loading and initial criticality  
Test program schedule and sequence  
Individual test descriptions

Each area is discussed below.

### **14.2.1 Summary of Test Program and Objectives**

Section 14.2.1 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 14.2.1 of the certified ABWR DCD, Revision 4 referenced in 10 CFR Part 52, Appendix A, with no departures or supplements. NRC staff reviewed the COL application and checked the referenced ABWR 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 issue 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 have been resolved.

### **14.2.2 Organization and Staffing**

#### **14.2.2.1 Introduction**

This section of the FSAR addresses the organization that manages, supervises, or executes any phase of the test program. The discussion addresses the organizational authorities and responsibilities, the degree of participation of each identified organizational unit, and the principal participants. The organizational units addressed are (1) normal plant staff, (2) startup group, (3) nuclear steam supply system (NSSS) vendor staff, and (4) other concerned parties outside the plant staff organizations (e.g., architect-engineer, the constructor, the turbine-generator supplier, and vendors of other equipment).

#### **14.2.2.2 Summary of Application**

Section 14.2.2 of the STP Units 3 and 4 FSAR incorporates by reference Section 14.2.2 of the ABWR DCD, Revision 4 referenced in 10 CFR Part 52, Appendix A.

In addition, the applicant provides the following:

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

- STD DEP Admin
- STD DEP Vendor Vendor Replacement

Specifically, in COL FSAR Subsections 14.2.2.1, "Normal Plant Staff," 14.2.2.2, "Startup Group," 14.2.2.3, "Nuclear Steam Supply System (NSSS) Vendor," and 14.2.2.5, "Interrelationships and Interfaces," the COL applicant replaces the reference to General Electric

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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.

(GE) or General Electric-Hitachi (GEH) as the NSSS vendor with the generic term “NSSS vendor.”

### Supplemental Information

In FSAR Section 14.2.2.1, the applicant provides an additional description of the role of plant staff for preoperational and start-up testing and states that the duties and responsibilities of the staff are described in the STP Units 3 and 4 Startup Administrative Manual (SAM).

#### **14.2.2.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NUREG–1503, “Final Safety Evaluation Report Related to the Certification of the Advanced Boiling-Water Reactor Design,” (July 1994) (Final Safety Evaluation Report [FSER] related to the ABWR DCD). In addition, the relevant requirements of the Commission regulations for the supplemental information in the SAM on administrative controls governing the ITP—and the associated acceptance criteria—are in Section 14.2 of NUREG–0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants,” the Standard Review Plan (SRP).

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

In addition, the relevant requirements of the Commission regulations for the supplemental information in the SAM on administrative controls governing the ITP—and the associated acceptance criteria—are in Section 14.2 of NUREG–0800, RG 1.68; and RG 1.206, Section C.I.14. The acceptance criteria for organizational administrative functions that govern the ITP are in NUREG–0800, Section 14.2, SRP Acceptance Criteria Item 3.A, “Management Organizations”; Item 3.D, “Staff Responsibilities, Authorities and Qualifications,” RG 1.68; Regulatory Position C.6, “Participation of Plant Operating and Technical Staff”; and RG 1.206 Regulatory Position C.I.14.2.2, “Organization and Staffing.”

#### **14.2.2.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 14.2.2 of the generic DCD for the ABWR design. The staff reviewed Section 14.2.2 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:

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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 Not Requiring Prior NRC Approval

- STD DEP Admin
- STD DEP Vendor, Vendor Replacement

NRC staff reviewed the administrative departures in FSAR Subsections 14.2.2.1, 14.2.2.2, 14.2.2.3, and 14.2.2.5. The staff found it acceptable to delete “GEH” and replace it with “NSSS vendor” because Toshiba is now the alternate NSSS vendor for the STP Units 3 and 4 ITP.

The applicant's evaluation determined that these departures do 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 these departures do not require prior NRC approval.

### Supplemental Information

In FSAR Subsection 14.2.2.1, “Normal Plant Staff,” the COL applicant identified that plant staff are involved in the ITP. This includes plant staff and startup engineer assignments to perform tests and operate permanent plant equipment that has been released from construction to the startup organization. The supplemental information provided by the applicant also pointed to the SAM for the duties and responsibilities of key plant staff. However, the COL applicant did not include the SAM in the COL application. In Request for Additional Information (**RAI 14.02-1**) the staff requested STP to provide the SAM on the docket for STP Units 3 and 4. In response to this RAI, on February 16, 2009, the COL applicant submitted U7-P-SU01-0001, “STP Unit 3&4 Startup Administration Manual,” Revision 1, dated February 12, 2009. This resolved **RAI 14.02-1**.

In FSAR Subsection 14.2.2.2, “Startup Group,” the COL applicant provides a startup test group with augmented staff from other parties such as the NSSS vendor, the architect-engineer and plant constructor. SAM Section 3.0 also provides additional details on these augmented group responsibilities.

In FSAR Subsection 14.2.2.3, “Nuclear Steam Supply System (NSSS) Vendor,” the COL applicant has replaced “GE” with generic term “NSSS” vendor.” The NSSS vendor is the supplier of the BWR NSSS and is responsible for the specific BWR designs. The NSSS vendor resident site manager is responsible for all NSSS vendor-supplied equipment, is the official site spokesperson for the NSSS vendor, and coordinates with the plant owner’s staff to perform several duties that include:

- (1) Reviewing and approving test procedures, changes to test procedures and test results within the NSSS scope of supply.
- (2) Providing technical direction to the station staff
- (3) Managing the activities of the NSSS vendor site personnel in providing technical direction to shift personnel in the testing and operation of NSSS vendor-supplied equipment.
- (4) Acting as the Liaison between the site and the NSSS vendor home office to provide rapid and effective solutions to problems that cannot be resolved onsite.

- (5) Participating as a member in the Startup Coordinating Group (SCG).

In FSAR Subsection 14.2.2.5, "Interrelationships and Interfaces," NRC staff determined that the COL applicant should provide effective coordination between the various site organizations involved in the ITP through the SCG. The SCG is composed of the plant owner/operator, NSSS vendor, and others. SAM Section 3.0, "Responsibilities," provides additional details on the responsibilities of each individual within these organizations.

The staff reviewed STP Units 3 and 4 SAM Section 3.0, "Responsibilities," and found that it contains organizational responsibilities for several different groups (e.g., Joint Test Group (JTP), Preoperational/Startup Test Group, Plant Operations Review Committee (PORC)), including several different directors, managers and test engineers responsible for conducting preoperational and startup test activities for STP Units 3 and 4. SAM Section 3.0 adequately defines roles and responsibilities for each group, committee, manager, director or engineer within the entire STP ITP organization. In accordance with NUREG-0800, SRP 14.2, Item 3.A, the staff determined that FSAR Subsections 14.2.2.1 through 14.2.2.5 and SAM Section 3.0 describe the principal management positions responsible for planning, executing and documenting ITP activities. These descriptions include augmented organizations managing or executing any phase of the ITP. Therefore, these FSAR Subsections and SAM Section 3.0 are acceptable.

FSAR Subsection 14.2.2.1 and SAM Section 3.0 discusses STP organizational staff training and qualification requirements for personnel conducting the ITP. SAM Subsection 14.2.2.1 references FSAR Section 13.1. In COL FSAR Section 13.1.2, "Operating Organization," the staff determined that the COL applicant references RG 1.8, "Qualification and Training of Personnel for Nuclear Power Plants," which endorses the use of American National Standards Institute (ANSI)/American Nuclear Society (ANS)-3.1-1993; R1999, "Selection, Qualification, and Training of Personnel for Nuclear Power Plants." SAM Section 3.0 also references the STP quality assurance program description (QAPD) for training and qualification of personnel conducting the ITP. FSAR Section 13.1 and SAM Section 3.0 describe appropriate training requirements for organizations conducting the ITP to ensure that necessary plant staff are ready to begin the ITP, in accordance with NUREG-0800 SRP Section 14.2, Item 3.D. Therefore, FSAR Subsection 14.2.2.1 and SAM Section 3.0 are acceptable.

#### **14.2.2.5      *Post Combined License Activities***

There are no post COL activities related to this section.

#### **14.2.2.6      *Conclusion***

The 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 organization and staffing and the administrative controls that govern the ITP, 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 organization and staffing 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.

The staff reviewed that COL FSAR Subsections 14.2.2.1 through 14.2.2.5 and SAM Section 3.0 and found them acceptable because they describe the organizational responsibilities and authorities, the degree of participation of each organizational unit in the implementation of the ITP, and the personnel training, experience and qualification requirements for individuals conducting the ITP. Therefore, in accordance with NUREG–0800 SRP Section 14.2, the FSAR Sections and SAM Section 3.0 are acceptable.

### **14.2.3 Test Procedures**

#### **14.2.3.1 Introduction**

This section of the FSAR addresses the process used to develop, review, and approve individual test procedures, including the organizational units or personnel that are involved in performing these activities and their respective responsibilities. In general, testing during all phases of the ITP will be conducted using detailed, step-by-step written procedures to control the conduct of each test. These test procedures will specify testing prerequisites, describe desired initial conditions, include appropriate methods to direct and control test performance (including the sequencing of testing), specify acceptance criteria for evaluating the test, and provide for or specify the format for recording data or observations.

#### **14.2.3.2 Summary of Application**

Section 14.2.3 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 14.2.3 of the certified ABWR DCD Revision 4, referenced in 10 CFR Part 52, Appendix A.

In addition, the COL applicant provides the following:

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

- STD DEP Vendor Vendor Replacement

Specifically, in COL FSAR Section 14.2.3, the COL applicant replaces the reference to GEH as the NSSS vendor with the generic term “NSSS vendor.”

##### *COL License Information Item*

- COL License Information Item 14.2 Test Procedures/Startup Administrative Manual

In DCD COL License Information Item 14.2, Item (4) requires the COL applicant to submit to NRC staff for review the (1) approved preoperational test procedures approximately 60 days before their intended use, and (2) startup test procedures approximately 60 days before fuel loading.

#### **14.2.3.3 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 COL license information item, and the associated acceptance criteria, are in NUREG–0800 Section 14.2; RG 1.68; and RG 1.206, Section C.I.14. COL License Information Item 14.2, Item (4) for test

procedures must also satisfy the guidelines in NUREG–0800 Section 14.2, SRP Acceptance Criteria Item 3.E; RG 1.68, Regulatory Position C.4, “Procedures”; and RG 1.206, Regulatory Position C.I.14.2.3, “Test Procedures.”

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. 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.

NUREG–0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants,” SRP Section 14.2, “Initial Plant Test Program,” Revision 3, issued March 2007, provide guidance and acceptance criteria to NRC staff for reviewing a proposed design certification (DC) or COL applicant’s ITP. Because the COL applicants referencing the ABWR DC are committed to SRP Section 14.2, Revision 3, NRC staff used this guidance document as part of the regulatory criteria for the review and acceptance of the DC applicant’s COL License Information Item 14.2, Item (4).

#### **14.2.3.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 14.2.3 of the generic DCD for the ABWR design. The staff reviewed Section 14.2.3 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.

FSAR Section 14.2.3, states that “the NSSS vendor will provide the COL applicant with scoping documents (i.e., preoperational and startup test specifications) containing testing objective and acceptance criteria applicable to its scope of design responsibility.” For additional details on the evaluation of scoping documents, see SER Subsection 14.2.13.4.

The staff reviewed the information in the COL FSAR:

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

- STD DEP Vendor, Vendor Replacement

The staff reviewed the administrative departure in FSAR Section 14.2.3. The staff found it acceptable to delete “GEH” and replace it with “NSSS vendor” because Toshiba is now the alternate NSSS vendor for the STP Units 3 and 4 ITP.

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 this 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 from the certified ABWR DCD is subject to NRC inspections.

COL License Information Item

- COL License Information Item 14.2 Test Procedures/Startup Administrative Manual

In FSAR Subsection 14.2.13.2, "Test Procedures/Startup Administrative Manual," the staff determined that the COL applicant has provided the following post COL commitments for test procedures to address COL License Information Item 14.2, Item (4):

1. The approved preoperational test procedures will be available for NRC review approximately 60 days before their intended use but no later than 60 days before fuel loading (Section 14.2.30. (COM 14.2-3).
2. Approved startup test procedures will be available for NRC review approximately 60 days before fuel loading (Subsection 14.2-3). (COM 14.2-4).

The staff issued RAI 14.02-14 stating that the commitments associated with COL License Information Item 14.2 will be subject to license conditions and requested that the applicant inform the NRC staff as to whether or not the proposed standard license conditions are considered appropriate to support the STP Units 3 and 4 COL. For additional details, see Subsection 14.2.13.4 of this SER. This is being tracked as Open Item 14.02-14.

In addition, the COL applicant uses the following SAM sections to describe the administrative process used to develop, review, approve, and revise preoperational and startup test procedures:

- Section 3.2, "Group Responsibilities"
- Section 4.5.1, "Distribution and Control of Procedures"
- Section 4.5.2, "Adherence to Procedures and Use of Procedures"
- Section 4.5.3, "Performance of Preoperational and Startup Tests"
- Section 4.6, "Test Procedure and Control"
- Section 4.7, "Preparation, Initial Review and Approval"
- Section 4.8, "Test Modifications"

In SAM Section 3.2, the COL applicant identifies NSSS Vendor personnel, architectural engineers, and other major contractors to provide test objectives and acceptance criteria used to develop detailed test procedures. In SAM Section 4.5.1, the COL applicant identifies different personnel to develop, review, and approve test procedures. The Startup Administrative Manager has the responsibility to control the master original of the approved test procedures. A Test Director reviews and approves test procedures before the commencement of tests. Only one OFFICIAL TEST COPY is issued for a particular test procedure revision. Tests will only be conducted using the OFFICIAL Test COPY of the latest approved test procedures. Tests are

performed in sequence; if tests are performed out of sequence, the OFFICIAL TEST COPY clearly identifies within the applicable procedure, which steps were completed out of sequence.

As noted in SAM Section 4.6, testing during all phases of the test program is conducted using test procedures to control the conduct of each test. The term “Test Procedure” is used to refer to all Nuclear Island (NI), Balance of Plant (BOP), and Turbine Island (TI) preoperational and startup test procedures. This section describes the content of the typical test procedure and establishes the requirements for test procedure control, which includes the preparation, initial review, implementation update, final review and approval, and revision control. This process includes establishing the purpose, description, and acceptance criteria for each test.

SAM Section 4.7 provides controls for the preparation, initial review, and approval of test procedures. In SAM Section 4.8, NRC staff determined the controls for modifying a test, including controls for major Test Procedure Change Notices (TPCNs), which may affect the safety of performing the test. For additional details, See SER Section 14.2.4.

Based on the above information, the staff determined that COM 14.2-3 and 14.2-4 are acceptable because they meet the guidance in COL license Information Item 14.2, Item (4) in generic ABWR DCD Subsection 14.2.13.2. COM 14.2-3 and 14.2-4 also meet the guidance in NUREG-0800 SRP 14.2, Item 3.E; RG 1.68 Regulatory Position C.4; and RG 1.206 Regulatory Position C.I.14.2.3. Therefore, COL License Information Item 14.2, Item (4) is acceptable.

#### **14.2.3.5 Post Combined License Activities**

The COL applicant identifies the following commitments:

- Commitment (COM) 14.2-3: Approved preoperational test procedures will be available for NRC review approximately 60 days before their intended use but no later than 60 days before fuel loading.
- Commitment (COM) 14.2-4: Approved startup test procedures will be available for NRC review approximately 60 days before fuel loading.

#### **14.2.3.6 Conclusion**

The 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 ITP test procedures. With the exception of Open Item 14.02-14, 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 ITP test procedures 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. However, as a result of Open Item 14.02-14, the staff was unable to finalize the conclusions related to this section, in accordance with the NRC requirements.

## **14.2.4 Conduct of the Test Program**

### **14.2.4.1 Introduction**

This section of the FSAR describes the administrative controls that govern the conduct of each major phase of the ITP. The ITP is conducted by the Startup Group in accordance with the SAM, which receives the same level of review and approval as do other plant administrative procedures. The SAM defines the specific format and content of preoperational and startup test procedures, as well as the review and approval process for both initial procedures and subsequent revisions or changes. The SAM also specifies the process for reviewing and approving test results and for resolving failures to meet the acceptance criteria and other operational problems or design deficiencies noted. The SAM describes the various phases of the ITP and establishes the requirements for progressing from one phase to the next, as well as those that move beyond selected hold points or milestones within a generic phase.

The COL applicant should describe in FSAR Section 14.2.4 or the SAM the methods followed to initiate plant modifications or maintenance tasks that are determined to be necessary for conducting the test program. This description should include the methods used to ensure retesting following such modifications or maintenance. In addition, the description should discuss the involvement of design organizations and the applicant in reviewing and approving proposed plant modifications. The description should also include the methods and identify provisions to ensure that the retesting that is required for modifications or maintenance remains in compliance with the ITAAC commitments. In addition, the applicant should describe the administrative controls pertaining to the adherence to approved test procedures during the conduct of the test program as well as the methods for effecting changes to approved test procedures.

### **14.2.4.2 Summary of Application**

Section 14.2.4 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 14.2.4, of the certified ABWR DCD, Revision 4 referenced in 10 CFR Part 52, Appendix A, with no departures or supplements.

In addition, the COL applicant provides the following:

#### **COL License Information Item**

- COL License Information Item 14.2 Test Procedures/Startup Administrative Manual

In DCD COL License Information Item 14.2, Item (5) requires a startup administrative manual (procedure) and any other documents that delineate the conduct of the test program to be reviewed by the NRC at the time of the COL.

In FSAR Subsection 14.2.13.2, "Test Procedures/Startup Administrative Manual," the COL applicant discusses COL License Information Item 14.2, Item (5), which is associated with test procedures and the SAM. The COL applicant submitted a revised SAM on June 17, 2009, for STP Units 3 and 4 (Agency-wide Documents Access and Management System (ADAMS) Accession Number ML091700122). The SAM governs administrative controls for conducting

the ITP. SAM Section 4.5, "Conduct of Testing," also includes guidance that will govern the conduct of the ITP.

#### **14.2.4.3 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 COL License Information Item and the associated acceptance criteria are in NUREG–0800 Section 14.2; RG 1.68; and RG 1.206, Section C.I.14. COL License Information Item 14.2, Item (5) is used to conduct the ITP and must satisfy the guidance in NUREG–0800 SRP 14.2, Acceptance Criterion 3.B, "Conduct of Initial Test Program"; RG 1.68; Regulatory Positions C.2, "Prerequisites for Testing," C.3, "Scope, Conditions, and Length of Testing," C.6, "Participation of Plant Operating and Technical Staff," and C.8, "Milestones and Power Hold Points"; and RG 1.206 C.I.14.2.4, "Conduct of Test Program."

#### **14.2.4.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 14.2.2 of the certified ABWR DCD. The staff reviewed Section 14.2.4 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 the 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.

Because the COL applicant takes no exceptions to Section 14.2.4 of the generic DCD for the ABWR and supplements FSAR Section 14.2.13.2, "Test Procedures/Startup Administrative Manual," with a reference to the SAM, NRC staff limited the review to SAM Section 4.5, "Conduct of Testing."

#### COL License Information Item

- COL License Information Item 14.2 Test Procedures/Startup Administrative Manual (Item 5)

SAM Section 4.5 contains guidance governing the conduct of the ITP. This section contains several subsections for conducting tests by controlling the following activities:

- Distribution and Control of Procedures
- Adherence to Procedures and Use of Procedures
- Performance of Preoperational and Startup Tests
  - Responsibilities and Interface
  - Measuring and Test Equipment
  - Performance of Tests
    - a. Test Briefing

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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.

- b. Test Coordination
- c. Test Entries
- d. Test Procedure Corrections
- e. Test Interruptions
- f. Deficiency, Discrepancy, Exceptions, and Nonconformance Dispositions

Any test deficiencies, discrepancies, exceptions, and nonconformances shall be tracked and resolved as specified in procedures, policies, or instructions, in accordance with the STP Units 3 and 4 QAPD. NRC staff reviewed the STP Unit 3 and 4 QAPD and found that it has adequate controls for conducting test activities, in accordance with 10 CFR Part 50, Appendix B, Criterion XI, "Test Control."

The staff identified missing information related to guidance and regulations governing the conduct of the test program in SAM Section 4.5, "Conduct of Testing"; Section 4.8, "Procedure Modifications"; and Section 6.3, "Regulations and Regulatory Requirements for the ITP." Therefore, the staff requested additional information for three ITP tissues associated with guidance and regulations governing the ITP in the SAM.

RG 1.68, Revision 3 states, "Some preoperational tests completed as part of the Initial Test Program (ITP) cover certain ITAAC completed prior to fuel load. For example, testing performed to demonstrate that safety-related SSCs will perform satisfactorily in service must be conducted under a program that satisfies Criterion XI, 'Test Control,' of Appendix B to 10 CFR Part 50, and may also satisfy testing required by the ITAAC process." The scope of the ITP, however, is not limited solely to safety-related SSCs. Consequently, this guide specifies the scope of plant SSCs to be tested to satisfy the requirements of General Design Criteria (GDC) 1, "Quality Standards and Records" (as specified in Appendix A to 10 CFR Part 50), as well as the QA criteria set forth in Appendix B to 10 CFR Part 50. In addition, Section II.3.E.v of NUREG-0800 Section 14.2 states that "the applicant should include provisions to ensure that the retesting required for modifications or maintenance remains in compliance with inspections, tests, analyses, and acceptance criteria requirements."

Based on the information in RG 1.68 and NUREG-0800, Section 14.2 referred to above, the staff issued **RAI 14.02-2** requesting the applicant to update the STP Units 3 and 4 SAM and to add information describing the administrative controls necessary to ensure that the retesting required for modifications or maintenance remains in compliance with ITAAC requirements.

On June 17, 2009, the COL applicant submitted Revision 2 to Procedure U7-P-SU01-0001, "Startup Administrative Manual" (ADAMS Accession Number ML091700122). In STP Units 3 and 4 SAM Subsection 4.5.3.3, "Performance of Tests," page 28, the COL applicant adds a bullet that states "Prior to fuel load, maintenance or modifications may be performed on SSCs that are subject to an ITAAC." The COL applicant also adds three sub-bullets for ITAAC maintenance and modification activities to ensure that acceptance criteria are met when maintenance or modifications are completed, and that the Problem Identification and Resolution Program resolves any identified ITAAC-related deficiencies. NRC staff determined that these changes acceptable and **RAI 14.2-2** is therefore resolved.

In **RAI 14.02-3** the staff requested the applicant to add a requirement to SAM Section 4.8.1. The COL must evaluate and obtain a license amendment, if it is revealed that a major Test Procedure Change Notice (TPCN) requires a change to the TS in accordance with

10 CFR 50.59(c)(1) or meets any of the eight criteria in 10 CFR 50.59(c)(2)(i) through (viii) or any of the criteria in 10 CFR Part 52, Appendix A, Sections VIII.B.5.b and VIII.B.5.c..

The COL applicant's response to **RAI 14.02-3** adds the following information to STP Units 3 and 4 SAM Section 4.8.1, "Test Procedure Change Notice (TPCNs)," page 39:

Major TPCNs must be evaluated or screened to determine if a change to the Technical Specifications is required in accordance with 10 CFR 50.59 (c)(1) or if the TPCN meets and one of eight criteria in 10 CFR 50.59 (c)(2)(i) through (viii) or any of the criteria in 10 CFR Part 52, Appendix A.VIII.B.5.b or VIII.B.5.c. If a major TPCN meets the criteria outlined above, a license amendment is required. This process will be covered by a separate plant procedure.

The staff determined that these changes acceptable and **RAI 14.02-3** is therefore resolved.

RG 1.68, Revision 3, states, "The scope of the ITP is not limited solely to safety-related SSCs. Consequently, this guide specifies the scope of plant SSCs to be tested to satisfy the requirements of GDC 1, "Quality Standards and Records" (as specified in Appendix A to 10 CFR Part 50), as well as the quality assurance criteria set forth in Appendix B to 10 CFR Part 50. While all SSCs important to safety are required to be tested, all of them need not be tested to the same stringent requirements. Specifically, GDC 1 requires, in part, that SSCs important to safety shall be tested to quality standards commensurate with the importance of the safety functions to be performed. A graded approach is also inherent in the testing requirements of Criterion XI of Appendix B to 10 CFR Part 50."

Based on the above information in RG 1.68, the staff determined that in the SAM, the applicant does not address nonsafety-related SSCs that are important to safety to be included in the preoperational and initial startup test programs. For example, the scope of the Reliability Assurance Program could include nonsafety-related SSCs that are important to safety.

The staff issued **RAI 14.02-4** requesting the applicant to revise the SAM to address non-safety-related SSCs that are important to safety. Examples of non-safety-related SSCs that are important to safety include the fire protection system, environmental qualification (EQ) of electrical equipment important to safety, the alternate rod injection system used to mitigate anticipated transients without scram, and nonsafety-related station blackout power sources (e.g., combustion turbine generators) used to meet the station blackout rule.

The staff also requested the applicant to add 10 CFR 50.48, 10 CFR 50.49, 10 CFR 50.62, and any other rules that apply to nonsafety-related SSCs that are important to safety to U7-P-SU01-0001, Section 6.3.1, "U.S. Code of Federal Regulations (CFR)," because these regulations relate to SSCs that are important to safety.

The COL applicant's response to **RAI 14.02-4** adds the following information to the STP Units 3 and 4 SAM Section 6.3:

Systems important to safety include non-safety systems that have a safety function credited in the FSAR or the ABWR DCD. Examples of such non-safety-related systems include the fire protection system, the EQ of electrical equipment important to safety, the alternate rod injection system used to mitigate

Anticipated Transients Without Scram (ATWS), and nonsafety-related station blackout power sources (e.g., combustion turbine generators) used to meet the station blackout rule.

The COL applicant also adds 10 CFR 50.48, 10 CFR 50.49, and 10 CFR 50.62 to SAM Section 6.3.1, "U.S. Code of Federal Regulations." The staff determined that these changes acceptable; and **RAI 14.02-4** is therefore resolved.

Based on the acceptable RAI responses, the applicant has adequately addressed COL License Information Item 14.2, Item (5)

#### **14.2.4.5      *Post Combined License Activities***

There are no Post Col Activities related to this section.

#### **14.2.4.6      *Conclusion***

The 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 conduct of test program, 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 conduct of test program that were incorporated by reference have been resolved.

The staff concluded that the relevant information in the COL FSAR and SAM Section 4.5 addressing COL License Information Item 14.2, Item (4) is acceptable and meets the requirements and acceptance criteria in NUREG-0800 SRP 14.2, Item 3.B and the guidance in RG 1.68; Regulatory Positions C.2, C.3, C.6, and C.8; and RG 1.206, Regulatory Position C.I.14.2.4. The staff also concluded that the SAM contains test controls for safety-related SSCs that meet 10 CFR Part 50, Appendix B, Criterion XI, "Test Control." Therefore, the staff concluded that the SAM contains acceptable QA guidance for conducting the ITP that is sufficient to support the issuance of a license.

### **14.2.5      *Review, Evaluation, and Approval of Test Results (Related to RG 1.206, Regulatory Position C.I.14.2.5, "Review, Evaluation, and Approval of the Test Program")***

#### **14.2.5.1      *Introduction***

This section of the FSAR describes the specific controls to be established for the review, evaluation, and approval of test results for each major phase of the program by the appropriate personnel and/or organizations. This description includes specific controls to be established that ensure the notification of affected and responsible organizations or personnel when test acceptance criteria are not met, as well as the controls established to resolve such matters. The applicant also discusses plans pertaining to the (1) approval of test data for each major test phase before proceeding to the next test phase, and (2) approval of test data at each power test plateau (during the power-ascension phase) before increasing the power level.

NSSS vendor Toshiba, and others outside the plant staff organization (as appropriate), have the opportunity to review the results for conformance to predictions and expectations. Test results,

including final resolutions, are then reviewed and approved by a designated startup group of supervisory personnel.

#### **14.2.5.2 Summary of Application**

Section 14.2.5 of the COL FSAR incorporates by reference Section 14.2.5 of the certified ABWR DCD, Revision 4 referenced in 10 CFR Part 52, Appendix A.

In addition, the COL applicant provides the following:

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

- STD DEP Vendor Vendor Replacement

Specifically, in COL FSAR Section 14.2.5, the COL applicant replaces the reference to GEH as the NSSS vendor with the generic term “NSSS vendor.”

##### COL License Information Item

- COL License Information Item 14.2 Test Procedures/Startup Administration Manual (Item 6)

In DCD COL License Information Item 14.2, Item (6) requires that a SAM (procedure) and any other documents that delineate the review, evaluation, and approval of test results be submitted for NRC review. STP Units 3 and 4 SAM Section 4.9.2, “Review and Approval of Test Results,” discusses test results and the review and acceptance of test packages.

#### **14.2.5.3 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 COL License Information Item 14.2, Item (6) and the associated acceptance criteria are in Section 14.2 of NUREG–0800.

NUREG–0800 Section 14.2, SRP Acceptance Criteria Item 3.F, “Review, Evaluation and Approval of Test Results”; RG 1.68; Regulatory Position C.9, “Test Reports”; and RG 1.206 Regulatory Position C.I.14.2.5, “Review, Evaluation and Approval of Test Results,” provides additional guidance on the review, evaluation and approval of preoperational and startup test reports and the results in those reports. In addition, a summary of startup testing should be included in a startup test report as discussed in RG 1.16, “Reporting of Operating Information – Appendix A, Technical Specifications.”

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. Tier 2 departures 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.

#### **14.2.5.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 14.2.5 of the generic DCD for the ABWR design. The staff reviewed Section 14.2.5 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.

The staff reviewed the information in the COL FSAR:

Tier 2 Departure Not Requiring Prior NRC Approval

- STD DEP Vendor Vendor Replacement

NRC staff determined that it acceptable to delete "GEH" and replace it with "NSSS vendor" because Toshiba is now the alternate NSSS vendor for the STP Units 3 and 4 ITP.

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 this departure does not require prior NRC approval.

COL License Information Item

- COL License Information Item 14.2 Test Procedures/Startup Administration Manual (item 6)

The staff determined that STP Units 3 and 4 SAM Section 4.9 "Test Results Review and Acceptance," Section 4.9.1, "Initial Test Summary Report" (Startup Test Only), and Section 4.9.2, "Review and Approval of Test Results," contains guidance for STP staff's review and approval of test results and test reports for the preoperational and startup test program. In SAM Section 4.9.1, the COL applicant describes the contents of the initial test report including the test abstract performance against the acceptance criteria, plant conditions, test results, test exceptions, final resolution of test exceptions, and test director preparation of the initial test summary report. In SAM Section 4.9.2, the COL applicant describes test director instructions on how to assemble the Test Package of preoperational and startup test results; test results verify whether the ITAAC are complete and have the approval of the applicant's Preoperational Test Group Leader, Quality Assurance Manager, and Startup Manager. The Test Package contains the following information:

- Initial test summary reports and the associated Startup Test Report Approval Sheets
- Official Test Copy of the startup test procedure and associated data records
- All TPCNs issued against the test procedure
- Test Exception Log
- All nonconformance reports issued

The Test Director then signs the Test Package and submits it to the STP organizations responsible for approving test results. The PORC and the JTG reviews provide recommendations and approve the Test Package. The completed test records and test procedures must meet the requirements of 10 CFR Part 50, Appendix B, Criterion 17, "Quality Assurance Records." The COL applicant ITP organizations must review test exceptions and resolve open items identified during the review of test results. The COL applicant ITP

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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.

organizations then implement Test Plateau Prerequisites. COL application SAM Section 6.3, "Regulations and Regulatory Requirement," identifies all regulations and RGs that apply to the STP Units 3 and 4 ITP, including RG 1.16, "Reporting of Operating Information Appendix A Technical Specifications."

The staff determined that STP Units 3 and 4 COL FSAR Section 14.2.5 and SAM Sections 4.9.2 and 6.3 meet COL License Information Item 14.2, Item (6) in generic ABWR DCD Sections 14.2.5 and Subsection 14.2.13.2. These SAM sections also meet the guidance in NUREG-0800 Section 14.2, SRP Acceptance Criteria Item 3.F, "Review, Evaluation and Approval of Test Results"; RG 1.68 Regulatory Position C.9, "Test Reports"; and RG 1.206 Regulatory Position C.I.14.2.5, "Review, Evaluation and Approval of Test Results." Therefore, the applicant has adequately addressed COL License Information Item 14.2, Item (6).

#### **14.2.5.5      *Post Combined License Activities***

There are no post Col activities related to this section.

#### **14.2.5.6      *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 relating to the review, evaluation, and approval of test results, 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 review, evaluation, and approval of test results that were incorporated by reference have been resolved.

The staff concluded that the relevant information in the COL FSAR and SAM addressing COL License Information Item 14.2, Item (6) is acceptable. This information meets the requirements of and acceptance criteria in NUREG-0800 Section 14.2, SRP Acceptance Criteria Item 3.F, "Review, Evaluation and Approval of Test Results"; RG 1.68 Regulatory Position C.9, "Test Reports"; and RG 1.206 Regulatory Position C.I.14.2.5, "Review, Evaluation and Approval of Test Results."

The staff concluded that COL FSAR Section 14.2.5 and SAM Section 4.9.2 contain sufficient information for the review, evaluation, and approval of test results associated with completing the ITP and with sufficient information to support the issuance of a license. Therefore, FSAR Section 14.2.5 and SAM Section 4.9.2 are acceptable.

### **14.2.6 Test Records**

#### **14.2.6.1      *Introduction***

This section of the FSAR describes the protocols pertaining to the disposition of test procedures and test data following the completion of the ITP. ITP results are compiled and maintained according to the startup manual, plant administrative procedures, and applicable regulatory requirements. Test records that demonstrate the adequacy of safety-related SSCs will be retained for the life of the plant. Retention periods for other test records will be based on consideration of their usefulness in documenting initial plant performance characteristics.

#### **14.2.6.2 Summary of Application**

Section 14.2.6 of the COL FSAR incorporates by reference Section 14.2.6 of the certified ABWR DCD, Revision 4 referenced in 10 CFR Part 52 Appendix A, with no departures or supplements. In addition, the COL applicant provides the following:

##### Supplemental Information

The COL applicant provides supplemental information in STP SAM Section 4.9.2, “Review and Approval of Test Results,” and Subsection 4.9.2.1, “Test Package.”

#### **14.2.6.3 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 reviewing the supplemental information and the associated acceptance criteria are in NUREG–0800 SRP Section 14.2; RG 1.206 Regulatory Position C.I.14.2.6, “Test Records”; RG 1.68 Regulatory Position C.9, “Test Reports”; and RG 1.28, “Quality Assurance Program Requirements (Design and Construction),” Revision 3, dated August 1985, Table 1, “Retentions Times for Lifetime and Nonpermanent Records,” Section 5, “Preoperational and Startup Test Records.”

#### **14.2.6.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 14.2.6 of the generic DCD for the ABWR design. The staff reviewed Section 14.2.6 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 and the SAM:

##### Supplementary Information

The COL applicant submitted the SAM on the docket. STP SAM Section 4.9.2 and Subsection 4.9.2.1 provide information on the COL applicant’s responsibilities for preparing preoperational test records and the content of test package documents and for completing the tests at different testing plateaus. This information includes requirements for identifying ITAAC-related tests and for endorsing completed test packages.

STP SAM Subsection 4.9.2.4, “Completed Test Procedures,” states that “test records will be governed by the QA program consistent with 10 CFR Part 50, Appendix B, Criterion 17, Quality Assurance Records.” Furthermore, this subsection states that “completed test procedures, both for preoperational and startup testing, are records as defined in the SAM to be sent to the STP Units 3 and 4 Records Management/Document Control.”

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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 also determined that STP SAM Section 6.3.2 lists RG 1.16. Therefore, the STP SAM also meets the guidance in RG 1.68, Regulatory Position C.9; and RG 1.206, Regulatory Position C.I.14.2.6 for maintaining test records. Thus, the staff determined found that the COL applicant will maintain test records in accordance with generic DCD Section 14.2.6 and SAM Section 4.9.2. The guidance for maintaining test records in the COL application STP Units 3 and 4 ITP is therefore acceptable.

#### **14.2.6.5 Post Combined License Activities**

There are no post COL activities related to this section.

#### **14.2.6.6 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 ITP test records, 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 ITP test records that were incorporated by reference have been resolved.

In addition, the staff concluded that the relevant information in the COL FSAR and SAM Sections 4.9.2 and 6.3.2 are acceptable and meet the requirements and acceptance criteria in NUREG-0800, SRP Section 14.2; RG 1.206, Regulatory Position C.I.14.2.6; and RG 1.68, Regulatory Position C.9 for maintaining test records.

### **14.2.7 Conformance of Test Programs with Regulatory Guides**

#### **14.2.7.1 Introduction**

This section of the FSAR discusses the ITP and lists NRC RGs applicable to the development of the ITP.

#### **14.2.7.2 Summary of Application**

Section 14.2.7 of the COL FSAR incorporates by reference Section 14.2.7 of the certified ABWR DCD, Revision 4 referenced in 10 CFR Part 52, Appendix A.

In addition, in FSAR Section 14.2.7, 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 removes the reference to RG 1.108, which was withdrawn in August 1993, and replaces RG 1.108 with RG 1.9.

### **14.2.7.3 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 conformance of test programs with RGs and the associated acceptance criteria are in Section 14.2 of NUREG-0800.

In accordance with Section VIII, “Process 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.b, which is similar to the requirements in 10 CFR 50.59.

### **14.2.7.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 14.2.7 of the generic DCD for the ABWR design. The staff reviewed Section 14.2.7 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*

The following Tier 2 departure Not Requiring Prior NRC Approval identified by the applicant in this section may also be evaluated in other sections of this SER accordingly. For more information, please refer to COLA Part 07, Section 5.0 for a listing of all FSAR sections affected by this departure.

- STD DEP 9.5-1 Diesel Generator Jacket Cooling Water System

The applicant modifies ABWR DCD Section 14.2.7 to use RG 1.9 instead of RG 1.108 to develop the ITP, as it relates to emergency diesel generator testing. 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, 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.

### **14.2.7.5 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.

#### **14.2.7.6 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 relating to conformance of test programs with regulatory guides, 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 conformance of test programs with regulatory guides that were incorporated by reference have been resolved.

The staff confirmed that the COL applicant uses all RGs except for the use of RG 1.9 instead of RG 1.108 as discussed in SER Subsection 14.2.7.4 above, which is referenced in the DCD to develop the STP Units 3 and 4 ABWR ITP. Therefore, conformance of the ITP with the RGs is acceptable and supports the issuance of a license.

The staff concluded that the relevant information in COL FSAR Section 14.2.7 is acceptable and meets the requirements of 10 CFR Part 52 Appendix A, Section VIII.B.5.b. In FSAR Section 14.2.7, the COL applicant replaces RG 1.108 with RG 1.9. The staff concluded that STP DEP 9.5-1 is acceptable because the COL applicant follows the requirements in 10 CFR Part 52, Appendix A, Section VIII.B.5.b and does not need prior NRC approval to replace RG 1.108 with RG 1.9.

#### **14.2.8 Utilization of Reactor Operating and Testing Experience in the Development of Test Program**

##### **14.2.8.1 Introduction**

This section of the FSAR describes the program for reviewing available information on reactor operating and testing experiences and should discuss how the applicant uses this information in developing the ITP. This description should include the sources and types of information reviewed, the conclusions or findings, and the effect of the review on the ITP.

##### **14.2.8.2 Summary of Application**

Section 14.2.8 of the COL FSAR incorporates by reference Section 14.2.8 of the certified ABWR DCD, Revision 4 referenced in 10 CFR Part 52, Appendix A.

In addition, the COL applicant provides the following:

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

- STD DEP Vendor Vendor Replacement

Specifically, in COL FSAR Section 14.2.8, the COL applicant replaces the reference to GEH as the NSSS vendor with the generic term "NSSS vendor."

##### *Supplemental Information*

In COL FSAR Section 14.2.8, the COL applicant also incorporates supplemental information related to the benefits of experience acquired with the successful and safe startup of previous BWR/1-6 and ABWR plants.

### **14.2.8.3 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 utilization of reactor operating and testing experience in the development of test programs, and the associated acceptance criteria, are in Section 14.2 of NUREG–0800.

In particular: NUREG–0800 Section 14.2, SRP Acceptance Criteria 3.G, “Utilization of Reactor Operating and Testing Experience in Development of the Test Program”; RG 1.206, Regulatory Position C.I.14.2.8, “Utilization of Reactor Operating and Testing Experience in Test Program Development”; and RG 1.68, Regulatory Position C.7, “Trial Testing of Plant Operating and Emergency Procedures.” provide guidance on reviewing available information on reactor operating and testing experiences and how this information is used in developing the ITP.

In accordance with Section VIII, “Process 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.b, which is similar to the requirements in 10 CFR 50.59.

### **14.2.8.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved Section 14.2.8 of the certified ABWR DCD. The staff reviewed Section 14.2.8 of the STP Units 3 and 4 COL FSAR and checked the referenced ABWR DCD to ensure that the combination of supplemental 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.

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

- STD DEP Vendor

NRC staff determined that it acceptable to delete “GEH” and replace it with “NSSS vendor” because Toshiba is now the alternate NSSS vendor for the STP Units 3 and 4 ITP.

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 this departure does not require prior NRC approval.

#### *Supplemental Information*

NRC staff determined that the supplemental information on operating experience and knowledge gained from ABWR plants and other reactor types has been factored into the design and test specifications for the NSSS vendor-supplied systems and equipment, which will be

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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.

demonstrated during the preoperational and startup test programs for the STP Units 3 and 4 ITP. The staff determined that the supplemental information related to operating and testing experience meets the guidance in NUREG–0800 SRP Section 14.2, Item 3.G; RG 1.206, Regulatory Position C.I.14.2.8; and RG 1.68, Regulatory Position C.7 and is therefore acceptable.

#### **14.2.8.5 Post Combined License Activities**

There are no post COL activities related to this section.

#### **14.2.8.6 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 industry operating and testing experience, 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 related to industry operating and testing experience 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 Part 52, Appendix A, Section VIII.B.5.

In accordance with NUREG–0800 Section 14.2, SRP Acceptance Criteria Item 3.G; RG 1.206, Regulatory Position C.I.14.2.8; and RG 1.68, Regulatory Position C.7, the staff concluded that the COL applicant has incorporated supplemental information on industry operating and testing experience from BWR/1-6 and ABWR plants to develop the STP Units 3 and 4 ITP; therefore, it is acceptable.

#### **14.2.9 Trial Use of Plant Operating and Emergency Procedures**

Section 14.2.9 of the COL FSAR incorporates by reference Section 14.2.9 of the certified ABWR DCD, Revision 4 referenced into 10 CFR Part 52, Appendix A, with no departures or supplements. NRC staff reviewed the COL application and checked the referenced DCD to ensure that no issue relating to this section remained for review.<sup>1</sup> The staff's review confirmed that there is no outstanding issue 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 this section have been resolved.

#### **14.2.10 Initial Fuel Loading and Initial Criticality**

##### **14.2.10.1 Introduction**

This section of the FSAR describes plans for initial fuel loading and initial criticality, including the prerequisites and precautionary measures to be established to ensure safe operation consistent with the guidelines and regulatory positions in RG 1.68. Prerequisites should include the successful completion of all ITAAC associated with preoperational tests before fuel loading,

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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.



adherence to TS requirements, and actions to be taken in the event of unanticipated errors or malfunctions.

Fuel loading and initial criticality are conducted in a very controlled manner, in accordance with specific written procedures as part of the startup test phase. NRC approves fuel loading after verifying that the COL applicant has satisfactorily completed the prerequisite testing or has provided the appropriate justification to proceed with fuel loading and completes the preoperational testing after fuel loading.

This section addresses the completion of preoperational testing, including the review and approval of test results required before fuel loading. If portions of any preoperational tests are intended to be conducted or their results approved after fuel loading, then the following shall be documented:

- List each test.
- State which portions of each test will be delayed until after fuel loading.
- Provide the technical justification for delaying these portions.
- State when each test will be completed and the results approved.

#### **14.2.10.2 Summary of Application**

Section 14.2.10 of the COL FSAR incorporates by reference Section 14.2.10 of the certified ABWR DCD, Revision 4 referenced in 10 CFR Part 52, Appendix A.

In addition, the COL applicant provides the following:

##### COL License Information Item

- COL License Information Item 14.2      Test Procedures/Startup Administration Manual (Item 7)

In DCD COL License Information Item 14.2, Item (7) requires the COL applicant to provide a SAM (procedure) and any other documents that delineate the method for controlling pre-fuel load checks, initial fuel loading, pre-critical testing, and initial criticality for NRC to review. The COL applicant also addresses this COL license information item in FSAR Subsection 14.2.13.2, "Test Procedures/Startup Administrative Manual"; and in SAM Section 3.3, "Post Fuel Load Responsibilities," SAM Section 4.1, "Overview."

#### **14.2.10.3 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 initial fuel loading and initial criticality, and the associated acceptance criteria, are in Section 14.2 of NUREG-0800.

COL License Information Item 14.2 is satisfied based on meeting the guidelines in NUREG-0800, Section 14.2; RG 1.68; and RG 1.206, Section C.I.14.

#### **14.2.10.4 Technical Evaluation**

As documented in NUREG-1503, NRC staff reviewed and approved Section 14.2.10 of the generic DCD for the ABWR design. The staff reviewed Section 14.2.10 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 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 14.2      Test Procedures/Startup Administration Manual (Item 7)

The COL applicant provides supplemental information in COL FSAR Subsection 14.2.13.2 SAM Section 3.3 and SAM Section 4.1. SAM Section 3.3 delineates responsibilities for controlling pre-fuel load checks, initial fuel loading, pre-critical testing, and initial criticality for NRC staff to review. SAM Section 4.1 requires open vessel and initial fuel load testing and calibration of nuclear and flow instrumentation, before conducting startup tests and plant heat-up. NRC staff determined that the information in the SAM for COL License Information Item 14.2, Item (7) satisfies the guidelines in NUREG-0800 Section 14.2, Item 4.A; RG 1.68 Appendix A, "Initial Test Program," Item 2, "Initial Fuel Loading and Pre-Critical Tests," and Item 3, "Initial Criticality"; and RG 1.206, Regulatory Position C.I.14.2.10, "Initial Fuel Loading and Initial Criticality."

**14.2.10.5      *Post Combined License Activities***

There are no post COL activities related to this section.

**14.2.10.6      *Conclusion***

The staff's findings related to this information are incorporated by reference 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 initial fuel loading and initial criticality, 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 initial fuel loading and initial criticality that were incorporated by reference have been resolved.

In addition, the staff concluded that the relevant information in the COL FSAR and the SAM addressing COL License Information Item 14.2 is acceptable and meets the requirements and acceptance criteria of NUREG-0800 Section 14.2, Item 4.A; RG 1.68 Appendix A, Items 2 and 3; and RG 1.206, Regulatory Position C.I.14.2.10.

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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

## **14.2.11 Test Program Schedule**

### **14.2.11.1 Introduction**

This section of the FSAR provides a schedule relative to the fuel loading date for conducting each major phase of the test program. The COL applicant provides an overview of the ITP and identifies each test required to be completed before initial fuel loading. In addition, the applicant identifies and cross-references each test (or portion thereof) required to be completed before initial fuel loading. The tests are designed to satisfy the requirements for completing the ITAAC in accordance with 10 CFR 52.99(a).

The COL applicant also includes a schedule for developing test procedures for each major phase of the ITP, including the anticipated time available for NRC field inspectors to review the approved procedures before their use. Test program scheduling and sequencing address the following five aspects:

1. Preoperational testing is conducted during a 9-month period.
2. Startup tests that include fuel loading, low-power tests, and power-ascension tests are conducted during a 3-month period.
3. Overlapping test program schedules (for multi-unit sites) do not result in significant divisions of responsibilities or a dilution of the staff provided to implement the test program.
4. The sequential schedule for individual startup tests establishes, insofar as it is practicable, that test requirements are completed before exceeding 25 percent power for all plant SSCs that are relied upon to prevent, limit, or mitigate the consequences of postulated accidents. The schedule establishes that, insofar as it is practicable, testing is accomplished as early in the test program as is feasible; so the safety of the plant is not entirely dependent on the performance of untested systems, components, or features.
5. Approved test procedures are in a form suitable for review by regulatory inspectors at least 60 days before their intended use or at least 60 days before fuel loading for fuel loading and startup test procedures. The licensee provides timely notification to the NRC of changes in approved test procedures that were made available for NRC review.

### **14.2.11.2 Summary of Application**

Section 14.2.11 of the COL FSAR incorporates by reference Section 14.2.11 of the certified ABWR DCD, Revision 4 referenced in 10 CFR Part 52, Appendix A.

In addition, the COL applicant provides the following:

#### COL License Information Item

- COL License Information Item 14.2 Test Procedures/Startup Administration Manual (Item 8)

In DCD COL License Information Item 14.2, Item (8) requires the applicant to provide a startup administrative manual (procedure) and any other documents that delineate the test program

schedule for NRC to review. In FSAR Section 14.2.11 the COL applicant identifies Commitment COM 14.2-1, which states that the schedule for conducting each major phase of the ITP will be provided to the NRC 6 months before commencement of the ITP.

### Supplemental Information

In addition to FSAR Section 14.2.11, SAM Section 4.0, "Initial Test Program Planning and Scheduling," describes specific permissions that are required for the approval of startup test results, before proceeding to the next testing plateau.

#### **14.2.11.3 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 test program schedule, and the associated acceptance criteria, are in Section 14.2 of NUREG-0800.

The relevant requirements for reviewing COL License Information Item 14.2, Item (8) are in NUREG-0800, Section 14.2; SRP Acceptance Criteria Item 3.C, "Test Program Schedule and Sequence"; RG 1.68 Regulatory Position C.2, "Prerequisites for Testing," and Regulatory Position C.5, "Schedule"; and RG 1.206 Regulatory Position C.I.14.2.11, "Test Program Schedule."

In accordance with NUREG-0800 Section 14.2, SRP Acceptance Criteria Item 4.A, the COL applicant must provide prerequisites for testing and a test schedule for preoperational, initial criticality, startup, and power ascension tests.

### **Technical Evaluation**

As documented in NUREG-1503, NRC staff reviewed and approved Section 14.2.11 of the generic DCD for the ABWR design. The staff reviewed Section 14.2.11 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:

#### COL License Information Item

- COL License Information Item 14.2 Test Procedures/Startup Administration Manual

To address DCD COL License Information Item 14.2, Item (8), the COL applicant identifies Commitment COM 14.2-1, which states that the schedule for conducting each major phase of the ITP will be provided to the NRC 6 months before commencement of the ITP.

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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.

NRC staff determined that the commitment to provide the ITP schedule acceptable; the applicant has adequately addressed COL License Information Item 14.2 – Item (8).

Supplemental Information

NRC staff also reviewed SAM Section 4.0 for ITP preoperational, initial criticality, startup, and power ascension tests. The SAM contains the following before fuel loading:

In accordance with SAM Section 4.4, “Startup Test Program Planning,” Step 4.4.1.2a, “Prerequisites for Fuel Loading,” the COL applicant states:

If any preoperational tests are intended to be conducted, or their results approved, after fuel load, the Test Deferral will include:

- List each test
- State which portions of each test will be delayed until after fuel loading
- Provide technical justification for delaying these portions
- State when each test will be completed and the results approved.

All ITAAC must be satisfactorily completed prior to loading fuel.

In accordance with the SRP Acceptance Criteria Item 4.A in NUREG–0800 Section 14.2, the staff determined that the planned prerequisites before fuel loading in SAM Section 4.4 are acceptable.

SAM Section 4.1, “Initial Test Program Planning and Scheduling,” states:

After fuel load, the startup test phase is divided into three parts:

1. Initial fuel loading and open vessel testing
2. Testing during nuclear heatup to rated temperature and pressure (i.e., approximately 5% power)
3. Power ascension tests from 5 to 100% of rated reactor power

The test items planned during the STP Units 3 and 4 startup test phase are described in the STP Units 3 and 4 Startup Test Specifications (U7-P-SU01-0002). These tests are divided into the following categories:

- Core Performance Analysis
- Steady State Tests
- Control System Tuning
- System Transient Tests
- Major Plant Transients (including trips)

- Test Plateaus

The Startup Test Program uses Five Test Plateaus (or Test Conditions):

1. Open Vessel
2. Heat Up
3. Lower Power – 5% to 25% of rated thermal power, Reactor Internal Pumps (RIPs) operating at 10% of minimum pump speed
4. Mid Power – 50 to 75% of rated thermal power, RIPs operating at minimum speed to rated speed.
5. High Power – 100% rated thermal power, from minimum RIP speed to maximum core flow

These test plateaus are the plant operating conditions at which the required Startup Tests are performed. In SAM Addendum 3, page 56, the COL applicant also defines the testing plateaus in the Sample Power/Flow Operating Map. Based on the above, the staff determined that the supplemental information in SAM Section 4.1 related to the test schedule for startup tests meets the guidance in NUREG-0800 Section 14.2, SRP Acceptance Criteria Item 3C, “Test Program Schedule and Sequence”; RG 1.68, Regulatory Positions C.2 and C.5; and RG 1.206, Regulatory Position C.I.14.2.11. Therefore, the staff found the supplemental information acceptable.

The staff issued RAI 14.02-14 stating that the commitments associated with COL License Information Item 14.2 will be subject to license conditions and requested that the applicant inform the NRC staff as to whether or not the proposed standard license conditions are considered appropriate to support the STP Units 3 and 4 COL. For additional details, see Subsection 14.2.13.4 of this SER. This is being tracked as Open Item 14.02-14.

#### **14.2.11.4 Post Combined License Activities**

The COL applicant identifies the following commitment:

- Commitment (COM 14.2-1) – Provide the schedule, relative to the initial fuel load date, for conducting each major phase of the initial test program, including the timetable for generation, review and approval of procedures, testing and analysis of results 6 months before commencement of the initial test program.

#### **14.2.11.5 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 relating to the test program schedule. With the exception of Open Item 14.02-14, 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 test program schedule that were incorporated by reference have been resolved.

However, as a result of Open Item 14.02-14, the staff was unable to finalize the conclusions relating to this section, in accordance with the NRC requirements.

## **14.2.12 Individual Test Descriptions**

### **14.2.12.1 Introduction**

This section of the FSAR provides test abstracts for each individual test conducted during the ITP. The tests emphasize the SSCs and design features that satisfy the following eight criteria:

1. Used for a safe shutdown and cool down of the reactor under normal plant conditions and for maintaining the reactor in a safe condition during an extended shutdown period.
2. Used for a safe shutdown and cool down of the reactor under transient (infrequent or moderately frequent event) conditions and postulated accident conditions and for maintaining the reactor in a safe condition during an extended shutdown period following such conditions.
3. Establish conformance with safety limits or limiting conditions for operations (LCOs) included in the facility's TS.
4. Classified as engineered safety features (ESFs), used to support or ensure the operation of the emergency feedwater system (EFS) design limits.
5. Assumed to function or for which credit is taken in the facility's accident analysis, as described in the FSAR.
6. Process, store, control, measure, or limit the release of radioactive materials.
7. Used in the special low-power testing program to be conducted at power levels no greater than 5 percent, for the purposes of providing meaningful technical information beyond that obtained in the normal startup test program, as required for the resolution of Three Mile Island (TMI) Action Plan Item I.G.1.
8. Identified as risk-significant in the facility-specific probabilistic risk assessment (PRA).

The abstracts (a) identify each test by title; (b) specify the prerequisites and major plant operating conditions necessary for each test (such as power level and mode of operation of major control systems); (c) provide a summary description of the test objectives and method, significant parameters, and plant performance characteristics to be monitored; and (d) provide a summary of the acceptance criteria established for each test to ensure that the test verifies the functional adequacy of the SSCs involved in the test. The abstracts should also contain sufficient information to justify the specified test method if the method does not subject the SSC under test to representative design operating conditions. In addition, the abstracts identify pertinent precautions for individual tests, as necessary (e.g., minimum flow requirements or reactor power level that must be maintained).

### **14.2.12.2 Summary of Application**

Section 14.2.12 of the COL FSAR incorporates by reference Section 14.2.12 of the certified ABWR DCD, Revision 4 referenced in 10 CFR Part 52, Appendix A.

In addition, the COL applicant provides the following:

Tier 1 Departures

- STD DEP T1 3.4-1 Safety-Related I&C Architecture

This departure addresses design changes to the safety-related instrumentation and control (I&C) architecture:

- Elimination of obsolete data communication technology
- Elimination of unnecessary inadvertent actuation prevention logic and equipment
- Clarification of digital controls nomenclature and systems
- Final selection of platforms that changed the implementation architecture
- Testing and surveillance changes

This departure affects the following test abstracts:

- FSAR Subsection 14.2.12.1.3, "Recirculation Flow Control System Preoperational Test"
- FSAR Subsection 14.2.12.1.11, "Safety System Logic and Control Preoperational Test"
- FSAR Subsection 14.2.12.1.12, "Data Communication Function Preoperational Test"
- FSAR Subsection 14.2.12.1.14, "Reactor Protection System Preoperational Test"
- FSAR Subsection 14.2.12.2.7, "Plant Information and Control System Operation"
- FSAR Subsection 14.2.12.2.16, "Plant Automation and Control"

- STD DEP T1 2.4-3 reactor core isolation cooling (RCIC) Turbine/Pump

This departure changes the RCIC turbine/pump design to an integrated monoblock design. This departure affects the following test abstracts:

- FSAR Subsection 14.2.12.1.9, "Reactor Core Isolation Cooling System Preoperational Test"
- FSAR Subsection 14.2.12.2.22, "RCIC System Performance"

- STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

This departure eliminates the requirement to maintain equipment needed to mitigate a design-basis loss-of-coolant accidental (LOCA) hydrogen release. This departure affects the following test abstracts:

- FSAR Subsection 14.2.12.1.13, "Leak Detection and Isolation System Preoperational Test"
- FSAR Subsection 14.2.12.1.18, "Remote Shutdown System Preoperational Test"
- FSAR Subsection 14.2.12.1.51, "Expansion, Vibration and Dynamic Effects Preoperational Test, BOP Piping"
- FSAR Subsection 14.2.12.1.55, "Reactor Water Chemistry Control Systems Preoperational Test"



Tier 2 Departures Requiring Prior NRC Approval

- STD DEP 8.3-1 Plant Medium Voltage Electrical System Design

This departure affects the following test abstracts:

- FSAR Subsection 14.2.12.1.18, "Remote Shutdown System Preoperational Test"
- FSAR Subsection 14.2.12.1.45.4, "Electrical Power Distribution System Preoperational Test"

Tier 2 Departures Not Requiring Prior NRC Approval

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

This departure affects the test abstract in FSAR Subsection 14.2.12.1.50, "Fuel-Handling and Reactor Component Servicing Equipment Preoperational Test."

- STD DEP 11.2-1 Liquid Radwaste Process Equipment

This departure affects the test abstract in FSAR Subsection 14.2.12.1.75, "Liquid and Solid Radwaste Systems Preoperational Tests."

- STD DEP 11.4-1 Solid Radwaste Process Equipment

This departure affects the test abstract in FSAR Subsection 14.2.12.1.75, "Liquid and Solid Radwaste Systems Preoperational Tests."

- STD DEP 4.6-1 Fine Motion Control Rod Drive (FMCRD) Friction Test Equipment

This departure affects the test abstract in FSAR Subsection 14.2.12.2.5, "Control Rod Drive System Performance."

- STD DEP 14.2-1 Control Rod Drive (CRD) Friction Testing Requirement

This departure affects the test abstract in FSAR Subsection 14.2.12.2.5, "Control Rod Drive System Performance."

- STD DEP Admin

This administrative departure resulted in minor edits to the following FSAR subsections where prior NRC approval is not required.

- FSAR Subsection 14.2.12.1.45.4, "Electrical Power Distribution System Preoperational Test"
- FSAR Subsection 14.2.12.1.70, "Main Turbine and Auxiliaries Preoperational Test"
- FSAR Subsection 14.2.12.1.75, "Liquid and Solid Radwaste Systems Preoperational Tests"
- FSAR Subsection 14.2.12.2.28, "Loss of Feedwater Heating"
- FSAR Subsection 14.2.12.2.33, "Turbine Trip and Load Rejection"
- FSAR Subsection 14.2.12.2.34, "Reactor Full Isolation"

- STD DEP Vendor Vendor Replacement

This administrative departure for vendor replacement of “GE” or “GEH” with “NSSS vendor” resulted in changes to the following FSAR 14.2.12 test abstracts.

- FSAR Subsection 14.2.12.1, “Preoperational Test Procedures”
- FSAR Subsection 14.2.12.2.6, “Neutron Monitoring System Performance”
- FSAR Subsection 14.2.12.2.7, “Plant Information and Control System Operation”
- FSAR Subsection 14.2.12.2.13, “Recirculation Flow Control”
- FSAR Subsection 14.2.12.2.17, “Reactor Recirculation System Performance”
- FSAR Subsection 14.2.12.2.22, “RCIC System Performance”
- FSAR Subsection 14.2.12.2.25, “Turbine Valve Performance”
- FSAR Subsection 14.2.12.2.29, “Feedwater Pump Trip”
- FSAR Subsection 14.2.12.2.30, “Recirculation Pump Trip”
- FSAR Subsection 14.2.12.2.33, “Turbine Trip and Load Rejection”

### Supplemental Information

The COL applicant provides supplemental information for the following test abstracts:

- FSAR Subsection 14.2.12.1.2, Reactor Recirculation System Preoperational Test,
- FSAR Subsection 14.2.12.1.52, Reactor Vessel Flow-Induced Vibration Preoperational Test
- FSAR Subsection 14.2.12.1.77, Ultimate Heat Sink Preoperational Test
- FSAR Subsection 14.2.12.2.12, Reactor Internals Vibration

### **14.2.12.3 Regulatory Basis**

The regulatory basis of the information incorporated by reference is in NREG–1503. In addition, the relevant requirements of the Commission regulations for the individual test descriptions and the associated acceptance criteria are in Section 14.2 of NUREG–0800.

In accordance with Section VIII, “Processes and Changes and Departures,” of, “Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor,” the applicant identifies Tier 1 and Tier 2 departures. Tier 1 departures requiring prior NRC approval are subject to the requirements of 10 CFR Part 52, Appendix A, Section VIII.A.4. Tier 2 departures that affect the TS require prior NRC approval and are subject to the requirements of Section VIII.C.4 of 10 CFR Part 52, Appendix A. Tier 2 departures not requiring prior NRC approval are subject to the requirements of 10 CFR 52.63(b)(2) and 10 CFR Part 52, Appendix A, Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

In addition, the relevant requirements of the Commission regulations for COL license information items, Tier 1 departures, the supplementary information from the applicant, and the associated acceptance criteria are in NUREG–0800 Section 14.2, Acceptance Criterion 5, “Individual Test Descriptions/Abstracts”; RG 1.68 Appendix A, “Initial Test Program”; and RG 1.206 Regulatory Position C.I. 14.2.12, “Individual Test Descriptions.”

#### 14.2.12.4 *Technical Evaluation*

As documented in NUREG–1503, NRC staff reviewed and approved Section 14.2.12 of the certified ABWR DCD. The staff reviewed Section 14.2.12 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 following preoperational and startup tests in STP Units 3 and 4 FSAR Section 14.2.12, including the startup test matrix.

#### Tier 1 Departures

The following Tier 1 departures identified by the applicant in this section require prior NRC approval and the full scope of their technical impact may be evaluated in the other sections of this SER accordingly. For more information, please refer to COLA Part 07, Section 5.0 for a listing of all FSAR sections affected by these Tier 1 departures.

#### STD DEP T1 3.4-1 Safety-Related I&C Architecture

This departure affects the following test abstracts in FSAR Section 14.2.12:

- FSAR Subsection 14.2.12.1.3– “Recirculation Flow Control System Preoperational Test”
- FSAR Subsection 14.2.12.1.4– “Feedwater Control System Preoperational Test”
- FSAR Subsection 14.2.12.1.8– “Residual Heat Removal System Preoperational Test”
- FSAR Subsection 14.2.12.1.11– “Safety System Logic and Control Preoperational Test”
- FSAR Subsection 14.2.12.1.12– “Multiplexing System Preoperational Test”
- FSAR Subsection 14.2.12.1.14– “Reactor Protection System Preoperational test”
- FSAR Subsection 14.2.12.1.16 - “Plant Information and Control System Preoperational Test”
- FSAR Subsection 14.2.12.1.17- “Automatic Power Regulator Preoperational Test”
- FSAR Subsection 14.2.12.2.7– “Plant Information and Control System Operation”
- FSAR Subsection 14.2.12.2.16– “Plant Automation and Control”
- FSAR Subsection 14.2.12.2.17 - “Reactor Recirculation System Performance”
- FSAR Table 14.2-1 – “Startup Test Matrix”

STD DEP T1 3.4-1 is also evaluated in Chapter 7 of this SER.

In FSAR Subsections 14.2.12.1.3, 14.2.12.1.8, 14.2.12.1.11, 14.2.1.16, 14.2.1.17, 14.2.12.2.7, 14.2.12.2.16 and Table 14.2-1, the applicant replaces the “process computer” and “process computer system (PCS)” name designations with “Plant Information and Control System (PICS).” In Subsection 14.2.12.1.11, the applicant generically defines the “dedicated diagnostic instrument surveillance test controller (STC)” as “diagnostic surveillance test equipment.” 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.

staff determined that the changes to these subsections acceptable. However, in the Departure Report for STD DEP T1 3.4-1, the applicant does not specifically address these nomenclature changes. Therefore, the staff issued **RAI 14.02-9**:

Departures in FSAR sub-section 14.2.12.1.12 are based on STD DEP T1 3.4-1, which includes elimination of obsolete data communication technology. As described in the Departure Report for STD DEP T1 3.4-1, proposed data communication functions are inherent to the proposed digital platforms, ESF Logic and Control System (ELCS), Neutron Monitoring System (NMS), Reactor Trip and Isolation System (RTIS), Plant Information and Control System (PICS), etc) and therefore separate and independent from each digital I&C system and divisions within the systems. Whereas, the certified ABWR design was based on a common data communication (multiplexer) system that was to be used by multiple digital I&C systems. Minimal changes made to the text in sub-section 14.2.12.1.12 fail to clearly communicate the scope of preoperational testing of the significantly different data communication features. Some of the sentences are incomplete or unclear, e.g. modified last sentence under Prerequisites It is not clear on the functions that shall be available. Under General Test Method and Acceptance Criteria, testing of Remote Digital Logic Controller (RDLC) function (a part of ELCS) has been called out but fails to recognize testing of communication functions in the NMS and RTIS. With significant changes to the data communication system, the applicant should provide relevant and applicable preoperational test requirements that are consistent with the proposed digital I&C platforms.

The applicant's response to **RAI 14.02-09** dated August 26, 2009, revises FSAR Subsection 14.2.12.1.12 to clarify that preoperational testing of the ELCS, NMS, RTIS, and PICS involves testing the data communication functions, including the redundancy and fail-safe functions.

Based on the proposed revisions to FSAR Subsection 14.2.12.1.12, the staff determined that the changes to this test abstract now adequately describe preoperational testing of the data communication function and are relevant to the proposed I&C architecture described in FSAR Chapter 7. Therefore, **RAI 14.02-09** is resolved, and is being tracked as **Confirmatory Item 14.02-9**.

Tier 1 departure STD DEP T1 3.4-1 provides the basis for changes to FSAR Subsections 14.2.12.1.11, 14.2.12.2.7, 14.2.12.2.16 and Table 14.2-1. However, in reviewing the Departures Report, not all of the changes are specifically described in the Departures Report (in Part 7 of the COL application). For example, the change in nomenclature from the "Process Computer System" (PCS) to the "Plant Information and Control System" (PICS) is not included. The staff issued **RAI 14.02-10** requesting the applicant to update the Departures Report to include these changes.

On August 26, 2009, the COL applicant provides the following response to **RAI 14.02-10**:

STD DEP T1 3.4-1, in part, is characterized as nomenclature clarification for the STP 3 & 4 NMS/RTIS and ELCS digital platforms. The current departure

description incorrectly identifies the DCD nomenclature for "Process" Computer System as "Plant" Computer System (PCF).

The staff determined this change acceptable. The COL applicant revised the nomenclature to refer to the PCF and not to the PICS. The PCF is a subsystem function within the PICS. This change is not consistent with Tier 1 Departure T 1 3.4-1 in the Part 7 Departures Report.

The applicant's response to **RAI 14.02-10** dated November 24, 2009, is a supplemental response to revise STP DEP T1.3.4-1 and change the nomenclature from Process Computer PICS to PCFs. The applicant clarifies the distinction between PCFs and the PICS by indicating that the PICS is a detailed design information that is not part of STD DEP T1 3.4-1. Therefore, the applicant deleted the PICS and replaced it with PCFs in FSAR Subsections 14.2.12.1.3, 14.2.12.1.4, 14.2.12.1.8, 14.2.12.1.11, 14.2.12.1.14, 14.2.12.1.16, 14.2.12.1.17, 14.2.12.2.7, and 14.2.12.2.16. The staff determined that these changes are acceptable and **RAI 14.02-10** is resolved. This RAI is being tracked as **Confirmatory Item 14.02-10**.

The COL applicant also modifies FSAR Subsections 14.2.12.1.16 and 14.2.12.1.17 but does not identify which departure the proposed changes apply to. It appears that Tier 1 Departure STD DEP T1 3.4-1 should also apply to these changes. The staff issued **RAI 14.02-11** requesting the applicant to clarify this change: FSAR Subsections 14.2.12.1.16 and 14.2.12.1.17 have been modified but do not cite the departure(s) number associated with the proposed changes. The staff requests that the COL applicant cite the appropriate departure associated with these changes.

The applicant's August 26, 2009, response to **RAI 14.02-11**, states:

The convention used in STP 3 & 4 FSAR is that all changes below the cited departure are associated with that departure. In this case, STP DEP T1 3.4-1 is cited above the Subsections noted in this RAI, in FSAR Subsection 14.2.12.1.14, and is therefore, the departure applicable to the subsections in question.

However, it is noted that STP DEP T1 3-4-1 changes indicated in Subsection 14.2.12.1.16(1) are incorrect, and therefore will be corrected in the future COLA revision. FSAR Subsection 14.2.12.1.16 will be revised to correct the nomenclature consistent with STP DEP T1 3.4-1. The applicant proposed to delete the Process Computer and add the Plant Computer Functions to preoperational test subsection 14.2.12.1.16.

The staff questioned whether this nomenclature for the PCF is correct. The PCF is a subsystem function within the PICS. This nomenclature is not consistent with the description of STP DEP T1 3.4-1 in the Departures Report. The applicant's response to RAI 14.02-011 dated November 24, 2009, is a supplemental response to revise STP DEP T1.3.4-1, including a nomenclature change to delete PICS and add PCFs. The COL applicant indicates that this nomenclature change applies to FSAR Subsections 14.2.12.1.3, 14.2.12.1.4, 14.2.12.1.8, 14.2.12.1.11, 14.2.12.1.14, 14.2.12.1.16, 14.2.12.1.17, 14.2.12.2.7, and 14.2.12.2.16. The staff determined that this response acceptable and **RAI 14.02-011** is resolved. This RAI is being tracked as **Confirmatory Item 14.02-11**.

- STD DEP T1 2.4-3 RCIC Turbine/Pump

FSAR Subsection 14.2.12.1.9, Reactor Core Isolation Cooling System Preoperational Test

Departure STD DEP T1 2.4-3, "RCIC Turbine/Pump," was evaluated per Section VIII.A.4 of Appendix A to 10 CFR Part 52 in Section 5.4.6 of this SER. The present review is limited to the effects of this departure on the RCIC system preoperational test.

NRC staff reviewed the changes in the test procedure based on the guidelines in NUREG-0800 Section 14.2, SRP Acceptance Criteria Item 5.A, "Individual Test Descriptions/Abstracts."

This preoperational test is affected by Tier 1 Departure STD DEP T1 2.4-3, "RCIC Turbine/Pump." The departure modifies the design of the RCIC turbine and pump assembly in favor of an improved design. The new RCIC turbine/pump design eliminates the requirements of a barometric condenser and vacuum pump. Therefore, the requirement of checking the proper operation of these pieces of equipment has been removed from the RCIC system preoperational test procedure.

The staff determined that this Tier 1 change to the test abstract in FSAR Subsection 14.2.12.1.9 is consistent with Tier 1 departure requirements in 10 CFR 52.63(a) and 10 CFR Part 52, Appendix A, "Process for Changes and Departures," Section VIII.A. The staff determined that the changes to the Reactor Core Isolation Cooling System Preoperational Test are acceptable.

FSAR Subsection 14.2.12.2.22, RCIC System Performance

NRC staff evaluated Departure STD DEP T1 2.4-3 "RCIC Turbine/Pump" per Section VIII.A.4 of Appendix A to 10 CFR Part 52 in Section 5.4.6 of this SER. Departure STD DEP T1 2.4-3 modifies the design of the RCIC turbine and pump assembly in favor of an improved design. The new RCIC turbine/pump design uses a single control system that will regulate the steam inflow to the turbine based on the discharge pressure of the pump. This change eliminates some controller adjustments that had to be performed earlier due to two separate control systems during the RCIC system performance startup tests.

The review in this SER section is limited to the effects of this departure on the RCIC system performance startup test. NRC staff reviewed the changes in the test abstract based on the guidelines in NUREG-0800 Section 14.2, SRP Acceptance Criteria Item 5.A, "Individual Test Descriptions/Abstracts."

As part of Departure STD DEP T1 2.4-3, the design changes delete the following information from ABWR DCD Subsection 14.2.12.2.22:

Proper controller adjustment is verified by introducing small stop disturbances in speed and follow demand and then demonstrating satisfactorily system response at both low RCIC pump flow (but above minimum turbine speed) and near rated RCIC pump flow conditions in order to span the RCIC operating range.

The following two Level 2 acceptance criteria are also deleted:

The RCIC turbine speed and pump flow control loops shall be adjusted so that the RCIC System flow related variable responses to test inputs are at least quarter-damped (i.e., the decay ratio of the second-to-first overshoot of each

variable is less than or equal to 0.25) as stated in the applicable RCIC System Design Specification.

The RCIC Turbine Gland Seal System shall be capable of preventing significant steam leakage to the atmosphere.

NRC staff determined that the changes to FSAR Subsection 14.2.12.2.22 are acceptable. The staff also determined that FSAR Subsection 14.2.12.2.11, "System Vibration," Item (C) related to vibration displacement measurements on the RCIC steam supply line at 100 percent RCIC steam line at rated flow will be completed by this test abstract. This test abstract covers all startup test activities related to the RCIC. Therefore, the staff determined FSAR Subsection 14.2.12.2.22 acceptable.

- STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

This departure affects the following test abstracts in FSAR Section 14.2.12:

- FSAR Subsection 14.2.12.1.13, "Leak Detection and Isolation System Preoperational Test"
- FSAR Subsection 14.2.12.1.18, "Remote Shutdown System Preoperational Test"
- FSAR Subsection 14.2.12.1.51, "Expansion, Vibration and Dynamic Effects Preoperational Test, BOP Piping"
- FSAR Subsection 14.2.12.1.55, "Reactor Water Chemistry Control Systems Preoperational Test"
- FSAR Subsection 14.2.12.1.72, "Flammability Control System Preoperational Test"

10 CFR 50.44, "Combustible Gas Control for Nuclear Power Reactors," was modified to no longer require a hydrogen control system for an inert containment. Consistent with this regulation change, this departure eliminates the requirement for hydrogen control systems to mitigate a design-basis LOCA hydrogen release from the ABWR design. Therefore, the applicant has removed the ABWR flammability control system (FCS) from Subsections 14.2.12.1.13, 14.2.12.1.18, 14.2.12.1.51, and 14.2.12.1.55. In addition, the applicant has deleted the preoperational test abstract for the FCS (Subsection 14.2.12.1.72) from the FSER. The staff's review of the elimination of the hydrogen control system is in SER Section 6.2.5. The staff determined the changes to FSAR Subsections 14.2.12.1.13, 14.2.12.1.18, 14.2.12.1.51, 14.2.12.1.55, and 14.2.12.1.72 consistent with eliminating the hydrogen control system and therefore acceptable. This departure is also evaluated in Chapter 6 of this SER.

### Tier 2 Departure Requiring Prior NRC Approval

The following Tier 2 departure identified by the applicant in this section requires prior NRC approval and the full scope of its technical impact may be evaluated in the other sections of this SER accordingly. For more information, please refer to COLA Part 07, Section 5.0 for a listing of all FSAR sections affected by this Tier 2 departure.

- STD DEP 8.3-1 Plant Medium Voltage Electrical System Design

This departure affects the following test abstracts in FSAR Section 14.2.12:

- FSAR Subsection 14.2.12.1.18, "Remote Shutdown System Preoperational Test"

- FSAR Subsection 14.2.12.1.45.4, “Electrical Power Distribution System Preoperational Test”

Departure STD DEP 8.3-1 changes the medium voltage electrical distribution system from a single 6.9 kV system to a dual-voltage system with 13.8 kV and 4.16 kV. Therefore, the availability of the 4.16 kV alternating current (AC) electrical power system that replaces the 6.9 kV AC system in the ABWR DCD is now a prerequisite for the remote shutdown system preoperational test (13.8 kV and 14.6kV replace the 6.9 kV for the electrical power distribution system preoperational test). The changes to the test abstract are consistent with the changes in STD DEP 8.3-1, which is also evaluated in Chapters 8 and 16 of this SER.

*Tier 2 Departures Not Requiring Prior NRC Approval*

The following Tier 2 departures Not Requiring Prior NRC Approval identified by the applicant in this section may also be evaluated in other sections of this SER accordingly. For more information, please refer to COLA Part 07, Section 5.0 for a listing of all FSAR sections affected by these departures.

NRC staff evaluated the following Tier 2 standard departures in accordance with the requirements in 10 CFR Part 52, Appendix A, Sections VIII.B.5.b, VIII.B.5.c, and VIII.b.5.d.

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

NRC staff evaluated the changes to FSAR Subsection 14.2.12.1.50, “General Test Methods and Acceptance Criteria,” related to the Fuel Handling and Reactor Component Servicing Equipment test abstract. The COL applicant has changed the list of reactor component servicing equipment (i.e., adding “refueling machine” and deleting “refueling bridge”). Acceptance Criterion (d) deletes “RPV head tensioning and detensioning.” Acceptance Criterion (f) adds “Heavy load strong backs will be tested to ANSI 14.6 requirements.” Acceptance Criterion (h) deletes the “fuel pool sipper,” and Acceptance Criterion (i) deletes the “flange seal test plug.”

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, 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.

- STD DEP 11.2-1 Liquid Radwaste Process Equipment

See the evaluation of Departure 11.4-1 below.

- STD DEP 11.4-1 Solid Radwaste Process Equipment

NRC staff reviewed COL Applicant’s “Departures Report,” Part 7, Section 3.0, “Departures Not Requiring Prior NRC Approval,” Departures STD DEP 11.2-1 and 11.4-1. The staff determined that in FSAR Subsection 14.2.12.1.75, the COL applicant deleted from acceptance criteria (g) solid radwaste system functional tests for the thin film dryer, pelletizer, pellet filling machine, mixing tank, drum conveyer and incinerator, including operation of solidifying, packaging, compacting and incinerating processes, as specified in Subsection 11.4. The COL applicant deleted “demineralizer regeneration” from acceptance criteria (h). In acceptance criteria (j), the applicant deleted “between designated locations using simulated waste variation” since the solid



radwaste no longer performs simulated waste variation as noted Chapter 11. The applicant also deleted the radwaste system from acceptance criteria (k) since radwaste system isolation valves are already covered by the containment isolation system upon receipt of a simulated containment isolation initiation signal.

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, 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.

- STD DEP 4.6-1 FMCRD Friction Test Equipment

NRC staff reviewed the COL applicant's "Departures Report," Part 7, Section 3.0, "Departures Not Requiring Prior NRC Approval," STD DEP 4.6-1. Departure STD DEP 4.6-1 eliminates the use of a separate pump for the CRD system performance startup test in FSAR Subsection 14.2.12.2.5. Instead, the CRD pump will be used for the test.

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, 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.

- STD DEP 14.2-1 CRD Friction Test Equipment

NRC staff reviewed the COL applicant's "Departures Report," Part 7, Section 3.0, "Departures Not Requiring Prior NRC Approval," STD DEP 14.2-1. STD DEP 14.2-1 eliminates the requirement to perform CRD friction test at rated pressure, as described in Section 14.2.12.2.5 and Table 14.2-1 of the ABWR DCD due to the use of a new positioning method for the control rods. The new positioning method uses an electric motor compared to the old method that uses hydraulic pressure. The portion of the friction test at the rated pressure is eliminated from the CRD system performance startup test requirements. This subsection also states that a continuous monitoring system will detect the presence of friction in the drive mechanism.

The staff determined that changes made to FSAR Subsection 14.2.12.2.5 are consistent with changes identified in STD DEP 14.2-1; therefore, the NRC staff determined that prior NRC review and approval is not required consistent with the requirements in 10 CFR Part 52, Appendix A, Section VIII.B.5. The COL applicant's process for evaluating departures and other changes to the DCD are subject to NRC inspection.

- STD DEP Admin

In COL FSAR Section 14.2.12, the COL applicant identifies several administrative departures in the subsections listed below:

- FSAR Subsection 14.2.12.1.45.4, "Electrical Power Distribution System Preoperational Test"
- FSAR Subsection 14.2.12.1.70, "Main Turbine and Auxiliaries Preoperational Test"
- FSAR Subsection 14.2.12.1.75, "Liquid and Solid Radwaste Systems Preoperational Tests"
- FSAR Subsection 14.2.12.2.28, "Loss of Feedwater Heating"
- FSAR Subsection 14.2.12.2.33, "Turbine Trip and Load Rejection"

- FSAR Subsection 14.2.12.2.34, “Reactor Full Isolation”

These administrative departures are minor corrections, such as editorial or administrative errors in the referenced ABWR DCD (e.g., misspelling, incorrect references, table headings, etc.) in the FSAR subsections noted above, where prior NRC approval is not required. The applicant's evaluation determined that these departures do 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 these departures do not require prior NRC approval.

- STD DEP Vendor Vendor Replacement
- In COL FSAR Section 14.2.12, the COL applicant replaces references to GE or GEH as the NSSS vendor with the generic term “NSSS vendor” in the subsections listed below. FSAR Subsection 14.2.12.1, “Preoperational Test Procedures”
- FSAR Subsection 14.2.12.2.6, “Neutron Monitoring System Performance”
- FSAR Subsection 14.2.12.2.7, “Plant Information and Control System Operation”
- FSAR Subsection 14.2.12.2.13, “Recirculation Flow Control”
- FSAR Subsection 14.2.12.2.17, “Reactor Recirculation System Performance”
- FSAR Subsection 14.2.12.2.22, “RCIC System Performance”
- FSAR Subsection 14.2.12.2.25, “Turbine Valve Performance”
- FSAR Subsection 14.2.12.2.29, “Feedwater Pump Trip”
- FSAR Subsection 14.2.12.2.30, “Recirculation Pump Trip”
- FSAR Subsection 14.2.12.2.33, “Turbine Trip and Load Rejection”

NRC staff found it acceptable to delete the term “GE” or “GEH” in these FSAR Subsections and replace it with “NSSS vendor,” because Toshiba is now the alternate NSSS vendor for the STP Units 3 and 4 ITP. The applicant's evaluation determined that these departures do 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 these departures do not require prior NRC approval.

### Supplemental Information

The applicant provides supplemental information for the following subsections:

- FSAR Subsection 14.2.12.1.2, “Reactor Recirculation System Preoperational Test”
- FSAR Subsection 14.2.12.1.52, “Reactor Vessel Flow-Induced Vibration Preoperational Test”
- FSAR Subsection 14.2.12.2.12, “Reactor Internal Vibration”
- FSAR Subsection 14.2.12.1.77, “Ultimate Heat Sink Preoperational Test”

The COL applicant supplements FSAR Subsections 14.2.12.1.2, 14.2.12.1.52 and 14.2.12.2.12 by stating that STP Units 3 and 4 reactor internals testing requirements reference Tier 2 Subsections 3.9.2.3 and 3.9.2.4 (and 3.9.2.6 for the reactor internal vibration startup test) in the STP Units 3 and 4 FSAR. However, the information in STP FSAR Subsections 3.9.2.3 and 3.9.2.4 (and 3.9.2.6 for the reactor internal vibration startup test) is not sufficient to provide reasonable confidence that these two preoperational tests for the reactor recirculation system and the reactor vessel flow-induced vibration system and the startup testing for the reactor internal vibration will satisfy NRC regulations.

For example, Criterion XI of Appendix B to 10 CFR Part 50 requires the establishment of a test program to ensure that all tests required to demonstrate that SSCs will perform satisfactorily in service are identified and performed in accordance with written test procedures that incorporate the requirements and acceptance limits in applicable design documents. The test program should include, as appropriate, proof tests before installation, preoperational tests, and operational tests during plant operation of SSCs. Test procedures should include provisions for ensuring that all prerequisites for the given test have been met, adequate test instrumentation is available and used, and the test is performed under suitable environmental conditions. Test results should be documented and evaluated to ensure that test requirements have been satisfied. In **RAI 14.02-06 and RAI 14.02-08**, NRC staff requested a comprehensive test program for these three test abstracts be submitted to the NRC for review.

The COL applicant's July 29, 2009, response to RAI 14.02-06 and RAI 14.02-08 states that as noted in the response to RAI 03.09.02-2, the ABWR Prototype Comprehensive Vibration Assessment Program is in the Toshiba Report, RS-5126954 Revision 1, "Prototype ABWR Reactor Internals Flow Induced Vibration Test Report." In addition, the application of the Prototype Vibration Assessment Program and the additional testing and analyses for a complete vibration assessment for STP Units 3 and 4 are in Toshiba report RS-5126579 Revision 1, "STP-3 and 4 Reactor Internals Flow Induced Vibration Assessment Program." These reports provide the detailed information associated with STP FSAR Subsections 3.9.2.3 and 3.9.2.4 (and 3.9.2.6 for the reactor internal vibration). NRC staff needs to evaluate the proprietary information in Toshiba Reports RS-5126954 Revision 1 and RS-5126579 Revision 1, before the staff can reach a safety determination on the Reactor Internals Flow-Induced Vibration Assessment Program (FIVAP) for STP Units 3 and 4. The Prototype Reactor Internals FIVAP Test Report results and the STP Units 3 and 4 Reactor Internals FIVAP should be consistent with the Regulatory Positions in RG 1.20. The STP Unit 3 and 4 reactor internal FIVAP preoperational and startup test acceptance criteria should also be consistent with the regulatory positions in RG 1.20 and the prototype plant test results. These issues are being tracked as **Open Items 14.02-06 and 14.02-08**.

In FSAR Subsection 14.2.12.1.77 Item (2), "Prerequisites," the COL applicant provides supplemental changes that delete the spray pond and replace it with the reactor service water (RSW) pump house and the ultimate heat sink (UHS) basin. The COL applicant also revises three "General Test Methods and Acceptance Criteria" to delete the spray pond and replace it with the UHS cooling tower and basin. The staff's evaluation of these design changes is in Section 9.2.5 of this SER. Consistent with these changes, the staff determined that the changes in FSAR Subsection 14.2.12.1.77 are necessary conforming changes and are therefore acceptable.

#### **14.2.12.5 Post Combined License Activities**

There are no post COL items in this section.

#### **14.2.12.6 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 relating to individual test descriptions. With the exception of **Open Items 14.02-06, and 14.02-08** and **Confirmatory Items 14.02-09, 14.02-10, and 14.02.11**, 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 individual test descriptions that were incorporated by reference have been resolved.

Therefore, as a result of **Open Items 14.02-06, and 14.02-08** and **Confirmatory Items 14.02-09, 14.02-10, and 14.02.11**, the staff was unable to finalize the conclusions relating to individual test descriptions, in accordance with the ITP requirements and acceptance criteria for relevant NRC regulations and regulatory guidance in NUREG-0800, Section 14.2; RG1.68, Regulatory Positions C.1 through C.9; and RG 1.206, Regulatory Position C.I.14.2.12.

### **14.2.13 COL License Information**

#### **14.2.13.1 Introduction**

In this section, the COL applicant addresses the COL license information items required in ABWR DCD Section 14.2.13, "COL Information Items."

#### **14.2.13.2 Summary of Application**

The COL applicant provides site-specific supplements to address the following COL license information items:

- COL License Information Item 14.1 Other Testing

For COL License Information Item 14.1, the ABWR DCD Subsection 14.2.12.3, "Test Procedures/Startup Administrative Manual," requires the COL applicant to ensure that the testing of any other systems and components is adequate to demonstrate conformance to the ABWR requirements. In FSAR Subsection 14.2.13.1, the COL applicant states that FSAR 14.2S provides additional testing requirements for the following systems:

- a. Electrical switchyard and equipment
- b. Personnel monitors and radiation survey instruments
- c. Site-specific equipment

- COL License Information Item 14.2 Test Procedures/Startup Administrative Manual

For COL License Information Item 14.2, the ABWR DCD Section 14.2.12.3, "Test Procedures/Startup Administrative Manual," requires the COL applicant to provide the following for NRC review:

1. Scoping documents (i.e., Preoperational and Startup Test Specifications) containing test objectives and acceptance criteria applicable to the scope of responsibility (ABWR DCD Section 14.2.3).
2. Scoping documents delineating the plant operational conditions to be tested, test methodologies to be utilized, specific data to be collected, and acceptable data reduction techniques to be reviewed by NRC at the time of the COL (ABWR DCD Section 14.2.3).
3. Scoping documents delineating any reconciliation methods needed to account for test conditions, methods, or results if testing is performed at conditions other than those of representative design operating conditions (ABWR DCD Section 14.2.3).

4. Submitting approved preoperational test procedures approximately 60 days before their intended use and startup test procedures approximately 60 days before fuel loading (ABWR DCD Section 14.2.3).
5. Submitting at the time of the COL a SAM (procedure) and any other documents that delineate the conduct of the test program (ABWR DCD Section 14.2.4).
6. Submitting A SAM (procedure) and any other documents that delineate the review, evaluation, and approval of test results (ABWR DCD Section 14.2.5).
7. Submitting A SAM (procedure) and any other documents that delineate the method of controlling pre-fuel load checks, initial fuel loading, pre-critical testing, and initial criticality (ABWR DCD Section 14.2.10).
8. Submitting A SAM (procedure) and any other documents that delineate the test program schedule (ABWR DCD Section 14.2.11).
9. Submitting a SAM (procedure) that will authorize the determinations of operability and availability of interfacing support systems requirements (ABWR DCD Section 14.2.3).

In FSAR Subsection 14.2.13.2, "Test Procedures/Startup Administrative Manual," the COL applicant provides information related to the SAM, test specifications, and test procedures to satisfy COL License Information Item 14.2.

#### **14.2.13.3 Regulatory Basis**

The relevant requirements of the Commission regulations for the COL license information items and the associated acceptance criteria are in Section 14.2 of NUREG-0800. Section 14.2 of NUREG-0800 states, "For a COL application referencing a DC, a COL applicant must address COL action items (referred to as COL license information in certain DCs) included in the referenced DC. Additionally, a COL applicant must address requirements and restrictions (e.g., interface requirements and site parameters) included in the referenced DC."

The post COL license information items must also address regulatory positions in RG 1.68 and RG 1.206. RG 1.68 Regulatory Position C.4, "Procedures," and RG 1.206 Regulatory Position C.I.14.2.3 state, "approved test procedures should be made available to the NRC approximately 60 days prior to their intended use."

RG 1.206 Regulatory Position C.III.4.3, "Combined License Information Items That Cannot Be Resolved Before Issuance of a License," also provides guidance on how COL applicants should handle post COL license conditions and license commitments. Specific guidance includes the following:

1. Identify a new license condition or an existing license condition (e.g., TS) to govern the matter addressed by the COL item (e.g., the license condition on operational programs discussed in Section C.IV.4). The license condition should include implementation schedules, where appropriate.
2. Ensure that the COL applicant describes in the application (e.g., within an appropriate section of the COL application) the proposed approach to address a COL license information item in sufficient detail to support the NRC licensing finding. There should also

be a description of how the COL applicant intends to update any affected licensing basis documents (e.g., the FSAR) or to otherwise inform the NRC staff of the final disposition of the COL item. The descriptions should include implementation schedules, where appropriate.

#### **14.2.13.4 Technical Evaluation**

- COL License Information Item 14.1 Other Testing

In FSAR Subsection 14.2.13.1, "Other Testing," the COL applicant states that FSAR Section 14.2S provides the test abstracts for the electrical switchyard and equipment, personnel radiation monitors and radiation survey equipment and site-specific security. There was no test for the automatic dispatcher control system because the system is not in STP Units 3 and 4. The evaluation of these test abstracts is in SER Section 14.2S.

- COL License Information Item 14.2 Test Procedure/Startup Administrative Manual

The COL applicant provides supplemental information to address COL License Information Item 14.2 in FSAR Subsection 14.2.13.2. The COL applicant addresses each of the 9 sub-items under COL License Information Item 14.2.

To address COL License Information Item 14.2, Item (1), the COL applicant provides the following:

Startup Test Specification document provides guidance for sequencing testing during the Startup Test Phase. This scoping document contains the following elements for the Startup Test Phase of the Initial Test Program.

- Testing objectives and acceptance criteria
- Plant operational conditions at which test are to be conducted, testing methodologies to be utilized, specified data to be collected and acceptable data reduction techniques
- Reconciliation methods needed to account for test conditions, methods or results if testing is performed at conditions other than representative design operating conditions.

In addition, the COL applicant provides the following post COL commitment item:

Site Specific Preoperational and Startup Test Specification, containing testing objectives and acceptance criteria, will be provided to the NRC staff at least 6 months prior to the start of the Initial Test Program. (COM 14.2-2).

The staff determined that this license commitment (COM 14.2-2) addressed ABWR DCD COL License Information Item 14.2, Item (1).

To address ABWR DCD COL License Information Item 14.2, Items (2) and (3), the COL applicant states that the Pre-Operational and Startup Test Specification scoping documents will

contain the following elements for completing the Pre-Operational and Startup Test Phase of the ITP:

- Testing objectives and acceptance criteria
- Plant operating conditions at which tests are to be conducted, testing methodologies to be utilized, specific data to be collected, and acceptance criteria reduction techniques.
- Reconciliation methods needed to account for test conditions, methods or results if testing is performed at conditions other than representative design operating conditions.

As stated above, these documents will be provided to the NRC at least 6 months before the start of the ITP. (COM 14.2-2). In accordance with RG 1.206, Regulatory Position C.III.(4)(3) and ISG-15, the staff determined that the COL license information item (COM 14.2-2) addresses ABWR DCD COL License Information Item 14.2 Items (1), (2), and (3).

To address ABWR DCD COL License Information Item 14.2, Item (4), the COL applicant states that “approved preoperational test procedures will be available for NRC review approximately 60 days prior to their intended use but no later than 60 days prior to fuel loading. (FSAR Section 14.2.3) (COM 14.2-3). Approved startup test procedures will be available for the NRC to review approximately 60 days prior to fuel loading (FSAR Subsection) (COM 14.2-4).” This commitment is consistent with RG 1.68 and the requirements in the ABWR DCD. Therefore, COL License Information Item 14.2, Item (4) is acceptable.

To address ABWR DCD COL License Information Item 14.2, Items (5) through (9), the COL applicant has submitted the SAM, which delineates the processes used to administer the STP Units 3 and 4 ITP. These processes include (1) conduct of the test program (FSAR Section 14.2.4); (2) review, evaluation, and approval of test results (FSAR Section 14.2.5); (3) methods for controlling pre-fuel load checks, initial fuel loading, pre-critical testing, and initial criticality; (4) the test program schedule (FSAR Section 14.2.11); and (5) determinations of operability and availability of interfacing systems. The contents of the SAM that relate to COL License Information Item 14.2, Items (5) through (8) are evaluated in the following SER Sections:

- Item (5) – SER Section 14.2.4, “Conduct of the Test Program”
- Item (6) – SER Section 14.2.5, “Review, Evaluation and Approval of Test Results”
- Item (7) – SER Section 14.2.10, “Initial Fuel Loading and Initial Criticality”
- Item (8) – SER Section 14.2.11, “Test Program Schedule”

FSAR Subsection 14.2.13.2 states, “Determination of operability and availability of interfacing support system requirements.” SAM Subsection 4.5.3.3, states, “verification that interfacing support systems are operable or in a condition that will satisfy testing requirements.” Based on this information, the staff determined that the applicant adequately addresses ABWR DCD COL License Information Item 14.2, Item (9), and it is therefore acceptable. Based on the evaluations in the previous sections of SER 14.2, SER Subsection 14.2.13.2, and SAM Subsection 4.5.3.3, the staff found that COL License Information Item 14.2, Items (5) through (9) are acceptable.

Based on the above information, COL Information Items 14.2, - Items (1) through (9) met the guidance in ABWR DCD Subsection 14.2.13.2, NUREG 0800, SRP Section 14.2, and the

applicable regulatory positions in RG 1.68 and RG 1.206; therefore, they are acceptable. In accordance with ABWR DCD COL License Information Items 14.2, Items (1) through (4) and (6) through (8); and RG 1.206, Regulatory Position C.III.4.3, Item (3), NRC staff identified these post COL items as license conditions. The staff issued RAI 14.02-14 stating that the commitments associated with COL License Information Item 14.2 will be subject to license conditions and requested that the applicant inform the NRC staff as to whether or not the proposed standard license conditions are considered appropriate to support the STP Units 3 and 4 COL. This is being tracked as Open Item 14.02-14.

#### **14.2.13.5 Post Combined License Activities**

The COL applicant identifies the following commitments to address COL License Information Item 14.2:

- Commitment (COM 14.2-1): The schedule, relative to the initial fuel load date, for conducting each major phase of the initial test program, including the timetable for generation, review and approval of procedures, testing and analysis of results will be provided to the NRC 6 months prior to commencement of the initial test program.
- Commitment (COM 14.2-2): Site-specific Preoperational and Startup Test Specifications, containing testing objectives and acceptance criteria, will be provided to the NRC at least 6 months prior to the start of the Initial Test Program.
- Commitment (COM 14.2-3): Approved preoperational test procedures will be available for NRC review approximately 60 days prior to their intended use but no later than 60 days prior to fuel loading.
- Commitment (COM 14.2-4): Approved startup test procedures will be available for NRC review approximately 60 days prior to fuel loading.

#### **14.2.13.6 Conclusion**

As a result of **Open Item 14.02-14**, the staff was unable to finalize the conclusions relating to this section, in accordance with the NRC requirements.

### **14.2S Initial Plant Test Program**

#### **14.2S.1 Organization and Training In Support of the Initial Test Program**

##### **14.2S.1.1 Introduction**

This section incorporates site-specific training for STP Units 3 and 4 personnel conducting the ITP.

##### **14.2S.1.2 Summary of Application**

The applicant states that STP Units 3 and 4 personnel training for the ITP is described in FSAR Section 13.4.

##### **14.2S.1.3 Regulatory Basis**



The relevant requirements of the Commission regulations for the supplemental information on organization and training in support of the ITP, and the associated acceptance criteria, are in Section 14.2 of NUREG-0800. Nuclear power plant personnel conducting the ITP must meet the training requirements in 10 CFR 50.34, 10 CFR 50.54, 10 CFR 50.120, 10 CFR 52.78, and 10 CFR 55.

#### **14.2S.1.4 *Technical Evaluation***

In FSAR Section 14.2S.1, "Organization and Training in Support of the Initial Test Program," the COL applicant states, "training for plant staff is described in Section 13.4." However, NRC staff did not find any training requirements in Revision 3 to FSAR Section 13.4, "Review and Audit." The staff did find nuclear industry training requirements and guidance in FSAR Sections 13.1.3, 13.2, and 13.4S.

Based on the above information, the staff issued **RAI 14.2S1-1** requesting the COL applicant to update FSAR Section 14.2S-1 to incorporate the correct cross reference to training requirements for ITP personnel in FSAR Chapter 13.

On January 13, 2010, the COL applicant revised FSAR Section 14.2S to reference FSAR Section 13.2, "Training," as the applicable section for training plant staff personnel conducting[how to conduct] the ITP. This section references NEI 06-13, "Template for an Industry Training Program Description." The staff endorsed the use of NEI 06-13. thus resolving RAI 14.2-13. For additional details, see SER Section 13.2.

#### **14.2S.1.5 *Post Combined Licensed Activities***

There are no post COL activities related to this section.

#### **14.2S.1.6 *Conclusion***

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 organizations and training, and no outstanding information is expected to be addressed in the COL FSAR related to this subsection.

### **14.2S.2 *First-of-a-Kind Systems***

#### **14.2S.2.1 *Introduction***

This section of the FSAR provides supplemental information on the FOAK system tests in compliance with RG 1.206, Subsection C.I.14.2.8. In accordance with this RG, the COL applicant should provide a summary description of preoperational and/or startup tests that are planned for each unique or FOAK principal design feature that may be included in the facility design. This summary test description should include the test method, objective, and frequency (e.g., first-plant-only test, first-three-plant tests) necessary to validate design or analysis assumptions. The COL application should also include the justification for not including preoperational and/or startup testing for any unique or FOAK design features. In addition, the COL applicant should provide information, as applicable, that is sufficient to credit previously performed testing for identical, unique, or FOAK design features at other NRC licensed production facilities.

### **14.2S.2.2 Summary of Application**

In STP COL FSAR Section 14.2S.2 Revision 2, the applicant identifies the following FOAK tests that contain new, unique, or special tests for new design features associated with SSCs that are part of a new reactor design under 10 CFR Part 52:

#### 1. Preoperational Tests

- Reactor Recirculation System Preoperational Test (reference ABWR DCD 4.2.12.1.2)
- Recirculation Flow Control System Preoperational Test (reference ABWR DCD 14.2.12.1.3)
- Feedwater Control System Preoperational Test (reference ABWR DCD 14.2.12.1.4)
- Control Rod Drive System (CRD) Preoperational Test (reference ABWR DCD 14.2.12.1.6)
- Rod Control and Information System Preoperational Test (reference ABWR DCD 14.2.12.1.7)
- Safety System Logic and Control Preoperational Test (reference ABWR DCD 14.2.12.1.11)
- Data Communications Function Preoperational Test (reference ABWR DCD 14.2.12.1.12, Multiplexing System Preoperational Test)
- Leak Detection and Isolation System Preoperational Test (reference ABWR DCD 14.2.12.1.13)
- Reactor Protection System Preoperational Test (reference ABWR DCD 14.2.12.1.14)
- Neutron Monitoring System Preoperational Test (reference ABWR DCD 14.2.12.1.15)
- Automatic Power Regulator Preoperational Test (reference ABWR DCD 4.2.12.1.17)
- Combustion Turbine Generator Preoperational Test (reference ABWR DCD 14.2.12.1.45, Electrical Systems Preoperational Test)
- Steam Bypass and Pressure Control System Preoperational Test (reference ABWR DCD 14.2.12.1.66)

#### 2. Startup Testing

- Control Rod Drive System Performance (reference ABWR DCD 14.2.12.2.5)
- Neutron Monitoring System Performance (reference ABWR DCD 14.2.12.2.6)
- Recirculation Flow Control (reference ABWR DCD 14.2.12.2.13)
- Plant Automation and Control (reference ABWR DCD 14.2.12.2.16)
- Loss of Feedwater Heating (reference ABWR DCD 14.2.12.2.28)
- Feedwater Pump Trip (reference ABWR DCD 14.2.12.2.29)
- Recirculation Pump Trip (reference ABWR DCD 14.2.12.2.30)
- Turbine Trip and Load Rejection (reference ABWR DCD 14.2.12.2.33)

### **14.2S.2.3 Regulatory Basis**

For any Tier 1 departures related to FOAK tests, the COL applicant must meet the requirements in 10 CFR 50.63(b)(1) and 10 CFR Part 52, Appendix A, Section VIII.A.4. The COL applicant must submit Tier 1 test departures to the NRC for review in accordance with the requirements in 10 CFR 50.63(a) and 10 CFR Part 52, Appendix A, Section VIII.A.4.

For any Tier 2 departures related to FOAK tests, the COL applicant must meet the requirements in 10 CFR 50.63(b)(2) and 10 CFR Part 52, Appendix A, Section VIII.B.5. The COL applicant may review and approve Tier 2 FOAK test departures in accordance with the requirements in 10 CFR 50.63(b)(2) and 10 CFR Part 52, Appendix A, VIII.B.5.

The relevant requirements of the Commission regulations for the supplementary information the applicant has submitted and the associated acceptance criteria are in NUREG-0800, Section 14.2, SRP Acceptance Criteria Item 5.C states, in part, "For new, unique, or FOAK design features used in the facility, the functional testing requirements and acceptance criteria necessary to verify their performance should be submitted for review and approval."

RG 1.206 Regulatory Position C.I.14.2.8 states, in part, that "the COL applicant should provide a summary description of preoperational and startup testing that is planned for each unique or FOAK principal design feature that may be included in the facility design." RG 1.68 also states, in part, that "if new, unique, or FOAK principal design features will be used in the facility, the in-plant functional testing requirements necessary to verify their performance need to be identified at an early date to permit these test requirements to be appropriately accounted for in the final design. Consequently, each new DC or COL applicant for an advanced plant should identify all FOAK tests."

In addition, RG 1.68 Appendix A, Section 6.0 presents examples of FOAK tests. For DC and COL applicants, the NRC will verify that all FOAK tests proposed by the applicant meet the ITAAC and the ITP testing requirements. Future COL applicants may propose other FOAK tests not specifically identified in RG 1.68.

#### **14.2S.2.4 Technical Evaluation**

During the NRC review of ABWR DCD Section 14.2, NRC staff found that the ABWR DCD did not identify any FOAK tests. The staff also did not request additional information related to the FOAK tests in FSER Section 14.2 to NUREG-1503. As part of the review of STP Units 3 and 4 FSAR Section 14.2, the staff requested additional information related to the FOAK tests. The COL applicant provides that information in FSAR Section 14.2S.2.

In addition, NRC staff verified that Tier 1 and 2 departures in FOAK tests meet the requirements in 10 CFR 52.63 and 10 CFR Part 52, Appendix A, Section VIII. The staff verified that FOAK tests met the guidance in SRP Section 14.2 Item 5.C, RG 1.206 Regulatory Position C.I.14.2.8, and RG 1.68 Appendix A, Section 6.0.

As part of the review of FSAR Section 14.2S.2, the staff identified a number of Tier 1 and Tier 2 test departures in FOAK tests. The COL applicant must submit Tier 1 test departures to the NRC in accordance with 10 CFR 52.63(a) and 10 CFR Part 52, Appendix A, VIII.A. The COL applicant may review and approve Tier 2 FOAK test departures in accordance with 10 CFR 50.63(b) and 10 CFR Part 52, Appendix A, VIII.B.5. The staff evaluated the acceptance of these departures in SER Section 14.2.12 and determined that the FOAK tests in FSAR Sections 14.2.S.2 meet the requirements of 10 CFR Part 52, Appendix A, Section VIII and the guidance in SRP Section 14.2 Item 5.C, RG 1.206 Regulatory Position C.I.14.2.8, and RG 1.68 Appendix A, Section 6.0 and are therefore acceptable.

#### **14.2S.2.5 Post Combined Licensed Activities**

There are no post COL activities related to this section.

#### **14.2S.2.6 Conclusion**

The staff reviewed the relevant information related to FOAK tests in COL FSAR Sections 14.2.12 and 14.2S.2 and compared them against the requirements in 10 CFR Part 52, Appendix A, Section VIII and the SRP Acceptance Criteria Item 5C in NUREG-0800 Section 14.2 and the guidance in RG 1.206, Subsection C.I.14.2.8 and RG 1.68 Appendix A, Section 6.0.

The staff's review concluded that the applicant has addressed the required information relating to FOAK systems, and no outstanding information is expected to be addressed in the COL FSAR related to this section.

#### **14.2S.3 Overlap of Unit 3 Test Program with Unit 4 Test Program**

##### **14.2S.3.1 Introduction**

This supplemental ITP scheduling activity will be implemented using the generic ABWR DCD Section 14.2.13, COL License Information Item 14.2, Item (8).

##### **14.2S.3.2 Summary of Application**

The COL applicant provides the following supplemental information related to STP Units 3 and 4 ITP scheduling activities:

The project schedule indicates that the STP Unit 4 fuel load date is approximately 12 months later than that for STP Unit 3. Accordingly, the startup schedule indicates that STP Unit 3 will have completed most of the low and mid power testing before preoperational test program for STP Unit 4 commences. Unit 3 will be given priority should any additional personnel be required for initial startup testing. During the period of overlap, startup personnel will be allowed to work both units.

##### **14.2S.3.3 Regulatory Basis**

The regulatory basis for the test schedule, is provided in Section 14.2.11 of this SER.

##### **14.2S.3.4 Technical Evaluation**

In FSAR Section 14.2.11, the COL applicant provides the following post COL license information items to satisfy COL License Information Item 14.2, Item (8) in generic ABWR DCD Subsection 14.2.13.2

Based on the supplemental information for this post COL license information in FSAR Section 14.2S.3, the staff determined that the information meets the guidance in NUREG-0800, Section 14.2, SRP Acceptance Criteria Item 3.C, RG 1.68, Regulatory Positions C.2 and C.5 and RG 1.206, Subsection C.I.14.2.11. Therefore, the staff determined that it is acceptable that Unit 3 is given priority should any additional personnel be required for initial startup testing. Therefore, the test program schedule overlap between STP Units 3 and 4 is acceptable. .

### **14.2S.3.5 *Post Combined License Activities***

The applicant identifies Commitment 14.-1 in Section 14.2.11 of SER.

### **14.2S.3.6 *Conclusion***

NRC staff reviewed the application and checked the reference DCD. The staff concluded this supplemental information is acceptable because it meets the requirements in the certified ABWR DCD Section 14.2.13, COL License Information Item 14.2, Item (8) and Test Program Schedule guidance in NUREG-0800, SRP 14.2, RG 1.68 and RG 1.206.

## **14.2S.4 *Testing Required to be Completed Prior to Fuel Load***

### **14.2S.4.1 *Introduction***

The COL applicant provides the schedule for completing preoperational tests that must be completed before fuel loading. This schedule includes information on the ITAAC overlap with preoperational tests that must be completed before fuel loading begins.

### **14.2S.4.2 *Summary of Application***

The COL applicant provides supplemental information on the ITAAC schedule in 14.2S.4. The COL applicant states that "Table 142S-1 provides a cross-reference to each system preoperational test (or portion thereof) required to be completed before initial fuel loading, that is designed to satisfy the requirements for completing ITAAC in accordance with 10 CFR 52.99(a)." The table compares Tier 1 (ITAAC) Testing Requirements with the overlap of Tier 2 Test Descriptions in ITP preoperational tests.

### **14.2S.4.3 *Regulatory Basis***

The relevant requirements of the Commission regulations for the applicant's supplemental information and the associated acceptance criteria are in NUREG-0800 Section 14.2; RG 1.68 Regulatory Position C.5, "Schedule"; and RG 1.206 Subsection C.I.14.2.11, "Test Program Schedule."

As stated in RG 1.68, the requirements regarding the ITAAC for COL applications are in 10 CFR Part 52 and include the ITAAC overlap with the ITP preoperational tests. Some preoperational tests completed as part of the ITP would cover the test required for certain ITAAC that needs to be completed before fuel loading. For example, testing performed to demonstrate that safety-related SSCs will perform satisfactorily in service must be conducted under a program that satisfies Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50, and may also satisfy testing required by the ITAAC process.

### **14.2S.4.4 *Technical Evaluation***

The staff determined that the COL applicant has provided supplemental information related to the ITAAC schedule to meet the requirements in 10 CFR 50.99(a) and the ITAAC overlap with ITP preoperational tests, which also meets the guidance in NUREG-0800 Section 14.2, Regulatory Position C.5 in RG 1.68, and Regulatory Position C.I.14.2.11 in RG 1.206.

### **14.2S.4.5 *Post Combined Licensed Activities***

There are no post COL activities related to this section.

#### **14.2S.4.6 Conclusion**

NRC staff reviewed the application and checked the referenced DCD. The staff's review concluded that supplemental information related to the test schedule in FSAR Section 14.2S.4 meets the guidance in NUREG-0800 Section 14.2 and the regulatory positions related to the test schedule in RG 1.68 and RG1.206.

### **14.2S.12 Site-Specific Individual Test Descriptions**

#### **14.2S.12.1 Introduction**

This section of the FSAR provides supplemental information for site-specific individual test descriptions that are beyond the scope of the certified ABWR DCD Section 14.2.12. ,

#### **14.2S.12.2 Summary of Application**

In accordance with the guidance in RG 1.68, the applicant provides the following site-specific preoperational tests:

- FSAR Subsection 14.2S.12.1.78, "Makeup Water Purification Preoperational Test"
- FSAR Subsection 14.2S.12.1.79, "Makeup Water Preparation Preoperational Test"
- FSAR Subsection 14.2S.12.1.80, "Electrical Switchyard System Preoperational Test"
- FSAR Subsection 14.2S.12.1.81, "Personnel Monitors and Radiation Survey Instruments Preoperational Test"

#### **14.2S.12.3 Regulatory Basis**

The relevant requirements of the Commission regulations for the supplementary information on the site-specific individual test description, and the associated acceptance criteria, are in NUREG-0800 Section 14.2; SRP Acceptance Criteria 5, "Individual Test Descriptions/Abstracts"; RG 1.68 Appendix A, "Initial Test Program"; and RG 1.206 Regulatory Position C.I.14.2.12, "Individual Test Descriptions."

In addition, 10 CFR 30.53 also applies to tests for radiation detection equipment and monitoring instruments. For additional details, see the evaluation of FSAR Section 14.2S.12.1.81.

#### **14.2S.12.4 Technical Evaluation**

The staff's review of the information in Section 14.2S.12 of the COL FSAR is summarized below:

#### **Evaluation of FSAR Subsection 14.2S.12.1.78, Makeup Water Purification Preoperational Test**

The COL applicant identifies the Makeup Water Purification (MUWP) Preoperational Test as a site-specific test. The staff evaluated the design of the MUWP system in Section 9.2.10 of this SER. To be consistent with RG 1.68 Appendix A Section 1.e, "Power Conversion System,"

Item (11), "Makeup Water and Chemical Treatment Systems," the MUWP system should be included in the ITP.

The COL applicant provides the MUWP preoperational test abstract in FSAR Subsection 1.2S.12.1.78. The staff reviewed the MUWP test abstract and determined that it meets the guidance in RG 1.68 Appendix A Section 1.e, Item (11) and is therefore acceptable.

#### **Evaluation of FSAR Subsection 14.2S.12.1.79, Makeup Water Preparation Preoperational Test**

DCD Tier 2 Subsection 9.2.8.8 states that the COL applicant shall prepare and perform a preoperational test on the makeup water preparation in accordance with the requirements of Chapter 14. This COL applicant has added FSAR Subsection 14.2S.12.1.79, "Makeup Water Preparation Preoperational Test."

NRC staff determined that COL FSAR Subsection 14.2S.12.1.79 is included in the STP Units 3 and 4 ITP because it meets the guidance for a preoperational test abstract in RG 1.68, Appendix A, Section 1.e, Item (11). Therefore, the staff determined Subsection 14.2S.12.1.79 acceptable.

#### **Evaluation of FSAR Subsection 14.2S.12.1.80, Electrical Switchyard System Preoperational Test**

In Subsection 14.2S.12.1.80, "Electrical Switchyard System Preoperational Test," under paragraph (3), "General Test Methods and Acceptance Criteria," the applicant provides a list of preoperational tests (a) through (g) that will be conducted to demonstrate the capability of the switchyard system to provide power to plant loads under various plant operating conditions. NRC staff issued **RAI 14.02-7** requesting the applicant to indicate that the list will also include (1) the capability to transfer between normal offsite and alternate offsite sources, in accordance with testing requirements of GDC 18; (2) verification that the measured voltages at the various AC buses are consistent with the analytically derived values in accordance with Branch Technical Position (BTP) 8-6; and (3) verification that safety-related loads under degraded voltage setpoints will have adequate voltage, in accordance with BTP 8-6.

The applicant's response dated July 29, 2009, states:

- The capability to transfer between the normal preferred offsite source (that is, the unit auxiliary transformers [UATs]) and the alternate preferred offsite source (the reserve auxiliary transformers [RATs]) is verified through testing the equipment described in Subsection 14.2.12.1.45.4.3(e). Specifically, this capability is demonstrated in the ability of the source breakers for each medium voltage bus to properly operate and the ability of the UATs, RATs, and distribution system cables and switchgear to transfer power to their loads, in accordance with GDC 18.
- Verification that measured voltages at various AC buses are consistent with analytical values will be accomplished under Test Item 3(h) of Subsection 14.2.12.1.45.4, which tests to verify that there is adequate voltage between no load and full load conditions. The results of this test will be compared to analytical values to verify the system design, in accordance with BTP PSB -1. The applicant further points out the importance of a reference to BTP

PSB 1 and not to BTP 8-6 in DCD Revision 4, Tier 1 Table 1.8-19, dated July 1981. The requirements applicable to this request from both documents are the same.

- The performance of the system under degraded voltage conditions will be developed by analysis, with the analytical results compared to the preoperational test described in Subsection 14.2.12.1.45.4 3(h). Verification of the acceptability of the results will be in accordance with BTP PSB 1. The degraded voltage setpoints will be selected based on the results of the analysis.

The staff determined the applicant's response acceptable and the issue resolved for the following reasons:

- Transfer between the normal and alternate preferred offsite sources is verified by tests described in 14.2.12.1.45.4.3(e).
- The measured voltages are consistent with analytical values accomplished under test 14.2.12.1.45.4.3(h).
- The degraded voltage setpoint is based on analysis that is verified by test 14.2.12.1.45.4.3(h).

The staff concluded that the planned preoperational testing program to demonstrate the capability of the switchyard electrical system and components to supply reliable and adequate offsite AC power to safety-related and non-safety-related equipment via the appropriate distribution network(s), including normal and standby lighting systems, is consistent with BTP PSB1 and BTP 8-6. Therefore, **RAI 14.02-7** is resolved and FSAR Subsection 14.2S.12.1.80 is acceptable.

#### **Evaluation of FSAR Subsection 14.2S.12.1.81, Personnel Monitors and Radiation Survey Instruments Preoperational Test**

FSAR Subsection 14.2S.12.1.81 describes the preoperational test for personnel monitors and radiation survey instruments. NRC staff issued **RAI 14.02-5** requesting the applicant to address the following:

1. Describe the general types of personnel monitors and radiation survey instruments that are covered by this test.
2. The stated purpose of the test is "To verify the ability of the personnel monitors and radiation survey equipment to indicate and alarm normal and abnormal radiation levels." Will all of the monitors and instruments have alarm capabilities? If not, what other criteria will be used to ensure the proper operation of the equipment?
3. Under the heading "Prerequisites," the text states that "High radiation alarm setpoints shall be properly established based on sensor location, background radiation level, expected radiation level and low occupation dose prior to the test." Explain how the specification "low occupation dose" is used as an input in establishing radiation alarm setpoints for the personnel monitors and radiation survey instruments covered by this preoperational test.



4. Under the heading “General Test Methods and Acceptance Criteria,” the text identifies various criteria, many of which appear to be focused on installed AC powered equipment with external interface(s) for alarms, annunciators, and recorders as well as interlock and bypass functions. How will the criteria be applied to simple portable or semi-portable AC/DC monitors and instruments that do not have all of the listed functions and capabilities?
5. The staff notes that RG 1.68 (Appendix A, Section 1.k [Preoperational Testing-Radiation Protection Systems]) includes “laboratory equipment used to analyze or measure radiation levels and radioactivity concentrations” as one of the system types that should receive pre-operational testing to demonstrate proper operation. Please include site-specific pre-operational test for laboratory equipment in FSAR Subsection 14.2S.12.1.81 or justify the absence of such testing.

On July 29, 2009, the COL applicant provided the following response to **RAI 14.02-05**:

FSAR Subsection 14.2S. 12.1.81 is intended to describe the purpose, prerequisites, and general test methods and acceptance criteria for the preoperational testing of the personnel monitors and radiation survey instruments used at STP Units 3 and 4. However, information in the section is incorrect. The author presents the following to correct the description and present amplifying information for use during the review.

- a. The equipment has not been procured at this time. Personnel monitors for contamination are typically fixed, AC powered, microprocessor controlled devices that detect beta and/or gamma radiation. Some personnel monitors also detect alpha radiation. The microprocessor controller continuously checks the monitor for proper operation. Radiation survey instruments are typically battery-powered, hand-carried items in a variety of configurations and ranges. Survey instrumentation will include instruments to detect and quantify all types and levels of radiation necessary for personnel radiation protection.
- b. Fixed personnel contamination monitors will have alarm capabilities. Survey Instruments typically do not have alarm functions, although some specific instruments do incorporate alarms. Proper a operation of portable radiation survey equipment is typically ensured by performing response (source) checks with sources.
- c. Under Prerequisites and General Test Methods and Acceptance Criteria, FSAR Section 12.3.4, Area Radiation and Airborne Radioactivity Monitoring Instrumentation was incorrectly used for text and referenced. This text will be corrected and the reference will be removed.
- d. See (c) above.
- e. In accordance with RG 1.68, pre-operational testing of laboratory equipment used to analyze or measure radiation levels or radioactivity concentrations will be added to FSAR Subsection 14.2S.12.1.81.

The staff determined the applicant's response acceptable based on the additional information in the response to **RAI 14.02-5**; the commitment to revise Tier 2, Subsection 14.2S.12.1.81; and the commitment in COL application Section 12.5S to incorporate by reference Nuclear Energy Institute (NEI) 07-03A, "Generic FSAR Template Guidance for Radiation Protection Program Description," Revision 1. NEI 07-03A contains additional calibration criteria and guidance for personnel monitors and radiation survey instruments that apply to radiation protection instruments used at STP Units 3 and 4. The review and evaluation of the STP Units 3 and 4 Operational Radiation Protection Program are described in SER Section 12.5. COL application Tier 2, Subsection 14.2S.12.1.81 corrections described in the response are included in COL application Revision 3 submitted in a letter dated September 16, 2009. The staff determined that these changes to FSAR Subsection 14.2S.12.1.81 resolve **RAI 14.02-5** because they meet the requirements in 10 CFR 30.53 and the guidance in RG 1.68. Therefore, FSAR Subsection 14.2S.12.1.81 is acceptable, and the RAI 14.02-5 is resolved.

#### **14.2S.12.5 *Post Combined License Activities***

There are no post COL activities related to this activity.

#### **14.2S.12.6 *Conclusion***

The NRC staff reviewed the application and checked the referenced DCD. NRC staff reviewed the supplemental information on site-specific individual descriptions. The staff's review concluded that the test abstracts provided in Subsection 14.2S.12 meet the guidance in NUREG-0800, Section 14.2 SRP Acceptance Criterion 5, "Individual Test Descriptions/Abstracts"; RG 1.68 Appendix A, "Initial Test Program"; and RG 1.206 Regulatory Position C.I.14.2.12, "Individual Test Descriptions." This test abstract is therefore acceptable.

### **14.3 Tier 1 Selection Criteria and Processes (Related To RG 1.206, Section C.I.14.3, "Inspection, Test, Analysis, and Acceptance Criteria")**

#### **14.3.1 Introduction**

This section of the FSAR provides the selection criteria and processes used to develop the Tier 1 information. The Tier 1 information provides the principal design bases and design characteristics that are certified by the 10 CFR Part 52 rulemaking process and included in the formal ABWR design certification rule.

The Tier 1 information in the ABWR DCD consists of an introductory section; design descriptions and corresponding inspections; and tests, analyses, and acceptance criteria (ITAAC) for the systems of the design, design material applicable to multiple systems of the design, interface requirements, and site parameters for the ABWR design. ABWR DCD Section 14.3, "Certified Design Material," provides the bases and methods that were used to develop the information for each of the Tier 1 items for the ABWR. The information in Tier 1 and DCD Section 14.3 is derived from the detailed information in the DCD. Furthermore, the purpose of the ITAAC, which are part of the Tier 1 information, is to verify that a facility that references the design certification has been built and will operate in accordance with the design certification and the applicable regulations. Consequently, there is no design information in Tier 1 or Section 14.3 that is not also in the various sections of the FSAR (or Tier 2).

### 14.3.2 Summary of Application

Section 14.3 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 14.3 of the certified ABWR DCD, Revision 4, referenced in 10 CFR Part 52, Appendix A.

The ITAAC that are changed by Tier 1 departures and are for site-specific systems, emergency planning, and security are discussed in Section 14.3S and Part 9 of the COL application.

The following Tier 1 and Tier 2\* departures are identified in the referenced sections of the STP Units 3 and 4 FSAR and also in Part 7, "Departures Report":

#### Tier 1 Departures

- STD DEP T1 2.1-2                                      Reactor Pressure Vessel System reactor internal pump (RIP) Motor Casing Cladding

This departure modifies the description of the RIP motor casing to clearly indicate that some portions of the motor casing have cladding.

- STD DEP T1 2.2-1                                      Control Systems Changes to Inputs, Tests and Hardware

This departure modifies the acceptance criteria for the rod control and information system (RCIS) associated with the testing of one dual-redundant, non-class 1E uninterruptible power supply at a time.

- STD DEP T1 2.3-1                                      Deletion of Main Steam Isolation Valve (MSIV) Closure and Scram on High Radiation

This departure deletes the Scram and MSIV closure on a high main steam line radiation trip.

- STD DEP T1 2.4-1                                      RHR System and Spent Fuel Cooling

This departure adds a third RHR loop, RHR division A, in the augmented fuel pool cooling and fuel pool makeup modes.

- STD DEP T1 2.4-2                                      Feedwater Line Break Mitigation

This departure reduces challenges to the containment pressure design value following a feedwater line break (FWLB).

- STD DEP T1 2.4-3                                      RCIC Turbine/Pump

This departure involves the replacement of the RCIC turbine and pump system design with an integrated (monoblock) alternate turbine-pump system design.

- STD DEP T1 2.12-1 Electrical Breaker/Fuse Coordination and Low Voltage Testing

This departure addresses changes in electrical breaker/fuse coordination and low voltage testing and modifies the ITAAC in Tier 1 Table 2.12.1, "Electric Power Distribution System"; Table 2.12.12, "Direct Current Power Supply"; Table 2.12.14, "Vital AC Power Supply"; and Table 2.12.15, "Instrument and Control Power Supply."

- STD DEP T1 2.12-2 instrumentation and control (I&C) Power Divisions

This departure adds a fourth division of safety related power to the Class 1E I&C power supply system.

- STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

This departure eliminates the requirement to maintain equipment needed to mitigate a design-basis, loss-of-coolant accident (LOCA) hydrogen release.

- STD DEP T1 2.15-1 Re-classification of Radwaste Building (RW/B) Substructure from Seismic Category 1 to Non-Seismic

This departure revises the seismic category of the RW/B substructure from Seismic Category I to nonseismic.

- STD DEP T1 2.15-2 RBSRDG HVAC

This departure revises DCD Tier 1 Section 2.15.5, the diesel generator (DG) engine room maximum temperature limit during DG operation from 50 °C to 60 °C.

- STD DEP T1 3.4-1 Safety-Related I&C Architecture

This departure eliminates obsolete data communication technology and unnecessary inadvertent actuation prevention logic and equipment, clarifies digital controls nomenclature and systems, revises the implementation architecture to use configurable logic devices, and revises the testing and surveillance descriptions for safety system logic and control (SSLC), consistent with the characteristics of the selected platforms.

- STD DEP T1 5.0-1 Site Parameters

This departure identifies four specific departures from the generic site parameters envelope, where site specific data were analyzed using current methodologies and standards.

### Tier 2\* Departure

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

This departure identifies Tier 2\* items in two tables of applicable NRC RGs and industry codes and standards that are being updated to more current revisions/editions.

### 14.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1503. The relevant requirements of Commission regulations for the “Certified Design Material” or Tier 1 information, and the associated acceptance criteria, are listed in Section 14.3 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 1 and Tier 2\* departures. Tier 1 and Tier 2\* departures require prior NRC approval and are subject to the requirements of 10 CFR 52 Appendix A, Sections VIII.A.4 and VIII.B.6, respectively.

### 14.3.4 Technical Evaluation

As documented in NUREG-1503, NRC staff reviewed and approved Section 14.3 and the Tier 1 design material of the certified ABWR DCD. The staff reviewed Section 14.3 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 Departures

The following Tier 1 departures identified by the applicant require prior NRC approval and the full scope of their technical impact may be evaluated in the other sections of this SER accordingly. For more information, please refer to COLA Part 07, Section 5.0 for a listing of all FSAR sections affected by these Tier 1 departures.

- STD DEP T1 2.1-2    Reactor Pressure Vessel System RIP Motor Casing Cladding

This Tier 1 departure is necessary in order to make the Tier 1 design information consistent with the associated Tier 2 information. The Tier 2 information associated with this Tier 1 departure was evaluated and found to be acceptable by NRC staff, as described in SER Section 5.3.3. Based on this evaluation, the staff found this Tier 1 departure acceptable.

- STD DEP T1 2.2-1    Control Systems Changes to Inputs, Tests and Hardware

This Tier 1 departure is evaluated in Chapter 7 and Section 14.3S of this SER.

STD DEP T1 2.3-1      Deletion of MSIV Closure and Scram on High Radiation

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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 Tier 1 departure is necessary in order to make the Tier 1 design information consistent with the associated Tier 2 information. The Tier 2 information associated with this Tier 1 departure was evaluated and found to be acceptable by NRC staff, as described in SER Section 11.5. Based on this evaluation, the staff found this Tier 1 departure acceptable.

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

This Tier 1 departure is necessary in order to make the Tier 1 design information consistent with the associated Tier 2 information. The Tier 2 information associated with this Tier 1 departure was evaluated and found to be acceptable by NRC staff, as described in SER Section 5.4.7. Based on this evaluation, the staff found this Tier 1 departure acceptable.

- STD DEP T1 2.4-2 Feedwater Line Break Mitigation

This Tier 1 departure is necessary in order to make the Tier 1 design information consistent with the associated Tier 2 information. The Tier 2 information associated with this Tier 1 departure was evaluated and found to be acceptable by NRC staff, as described in SER Section 6.2.2. Based on this evaluation, the staff found this Tier 1 departure acceptable.

- STD DEP T1 2.4-3 RCIC Turbine/Pump

This Tier 1 departure is necessary in order to make the Tier 1 design information consistent with the associated Tier 2 information. The Tier 2 information associated with this Tier 1 departure was evaluated and found to be acceptable by NRC staff, as described in SER Section 5.4.6. As a result of open items in Chapter 5, the staff is unable to finalize its conclusions.

- STD DEP T1 2.12-1 Electrical Breaker/Fuse Coordination and Low Voltage Testing

This Tier 1 departure is evaluated in Section 14.3S of this SER.

- STD DEP T1 2.12-2 I&C Power Divisions

This Tier 1 departure is necessary in order to make the Tier 1 design information consistent with the associated Tier 2 information. The Tier 2 information associated with this Tier 1 departure was evaluated and found to be acceptable by the NRC staff, as described in SER Subsection 8.3.1.4. Based on this evaluation, the staff found this Tier 1 departure acceptable.

- STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

This Tier 1 departure is necessary in order to make the Tier 1 design information consistent with the associated Tier 2 information. The Tier 2 information associated with this Tier 1 departure was evaluated and found to be acceptable by NRC staff, as described in SER Section 6.25. Based on this evaluation, the staff found this Tier 1 departure acceptable.

- STD DEP T1 2.15-1 Re-classification of Radwaste Building Substructure from Seismic Category 1 to Non-Seismic

This Tier 1 departure is necessary in order to make the Tier 1 design information consistent with the associated Tier 2 information. The Tier 2 information associated with this Tier 1 departure was evaluated and found to be acceptable by NRC staff, as described in SER Section 3.8. Based on this evaluation, the staff found this Tier 1 departure acceptable.

- STD DEP T1 2.15-2 RBSRDG HVAC

This Tier 1 departure is necessary in order to make the Tier 1 design information consistent with the associated Tier 2 information. The Tier 2 information associated with this Tier 1 departure was evaluated in SER Chapters 8 and 9. As a result of open items in Chapters 8 and 9, the staff is unable to finalize its conclusions.

- STD DEP T1 3.4-1 Safety-Related I&C Architecture

This Tier 1 departure is necessary in order to make the Tier 1 design information consistent with the associated Tier 2 information. The Tier 2 information associated with this Tier 1 departure was evaluated and found to be acceptable by NRC staff, as described in SER Chapter 7. Based on this evaluation, the staff found this Tier 1 departure acceptable.

- STD DEP T1 5.0-1 Site Parameters

This Tier 1 departure is necessary in order to make the Tier 1 design information consistent with the associated Tier 2 information. The Tier 2 information associated with this Tier 1 departure was evaluated and found to be acceptable by NRC staff, as described in the following SER sections:

- Maximum Flood Level, SER Sections 2.4S.4, 2.4S.5, and 2.4S.10
- Maximum Rainfall Rate (for roof design), SER Section 2.4S.2
- Minimum Shear Wave Velocity, SER Sections 3.7 and 3.8
- Ambient Design Temperature, SER Sections 9.2 and 9.4

As a result of open items in Chapter 2, the staff is unable to finalize its conclusions.

### Tier 2\* Departure

The following Tier 2\* departure identified by the applicant require prior NRC approval and the full scope of its technical impact may be evaluated in the other sections of this SER accordingly. For more information, please refer to COLA Part 07, Section 5.0 for a listing of all FSAR sections affected by this Tier 2\* departure.

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

SER Section 8.1.4 and Subsections 5.2.1.1 and 7.1.2.4 evaluate this Tier 2\* departure.

### **14.3.5 Post Combined License Activities**

There are no post COL activities associated with the Tier 1 departures. The evaluation of the departures to ITAAC and the site-specific, emergency planning and security ITAAC is in SER Section 14.3S.

### **14.3.6 Conclusion**

As a result of the open items mentioned above, the staff is unable to finalize its conclusions relating to “Tier 1 Selection Criteria and Processes” in accordance with the NRC regulations.

## **14.3S Inspections, Tests, Analyses and Acceptance Criteria (ITAAC)**

### **14.3S.1 Introduction**

Part 9 of the STP COL application includes the inspections, tests, and analyses applicable to emergency planning and physical security that the applicant proposes to perform, as well as the acceptance criteria that are necessary and sufficient to provide reasonable assurance that if the proposed inspections, tests, and analyses are performed and the acceptance criteria are met, the facility has been constructed and will operate in conformance with the COL, the provisions of the Atomic Energy Act, and NRC regulations. The applicant provides the proposed selection methodology and criteria for establishing the ITAAC that are necessary and sufficient to provide that reasonable assurance.

In Section 14.3S of the FSAR, the applicant addresses the criteria used to develop the ITAAC for site-specific systems, emergency planning, and security that are specified in Part 9 of the COL application. The applicant states that the site-specific selection criteria and methodology in Section 14.3 of the certified ABWR DCD were utilized as the site-specific selection criteria and methodology for inspections, tests, analyses, and acceptance criteria, including those applicable to the emergency planning and physical security hardware.

This section of the SER evaluates all site-specific ITAAC and Tier 1 departures from the ITAAC that are applicable to STP Units 3 and 4 established in the ABWR DCD.

### **14.3S.2 Summary of Application**

COL application Part 9 identifies the ITAAC applicable to STP Units 3 and 4. Part 9 contains the ITAAC that are included in the ABWR design certification material, the site-specific ITAAC, and the ITAAC that focus on emergency planning and safeguards and security requirements.

#### **14.3S.2.1 *Design Certification ITAAC***

Part 9, Section 2.0 contains the design certification ITAAC. The design certification ITAAC in the STP COL application are based on the ABWR design certification material in the certified



ABWR DCD, Revision 4, referenced in 10 CFR 52 Appendix A (ABWR DCD), Tier 1 Chapters 2 and 3. The total scope of the design certification material (including the ITAAC) is located in the Tier 1 material in Part 2 of the COL application and the ABWR DCD. The Tier 1 ITAAC are incorporated by reference, with the exception of the ITAAC that are modified by the following departures.

Tier 1 Departures

- STD DEP T1 2.2-1 Control Systems Changes to Inputs, Tests and Hardware

This departure modifies the ITAAC based on the final RCIS design implementation, where the power supply associated with the one non-Class 1E uninterruptible power supply being tested will become inoperable and both dual-redundant controller channels will remain operational when this test is conducted. The departure also modifies the ITAAC in Tier 1 Table 2.2.1, "Rod Control and Information System."

- STD DEP T1 2.4-1 RHR System and Spent Fuel Cooling

This departure adds a third RHR loop, RHR division A, in the augmented fuel pool cooling and fuel pool makeup modes and modifies the ITAAC in Tier 1 Table 2.4.1, "Residual Heat Removal System."

- STD DEP T1 2.4-3 RCIC Turbine/Pump

This departure changes the RCIC turbine/pump design to an integrated monoblock design and modifies the ITAAC in Tier 1 Table 2.4.4, "Reactor Core Isolation Cooling System."

- STD DEP T1 2.12-1 Electrical Breaker/Fuse Coordination and Low Voltage Testing

This departure changes electrical breaker/fuse coordination and low-voltage testing. The departure also modifies the ITAAC in Tier 1 Table 2.12.1, "Electric Power Distribution System"; Table 2.12.12, "Direct Current Power Supply"; Table 2.12.14, "Vital AC Power Supply"; and Table 2.12.15, "Instrument and Control Power Supply."

- STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

This departure eliminates the requirement to maintain equipment needed to mitigate a design-basis, LOCA hydrogen release. The departure also modifies the ITAAC in Tier 1 Table 2.3.3, "Containment Atmospheric Monitoring System"; Table 2.14.8, "Flammability Control System"; and Table 2.15.5.c, "Reactor Building Safety-Related Equipment HVAC System."

- STD DEP T1 3.4-1 Safety-Related I&C Architecture

This departure addresses design changes to the safety-related instrumentation and control (I&C) architecture:

- Elimination of obsolete data communication technology
- Elimination of unnecessary inadvertent actuation prevention logic and equipment
- Clarifications of digital controls nomenclature and systems
- Final selection of platforms that changed the implementation architecture
- Testing and surveillance changes

This departure modifies the ITAAC in Tier 1 Table 2.2.11, "Process Computer System"; Table 2.7.5, "Essential Multiplexing System"; and Table 3.4, "Instrumentation and Control."

#### **14.3S.2.2 Site-Specific ITAAC**

COL application Part 9, Section 3.0 contains the site-specific ITAAC. The STP Units 3 and 4 COL FSAR, Tier 2 Section 1.2, contains the following site-specific systems that require detailed ITAAC in the COL application. The listing coincides with the out-of-scope elements defined in the ABWR DCD, Tier 2 Revision 4 Section 1.1.2, "ABWR Standard Plant Scope," which lists the following out-of-scope structures, systems, and components (SSCs):

- Ultimate heat sink (UHS) (Section 9.2.5)
- Offsite power (Section 8.2.4)
- Makeup water preparation (Section 9.2.8)
- Potable and sanitary water systems (Section 9.2.4)
- Reactor service water (RSW) (Section 9.2.15)
- Turbine service water (Section 9.2.16)
- Communications (Section 9.5.2)
- Site security (Section 13.6.2)
- Circulating water system (Section 10.4.5)
- Heating, ventilating, and air conditioning (HVAC) (Section 9.4)

Part 9 of the STP COL application addresses the ITAAC for the 10 systems listed above and also for the following two systems:

- Backfill under Seismic Category 1 structures
- Breathing Air System (BAS)

The ITAAC for these systems are in Tables 3.0-1 through 3.0-12 of Part 9, Section 3.0. In general, the ITAAC for site-specific systems were developed to correspond to the interface criteria in Tier 1, Chapter 4 of the referenced ABWR DCD. Those site-specific systems that do not have a safety function sufficiently significant to meet the selection criteria for the ITAAC are identified by the designation "No entry for this system."

#### **14.3S.2.3 Emergency Planning ITAAC**

Part 9, Section 4.0 contains the site-specific Emergency Planning ITAAC proposed for STP Units 3 and 4. The technical evaluation of these ITAAC is in SER Section 13.3.

#### **14.3S.2.4 Physical Security ITAAC**

Part 9, Section 5.0 contains the site-specific Physical Security ITAAC proposed for STP Units 3 and 4.

### **14.3S.3 Regulatory Basis**

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

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

The regulations in 10 CFR 52.79(d)(2) and 10 CFR 52.80(a) contain requirements for site-specific ITAAC:

- 10 CFR 52.79(d)(2) requires the COL applicant to demonstrate in the FSAR that the design meets the interface requirements established under 10 CFR 52.47, “Contents of applications; technical information.”
- 10 CFR 52.80(a) requires the COL application to contain the proposed inspections, tests, and analyses, including those (a) that are applicable to emergency planning; (b) that the licensee shall perform; and (c) that meet necessary and sufficient acceptance criteria to provide a reasonable assurance that if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity with the COL, the provisions of the Atomic Energy Act, and the Commission’s rules and regulations.

In addition, SRP Section 14.3 provides the acceptance criteria and associated guidance for the review.

### **14.3S.4 Technical Evaluation**

As documented in NUREG–1503, NRC staff reviewed and approved the Tier 1 ITAAC in the certified ABWR DCD. The staff reviewed Part 9 of the STP Units 3 and 4 COL application and checked the referenced ABWR DCD to ensure that the combination of the information in the COL application and the information in the ABWR DCD appropriately represents the complete scope of information relating to this review topic.

The staff reviewed the following information in the COL FSAR:

#### *Tier 1 Departures*

The following Tier 1 departures identified by the applicant in this section require prior NRC approval and the full scope of their technical impact may be evaluated in the other sections of this SER accordingly. For more information, please refer to COLA Part 07, Section 5.0 for a listing of all FSAR sections affected by these Tier 1 departures.

- STD DEP T1 2.2-1 Control Systems Changes to Inputs, Tests and Hardware

STD DEP T1 2.2-1 modifies ITAAC Table 2.2.1, Item 11 Acceptance Criteria based on the final RCIS design implementation, where the power supply associated with the one non-Class 1E uninterruptible power supply being tested will become inoperable and both dual-redundant controller channels remain operational when this testing is conducted.

The purpose of this departure is to clarify that the ITAAC acceptance criteria are consistent with the final RCIS design. NRC staff issued **RAI 14.03.06-1** requesting the applicant to clarify the intent of this ITAAC. This ITAAC is characteristic of other similar ITAAC that place a test signal into the loads supplied by a specific power supply and verify that the test signal only exists at those loads. However, this ITAAC verifies that the test signal exists only in the power supply, which is not in agreement with other similar ITAAC. Based on Revision 2 of Part 7 of the STP application (page 2.1-6), each of the two RCIS channels can be supplied from one power supply when the other power supply is in test mode. Therefore, both RCIS channels can be supplied from either power supply, as stated on page 2.1-6. The applicant's response to RAI 14.03.06-1 (STPNOC Letter U7-C-STP-NRC-090162, dated September 24, 2009) indicates that (1) a change to the RCIS uninterruptible power supply (UPS) design allows both channels of the RCIS to remain operational if either one of the two associated UPS is operational, and (2) the ITAAC was revised to confirm the operability of the RCIS channels when one power supply is inoperable in an alarmed condition. The staff found the applicant's response acceptable. Therefore, **RAI 14.03.06-1** is resolved.

The proposed change to ITAAC Table 2.2.1 Item 11, based on STD DEP T1 2.2-1, is consistent with the RCIS design description in Tier 1 and in Section 7.6 of Tier 2. NRC staff concluded that the proposed ITAAC will ensure that the system will perform in accordance with its design. Therefore STD DEP T1 2.2-1 is acceptable. For the technical and regulatory compliance evaluation of this departure, refer to Chapter 7 of this SER. Therefore, the staff found this departure acceptable.

- STD DEP T1 2.4-1 RHR System and Spent Fuel Cooling

In FSAR Subsection 5.4.7.1, "Design Basis," the applicant introduces STD DEP T1 2.4-1, which revises the number of RHR loops connected to the upper pools from two to three to provide additional flexibility in the shutdown cooling flow to the upper pools, during normal refueling activities.

The purpose of this departure is to improve the capability of performing divisional outages in any order for maintenance and other activities, while maintaining the single failure margin. Therefore, this change will add the RHR division A loop in the augmented fuel pool cooling and fuel pool makeup modes, in addition to divisions B and C. The applicant states that the additional components, such as piping and valves, "will be of the same quality standard, seismic category, and ASME code as the B and C RHR loop components."

In Tier 1 Section 2.4.1, RHR is also revised to reflect the new division A connection to the fuel pool cooling system. The cross-tie connections are also correctly shown in the Tier-1 revisions of Figures 2.4.1a, b, and c. ITAAC Table 2.4.4 (Item 7) is revised to include the division A connection. NRC staff concluded that the proposed ITAAC, will ensure that the system will perform in accordance with its design. Therefore STD DEP T1 2.4-1 is acceptable. .

- STD DEP T1 2.4-3 RCIC Turbine/Pump

In this departure, the applicant changes the RCIC turbine and pump assembly design in favor of an improved design. The new RCIC turbine/pump is a monoblock design consisting of a horizontal, two-stage centrifugal water pump driven by a steam turbine contained in a turbine casing integral with the pump casing. The following features in this improved design simplify the system: (a) there is a monoblock design (pump and turbine within the same casing), (b) there is no required shaft seal, (c) there is no required barometric condenser, (d) there is no required oil lubrication or oil cooling system because the system is totally water lubricated, (e) there is no steam bypass line required for startup, (f) there are simpler auxiliary subsystems, and (g) there are no required vacuum pump and associated penetration piping or isolation valves. The design change affects the following ITAAC items:

Table 2.4.4 ITAAC Items 3.c, e, and f:

The steam supply bypass valve logic description and the 10-second time delays were deleted from the acceptance criteria. Because there is no steam supply bypass valve and no timer with the new turbine, NRC staff found this change acceptable.

Table 2.4.4, ITAAC Item 3.i:

The pump torque was deleted from the acceptance criteria. Because this parameter cannot be directly measured in the integrated turbine/pump configuration, the staff found this change acceptable.

NRC staff concluded that the proposed ITAAC, will ensure that the system will perform in accordance with its design. Therefore STD DEP T1 2.4-3 is acceptable.

- STD DEP T1 2.12-1 Electrical Breaker/Fuse Coordination and Low Voltage Testing

In DCD Tier 1 Table 2.12.1 (“Electrical Power Distribution System ITAAC”), Item 22 requires tests of the as-built Class 1E electric power distribution system to be conducted by operating connected Class 1E loads at their analyzed minimum voltage. Additionally, in DCD Tier 1 Table 2.12.12 (“Direct Current Power Supply ITAAC”), Item 11 requires tests of the as-built Class 1E DC system to be conducted by operating connected Class 1E loads at less than or equal to the minimum allowable battery voltage and at greater than or equal to the maximum battery charging voltage.

However, the applicant states that it is not practical to perform tests in this manner. The applicant has modified DCD Table 2.12.1, Item 22 and Table 2.12.12, Item 11 to include type tests at the manufacturer’s shop for the operating voltage range (minimum and maximum) of Class 1E AC and DC electrical equipment (Items 22 b and 11b). In addition to the manufacturer’s testing, the applicant will conduct system preoperational and start-up tests of each load of the as-built electrical system at the normal operating voltages (Items 22c and 11c). The applicant will compare the minimum analyzed voltages for the equipment against the manufacturer’s operating voltage range test results to ensure that each load can perform its intended safety function at the analyzed minimum voltage condition. NRC staff found that the combination of the factory, preoperational, and start-up tests meets the intent of the test requirements specified in the DCD based on the following:

Type tests at the manufacturer's shop are for the minimum and maximum operating voltage range.

Preoperational and start-up tests of the as-built electrical system are at the normal operating voltage.

Comparisons of the analyzed minimum and maximum voltages for the equipment against the results of the type tests at the manufacturer's shop are at the operating voltage range.

The applicant states that interrupting devices (circuit breakers and fuses) are coordinated so that the interrupting device closest to the fault opens before the other devices. The applicant notes that the expectation was changed to meet the requirements to the maximum extent possible, because protective device coordination may overlap and the discrete coordination may not be possible (see DCD Tier 1 Table 2.12.1, "Electrical Power Distribution System"; Table 2.12.12, "Direct Current Power Supply"; Table 2.12.14, "Vital AC Power Supply"; and Section 2.12.15, "Instrument and Control Power Supply"). The applicant has modified the above tables to include "to the maximum extent possible" after the interrupting devices are coordinated. For electrical loads powered at or below 120 VAC or 125 VDC, the requirement that the device closest to the fault open first is not always met. This is because many small loads have integral fuses/circuit breakers that cannot be changed to facilitate coordination with upstream protective devices. Therefore, in those cases for high current faults, the upstream protective device may trip before the integral protective device associated with the small load; or both protective devices may trip at the same time. In such cases, discrete coordination may not be possible.

The staff agreed that protective device coordination for 120 VAC or 125 VDC may overlap and the discrete coordination may not be possible. However, the applicant should provide a justification for the acceptability of these instances where adequate coordination cannot be achieved. The staff issued **RAI 14.03-1** requesting the applicant to modify the acceptance criteria to include a justification for acceptability in those instances where adequate coordination cannot be achieved. The applicant's response to **RAI 14.03-1** (STPNOC Letter U7-C-STP-NRC-090071, dated July 22, 2009) states that per the document dated July 22, 2009, the acceptance criteria in Table 2.12.1 (Item 11), Table 2.12.12 (Item 8), Table 2.12.14 (Item 10), and Table 2.12.15 (Item 9) will be modified to include, "For instances where coordination cannot be practically achieved, the analysis will justify the lack of coordination." The staff found the applicant's response acceptable. Therefore, **RAI 14.03-1** is resolved. Verification that these changes are incorporated in the next FSAR revision is being tracked as **Confirmatory Item 14.3-1**.

The staff found that the ITAAC for the electrical power distribution system and the DC power supply system are consistent with 10 CFR 52.80(a), SRP 14.3.6, and RG 1.206. NRC staff concluded that the proposed ITAAC, will ensure that the system will perform in accordance with its design. Therefore STD DEP T1 2.12-1 is acceptable.

#### STD DEP T1 2.14-1 Hydrogen Recombiner Requirements Elimination

This departure eliminates the requirements to maintain equipment used to mitigate a design-basis LOCA hydrogen release. The flammability control system (FCS) was removed from the ABWR STP design. As a result of this departure, the applicant also removed Table 2.14.8 (the ITAAC for the FCS) from the containment ITAAC and removed the ITAAC for the FCS from

Table 2.15.5c (“Reactor Building Safety Related Equipment”). The deletion of the ITAAC associated with the FCS is consistent with the removal of the FCS from the STP design. In addition, the applicant also downgraded the oxygen/hydrogen monitoring equipment to nonsafety related.

These proposed changes to STP Units 3 and 4 COL application Tier 1 Section 2.3.3, “Containment Atmospheric Monitoring System,” and to ITAAC Table 2.3.3, “Containment Atmospheric Monitoring System,” are consistent with the proposed CAM system changes in Tier 2, Chapter 7. The changes to ITAAC Table 2.3.3 are limited to downgrading the oxygen/hydrogen monitoring equipment to nonsafety related. NRC staff found these changes acceptable.

SER Section 6.2.5 evaluates the overall acceptance of Departure STD DEP T1 2.14-1. NRC staff concluded that the proposed ITAAC will ensure that the system will perform in accordance with its design. Therefore, STD DEP T1 2.14-1 is acceptable.

- STD DEP T1 3.4-1 Safety-Related I&C Architecture

*Tier 1 Section 2.2. “Control and Instrument Systems”*

The applicant has revised Table 2.2.11 based on Tier 1 Departure STD DEP T1 3.4-1, which changes the ABWR safety-related I&C systems architecture. In Items 1, 2, and 3 of Table 2.2.11, “Process Computer System ITAAC,” the applicant replaced “Process Computer System (PCS)” with “Plant Computer Functions (PCFs)” and modified the related text. As described in Tier 1 Section 2.2.11, in the proposed I&C architecture, all of the PCS functions are now performed in the plant information and control system (PICS), thereby eliminating the need for a dedicated PCS. Similar to the PCS, the PCFs are classified as nonsafety related. NRC staff concluded that replacing the PCS with PCFs will not decrease the level of safety. Therefore, the staff found these changes acceptable. Changes to these ITAAC are consistent with the I&C design description in Tier 1 and in Chapter 7 of Tier 2.

*Tier 1 Section 2.7. “Control Panels”*

The applicant has revised Table 2.7.5, ITAAC Items 1 through 7 based on Tier 1 Departure STD DEP T1 3.4-1. As described in Section 2.7.5, the essential and non-essential communication functions of the proposed I&C architecture are significantly different from the essential multiplexing system (EMS) and the non-essential multiplexing system (NEMS). In FSAR Tier 1 Table 2.7.5, the applicant has primarily taken departures that relate to nomenclature changes resulting from the proposed I&C architecture. As described in Section 2.7.5, the essential communication functions are accomplished as part of the safety-related I&C systems and equipment that make up safety system logic and control (SSLC). The non-essential communication functions are performed through a plant-wide, distributed network identified as the plant data network (PDN) system. The proposed data communication architecture is significantly different from the certified multiplexing system. NRC staff requested the applicant to include the inspections, tests, and/or analyses that address specific features of the proposed data communication functions inherent to the SSLC platforms, such as timing and load. In addition, Item 3 of Table 2.7.5 states that “Data cannot be transmitted from the non-safety-related side to equipment implementing the ECFs.” However, data are communicated from the nonsafety-related side to the safety-related system, although the transmission is manually controlled. The staff requested the applicant to sufficiently clarify this inconsistency and

include the tests and inspections of this manually controlled data communication system as an ITAAC item in Table 2.7.5. The applicant's response to **RAI 14.03.05-4** (STPNOC Letter U7-C-STP-NRC-090162, dated September 24, 2009) provides assurances that the safety-related I&C systems are deterministic. The response times for the system elements including architecture, communications (such as timing and loading), and processing elements will be analyzed in accordance with BTP 7-21 to verify that the performance characteristics of the systems are consistent with their safety requirements established in the design basis. The staff found that the DI&C design developed in accordance with BTP 7-21 meets the current regulations that form the bases for the BTP. In addition, inspections of the design acceptance criteria (DAC)/ITAAC in Table 3.4 will verify compliance of the safety-related DI&C systems to BTP 7-21. The applicant's response to the staff's question regarding Item 3 of Table 2.7.5 states that the NMS also includes a separate offline method that is used to transfer calibration data from the PICS to the NMS. When the NMS is online and is not bypassed, data transfer to the NMS from the nonsafety system is blocked by a key-lock switch. When calibration information is to be transferred from the nonsafety-related core monitor function of the PCF, the NMS division designated to receive the information must be placed in an inoperative status and a key-lock switch must be enabled to allow the data transfer. Only a limited data set in a predefined format will be accepted by the NMS. Before the data can be utilized by the NMS, manual verification and acceptance are required. To clarify this nonsafety-to-safety system communication function, the applicant will make the following change in FSAR Tier 1 Subsection 2.7.5, the sixth paragraph below "Essential Communication Functions (ECF)":

Data communication from safety-related to nonsafety related systems or devices is isolated through the use of an isolating transmission medium and buffering devices. Data cannot be transmitted from the nonsafety side to safety-related equipment when the equipment is in service.

The staff found that this FSAR update clarifies the NMS system interface with the non-safety-related system, and the proposed administrative controls will adequately assure the isolation of the NMS from nonsafety-related systems. The staff found the applicant's response acceptable. Therefore, **RAI 14.03.05-4** is resolved. Verification that this change is incorporated in the next FSAR revision is being tracked as **Confirmatory Item 14.03.05-4**.

For ITAAC Item 4 in Table 2.7.5, the staff requested the applicant to explain how the acceptance criterion as written addresses both of the design commitments for this ITAAC: (a) redundancy in the instrumentation circuits, and (b) self-diagnostics and alarming in the main control room (MCR) for a fault. The applicant's response to **RAI 14.03.05-1** (STPNOC Letter U7-C-STP-NRC-090028, dated April 2, 2009) revises this ITAAC in Revision 3 by deleting the redundancy statement in ITAAC Item 4, which is already addressed in ITAAC Item 1 in Table 2.7.5. The new ITAAC only addresses self-diagnostics and alarming in the MCR. The staff agreed with the applicant's response and with the revision to this ITAAC. Therefore, **RAI 14.03.05-1** is resolved.

Regarding the request for additional ITAAC, the applicant's response to **RAI 14.03.05-8** (STPNOC Letter U7-C-STP-NRC-090162, dated September 24, 2009) evaluates and demonstrates the adequacy of the existing DAC/ITAAC in conformance with SRP 14.3.5. The staff found the applicant's response acceptable. Therefore, **RAI 14.03.05-8** is resolved.



Changes to Table 2.7.5 ITAAC Items 1 through 7 are consistent with the I&C design description in Tier 1 and in Chapter 7 of Tier 2. For an additional technical and regulatory compliance evaluation of this departure, refer to Chapter 7 of this SER.

Tier 1 Section 3.4, "Instrumentation and Control"

The applicant revised Tier 1 Section 3.4, ITAAC Table 3.4 based on Tier 1 Departure STD DEP T1 3.4-1. The applicant provided additional changes to Tier 1 Section 3.4 and ITAAC Table 3.4 (STPNOC letter U7-C-STP-NRC-090009, dated February 9, 2009). In general, the changes reflect the proposed I&C architecture, which NRC staff found acceptable with the following concerns/issues regarding Table 3.4, "Instrumentation and Control ITAAC." The staff requested the following additional information from the applicant:

- Based on STD DEP T1 3.4-1, the applicant revised the I&C architecture-related nomenclature used in Table 3.4, ITAAC Item 3 of the "Design Commitment." However, the types of Class 1E power sources were not changed and are now inconsistent with the proposed power sources for the RTIS and emergency safety features (ESF) logic and control system (ELCS) described in Tier 1 Subsection A of Section 3.4. Also, the revised design commitment does not include the equipment implementing the ESF safety system logic function (SLF) in Division IV and the ESF remote digital logic controller (RDLC) in all four divisions. The staff requested the applicant to resolve this inconsistency between the ITAAC design commitment and the Tier 1 design description. The staff also asked the applicant to identify the ITAAC that address the equipment implementing the ESF SLF in Division IV and the ESF RDLC in all four divisions. The applicant's response to **RAI 14.03.05-5** (STPNOC Letter U7-C-STP-NRC-090162, dated September 24, 2009) states that the revised Tier 1 Subsection 3.4.A generically references Class 1E for power sources of the SSLC instead of specific Class 1E AC or Class 1E DC power. The purpose of this change is for clarification following the architectural splitting of the SSLC into the RTIS (AC powered) and the ELCS (DC powered). Tier 1 Table 3.4 ITAAC Item 3, "Design Commitment," specifically and correctly references Class 1E AC power for the RTIS and Class 1E DC power for the ELCS. Therefore, for purposes of consistency, Tier 1 Subsection 3.4.A will be revised. This FSAR update is consistent with the ABWR DCD. That is, the RPS and the MSIV (implemented in the RTIS platform) are powered from their respective divisional Class 1E AC sources and the ESF components (implemented in the ELCS platform) are powered from their respective divisional Class 1E DC sources. The staff found the proposed update of FSAR Tier 1, Subsection 3.4.A acceptable. Therefore, **RAI 14.03.05-5** is resolved. Verification that this change is incorporated in the next FSAR revision is being tracked as **Confirmatory Item 14.03.05-5**. The applicant's RAI response also states that the ITAAC design commitment, as described in Tier 1, Table 3.4 ITAAC Item 3 is correct. The ELCS is comprised of four divisions of inputs and DTFs, which feed the three divisions of the SLFs corresponding to the three divisions of ESF equipment to perform the safety functions. The ABWR DCD Tier 1 Table 3.4 ITAAC Item 3, "Design Commitment," lists for the ELCS the references to the DTM and SLU for Divisions I, II, and III and the DTM for Division IV. The departure modifies this to identify the DTF and SLF for Divisions I, II, and III and the DTF for Division IV. Tier 1 Departure STD DEP T1 3.4-1 effectively replaces the Remote Multiplexing Unit (RMU) with the RDLC. The RDLC is generically covered under Tier 1 Table 2.7.5 ITAAC Item 6, as part of each division of equipment implementing the ECF, which lists the same divisional Class 1E power as Tier 1 Table 3.4, ITAAC Item 3. The staff found the

applicant's description consistent with the design concepts in the ABWR DCD and therefore acceptable.

- Based on STD DEP T1 3.4-1, the applicant revised the ESF output channel bypass design commitment and related ITA and acceptance criteria in Table 3.4, ITAAC Item 4. The staff was unable to evaluate this change due to the vagueness of the ESF design description in Tier 1 Section 3.4 (questioned under a separate RAI). The staff requested the applicant to evaluate the impact on this ITAAC resulting from potential changes to the ESF design description. The applicant's response to **RAI 14.03.05-6** (STPNOC Letter U7-C-STP-NRC-090162, dated September 24, 2009) states that the ESF output channel bypass described in the referenced ABWR DCD will account for the failure of a redundant SLF detected with self-diagnostics. Tier 1 Departure STD DEP T1 3.4-1 changes the architecture, as described in the departure description. The final 2-out-of-2 vote on functions requiring redundant SLF processing is performed in non-microprocessor-based hardware, as described in Tier 1 Subsection 3.4.A for the ELCS processing step (3). Also, the functions that are implemented with redundant SLF processors are described in the same section and are based on Tier 2 Subsection 16 B 3.3.1.4. The output channel bypass remains in the ESF design. The ITA and acceptance criteria in Table 3.4, ITAAC Item 4 were modified as part of STD DEP T1 3.4-1: the modification of the ITA accounts for a nomenclature change from SLU to SLF and the removal of the RMU. ITA c(1) remains functionally the same as in the DCD. ITA c(2) repeats the testing of c(1) but with the automatic output channel bypass disabled and a manual output channel bypass operating. The applicant also states that ABWR DCD ITA 4c(2) and Acceptance Criterion 4c(2) will be restored to Tier 1 Table 3.4 with the nomenclature changes, and Tier 1 Subsection 3.4.A will be updated accordingly. The staff found the proposed changes to the FSAR consistent with the ESF output channel bypass the design described in the ABWR DCD. These changes are therefore acceptable. Therefore, **RAI 14.03.05-6** is resolved. Verification that these changes are incorporated in the next FSAR revision is being tracked as **Confirmatory Item 14.03.05-6**.
- Based on STD DEP T1 3.4-1, the applicant has changed the EMS to ECF and the NEMS to non-ECF (NECF) in Table 3.4, ITAAC Item 12. This ITAAC is for electromagnetic compatibility (EMC) compliance testing of the electrical and electronic components used in the SSLC and other microprocessor-based, software controlled equipment. (Note that the ECF and the NECF are functions and the electrical or electronic components they replaced, are essential and non-essential multiplexing systems). The staff requested the applicant to evaluate the applicability of ITAAC Item 12 to the ECF and NECF. The applicant's response to **RAI 14.03.05-7** (STPNOC Letter U7-C-STP-NRC-090162, dated September 24, 2009) revises Tier 1 Table 3.4, ITAAC Item 12 to clarify that it is the equipment performing the ECF and the NECF that will undergo the EMC qualification. The staff found the proposed revision to the FSAR acceptable. Therefore, **RAI 14.03.05-7** is resolved. Verification that these changes are incorporated in the next FSAR revision is being tracked as **Confirmatory Item 14.03.05-7**.
- Enclosure 4f of the applicant's response (letter U7-C-STP-NRC-090009, dated February 9, 2009) evaluates the Tier 1 ITAAC for conformance to SRP 14.3. In this evaluation, the applicant concludes that SRP 14.3 does not address specific

DAC/ITAAC. Therefore, the requirements of SRP 14.3 are not applicable to the DAC/ITAAC in Tier 1, Chapter 3. The staff found this evaluation unacceptable.

- The staff requested the applicant to reevaluate Tier 1 ITAAC for conformance to SRP 14.3 guidance. The applicant's response to **RAI 14.03.05-8** (STPNOC Letter U7-C\_STP-NRC-090162, dated September 24, 2009) reevaluates the Tier 1 ITAAC for conformance to SRP 14.3 and 14.3.5 guidance, which supersedes a similar previous evaluation (documented in Enclosure 4.f of STPNOC letter U7-C-STP-NRC-090009). The staff found the applicant's evaluation acceptable. Therefore, **RAI 14.03.05-8** is resolved.

Changes to ITAAC Table 3.4 discussed above are consistent with the I&C design description in Tier 1 and in Chapter of Tier 2. NRC staff concluded that the proposed ITAAC, will ensure that the system will perform in accordance with its design. Therefore STD DEP T1 3.4-1 is acceptable.

### Site-Specific ITAAC

In FSAR Section 14.3S, the applicant states that "In general," the ITAAC for site-specific systems were developed to correspond to the interface criteria in Tier 1 of the referenced ABWR DCD. Interface requirements specify the features and characteristics of site-specific systems in order for those systems to function in conjunction with the certified portion, in accordance with 10 CFR 52.79(c). The following site-specific systems were evaluated against the interface criteria identified for that system in Tier 1 of the referenced ABWR DCD.

STP Unit 3 & 4 FSAR, Revision 2, Section 14.3S states that: "The selection criteria and methodology provided in Section 14.3 of the reference ABWR DCD for the certified ABWR design were utilized as the site-specific selection criteria and methodology for inspections, tests, analyses, and acceptance criteria including those applicable to the emergency planning and physical security hardware. In general, the ITAAC for site-specific systems were developed to correspond to the interface criteria in Tier 1 of the reference ABWR DCD." **RAI 14.3.2-1** was issued requesting the applicant (a) to explain the basis for the use of the phrase "in general," (e.g., Are there any exceptions taken?) and (b) to provide a screening summary table relating pertinent ABWR DCD interface requirements vs. STP 3&4 FSAR ITAAC actions taken in addressing the interface requirements for site-specific structures. The applicant, in its response to **RAI 14.3.2-1** has justified and explained the pertinent Sections of STP 3 and 4 COLA FSAR, thereby adequately responding to the staff's request for clarification. The staff has concluded that the applicant has satisfactorily responded to **RAI 14.3.2-1**. Therefore, **RAI 14.3.2-1** is resolved.

ITAAC are required for all Tier 1 certified systems to ensure the as-built systems will comply with the design requirements and system characteristics defined in the ABWR DCD document. ITAAC are also used to ensure that interface conditions between the in-scope and the as-built, out-of-scope, site-specific portions of Tier 1 systems are met. A total of ten partially or wholly out-of-scope SSC systems are listed in ABWR DCD Tier 2, Subsection 1.1.2, Revision 4. Out of the ten SSC systems, only three have safety-related functions, another five systems do interact with in-scope SSC, while the remaining two are independent site-specific SSC systems. STP 3&4 FSAR, Part 9, Section 3.0, Revision 2, provides ITAAC for all 10 out-of-scope SSC systems. ITAAC tables have been established in two different ways, e.g. some of the non-safety related SSC systems have specific entries while others are designated with "No entry for

this system". **RAI 14.3.2-2** was issued to request the applicant to explain the reasons for using these two different approaches. In its response (U7-C-STP-NRC-090150, dated September 21, 2009, Attachment 2) the applicant states that "No entry for this system" is used whenever no interface requirements are specified in ABWR DCD. Other entries under column "Design Requirement" of the ITAAC tables reflect the interface conditions as required per ABWR DCD. The staff noted that ITAAC are issued in order to specify the activities that will ensure that the as-built SSC systems conform to the design features and characteristics defined in the design description of the same. Site-specific SSC that are independent cannot directly or indirectly interfere with certified SSC systems, such SSC if not safety-related, do not require ITAAC. Therefore no entries are required for those items systems. The applicant's response to **RAI 14.3.2-2** has justified its use of different ITAAC tabular forms and committed to revise the pertinent Sections of STP 3 and 4 COLA FSAR as described in its response, thereby adequately responding to the staff's request for clarification. Therefore, **RAI 14.3.2-2** is resolved. Verification that these changes are incorporated in the next FSAR revision is being tracked as **Confirmatory Item 14.3.2-2**.

#### General Requirement regarding the As-Built Plant

SRP Section 14.3.2, II (3) requires Applicant to provide ITAAC to reconcile the as-built plant with the structural design basis and Section 14.3.2.II(11) requires an as-built structural analysis be performed as a means to accomplish reconciliation. **RAI 14.3.2-8** was issued requesting the applicant to discuss how STP 3&4 intends to implement this ITAAC requirement and provide the corresponding ITAAC table addressing the as-built configuration reconciliation ITAAC for each site-specific SSCs, as applicable. In its response (STP Letter U7-C-STP-NRC-090150, dated September 21, 2009, Attachment 8) the applicant stated that ITAAC are provided for the site-specific SSC in COLA Part 9, Section 3.0 which require structural analyses reconciling the as-built configuration of these site-specific structures with their structural design bases. The staff in its evaluation confirms that the ITAAC tables in Section 3.0 of STP 3&4 COLA, Part 9 contain items requiring as-built reconciliation when applicable to specific SSC. The intent of **RAI 14.3.2-8** however is for the applicant to provide the procedures that shall be applied to accomplish the as-built reconciliation, e.g.; to provide a new ITAAC item that requires under "Design Requirements" to perform a structural analysis to reconcile as-built data with the structural design basis, under "Inspections, Tests, Analysis" to describe the design data and parameters that are going to be reconciled, and under "Acceptance Criteria" to specify the acceptable tolerances and deviations. Therefore the applicant's response is considered incomplete and needs to be augmented. The staff issued the **RAI 14.3.2-10** requesting to provide the procedures that will be applied to accomplish the as-built structural reconciliation, e.g. to provide a new ITAAC item that requires under "Design Requirements" to perform a structural analysis to reconcile as-built data with the structural design basis; under "Inspections, Tests, Analysis" to describe the design data and parameters that are going to be reconciled, and under "Acceptance Criteria" to specify the acceptable tolerances and deviations. This RAI is tracked as **Open Item 14.3.2-8**.

- Part 9, Table 3.0-1 Ultimate Heat Sink

The review of the structural aspects of this ITAAC is documented below. The NRC staff's review of other aspects of this ITAAC is in Section 9.2.5 of this SER.

COL application Part 9 Section 3.0, Table 3.0-1, "Design Requirement," Item 5 states, "The UHS is able to withstand the structural design-basis loads." The staff found that the contents of

this item lack (a) the necessary level of detail, (b) the listing of pertinent structural design-basis loads, and (c) a discussion of the applicable design criteria to be acceptable. The staff issued **RAI 14.3.2-3** requesting the applicant to provide the necessary level of detail consistent and commensurate with the design-basis loads and required safety functions described above for the UHS. The staff also requested more complete and detailed ITAAC that address each of the design requirements summarized above.

The applicant's response to **RAI 14.3.2-3** (STPNOC Letter U7-C-STP-NRC-090150, dated September 21, 2009) commits to include additional details of the UHS Basin, the RSW pump house, and the UHS cooling tower enclosure. Applicant's response to **RAI 14.3.2-3** modifies Item 5 and commits to revise the pertinent sections of STP Units 3 and 4 COL application Part 9, thereby adequately responding to the staff's request for clarification. The staff found the applicant's response acceptable. Therefore, **RAI 14.3.2-3** is resolved. Verification that these changes are incorporated in the next FSAR revision is being tracked as **Confirmatory Item 14.3.2-3**.

In **RAI 14.03.06-3**, the staff requested the applicant to indicate why the design commitment and the acceptance criteria in ITAAC Item 3(c) do not indicate that there is independence between each Class 1E division and non-Class 1E equipment. The applicant's response (STPNOC Letter U7-C-STP-NRC-090028, dated April 2, 2009) states that each Class 1 is independent of the other Class 1E divisions and non-Class 1E equipment. The staff agreed with the applicant's response and with the revision to this ITAAC. Therefore, **RAI 14.03.06-3** is resolved.

In **RAI 14.03.07-1**, the staff requested the applicant to revise ITAAC Item 2(a) to (1) include both an inspection and an analysis because pump head requirements and cooling demands of a system are determined by analysis, and (2) to allow the acceptance criteria to be in agreement with the design commitment given that the acceptance criteria only refer to where the RSW pump suction is located in the UHS basin wall and does not address all the other conditions stated in the design commitment. The applicant's response (STPNOC Letter U7-C-STP-NRC-090028, dated April 2, 2009) revises this ITAAC (1) with an analysis that evaluates the UHS for sufficient capacity to meet its required normal and safety functions, and (2) with inspections to verify the surface area of the UHS and the location of the RSW pump suction in the UHS wall. The staff agreed with the applicant's response and with the revision to this ITAAC. Therefore, **RAI 14.03.07-1** is resolved.

In **RAI 14.03.07-2**, the staff requested the applicant to revise ITAAC Item 2(b) to include both an inspection and an analysis and to number this ITAAC to be consistent with the numbered ITAAC in the ABWR certified design. An inspection will be required to verify that the dimensions of the UHS agree with the analysis. The applicant's response (STPNOC Letter U7-C-STP-NRC-090028, dated April 2, 2009) states that the response to **RAI 14.03.07-1** addresses the staff's concerns in this RAI question. The staff agreed with the applicant's response and with the revision to this ITAAC. Therefore, **RAI 14.03.07-2** is resolved.

In **RAI 14.03.05-2**, the staff requested the applicant to explain why the AC for ITAAC Item 4, as written, does not address the "required functions of the Ultimate Heat Sink (UHS) system" stated in the design commitment, and how the referenced figure provides sufficient information to permit the implementation of this ITAAC. The applicant's response (STPNOC Letter U7-C-STP-NRC-090028, dated April 2, 2009) indicates that information for the UHS and the RSW systems instrumentation and alarms is in COL application Part 2 Tier 1, Sections 2.2, 2.11.9, and 4.1. Supplemental information is in COL application Part 2 Tier 2, Sections 9.2.5

and 9.2.15. The applicant (1) revises the design commitment and the acceptance criteria to refer to displays, alarms, and controls in the MCR and the remote shutdown system (RSS) for water level and temperature monitoring; and (2) deletes any reference to Figure 9.3.1.3.0-1 because of the lack of detail. RAI 14.03.05-2 is also applicable to ITAAC Item 5 in Table 3.0-5. However, the applicant's response states that ITAAC Item 5 in COL application Revision 2, Table 3.0-5 is a duplicate of ITAAC Items 7 and 8 in ITAAC Table 2.11.9. Therefore, the applicant has deleted ITAAC Item 5 from Table 3.0-5. The staff found the applicant's response acceptable. Therefore, **RAI 14.03.05-2** is resolved.

NRC staff concluded that the proposed ITAAC will ensure that the system will perform in accordance with its design. Therefore, the proposed ITAAC is acceptable

#### Part 9, Table 3.0-2 Offsite Power System

The applicant identifies the offsite power system as a site-specific system with a safety-significant or risk-significant function that requires an ITAAC.

Tier 1 Section 2.12.1, "Electric Power Distribution System," of the DCD identifies the following seven interface requirements for the portions of the electrical power distribution system that are not part of the certified design. These requirements must be met for safe operation:

The offsite system shall consist of a minimum of two independent offsite transmission circuits from the transmission network (TN).

Voltage variations of the offsite TN during steady-state operation shall not cause voltage variations at the loads of more than plus or minus 10% of the loads nominal ratings.

The normal steady-state frequency of the offsite TN shall be within plus or minus 2 hertz of 60 hertz during recoverable periods of system instability.

The offsite transmission circuits from the TN through and including the main step-up power transformers and RAT(s) shall be sized to supply their load requirements, during all design operating modes, of their respective Class 1E divisions and non-Class 1E load groups.

The impedances of the main step-up power transformers and RAT(s) shall be compatible with the interrupting capability of the plant's circuit interrupting devices.

The independence of offsite transmission power, instrumentation, and control circuits shall be compatible with the portion of the offsite transmission power, instrumentation, and control circuits within GE's design scope.

Instrumentation and control system loads shall be compatible with the capacity and capability design requirements of DC systems within GE's design scope.

The applicant provides Table 3.0-2, "Offsite Power System," in Part 9 of the application with site-specific ITAAC that are consistent with the interface requirements and the guidance of RG 1.206. However, there are no ITAAC for lightning and grounding protection for the offsite power system. SRP Section 14.3.6 recommends that ITAAC for lightning and grounding protection

should be developed. NRC staff issued **RAI 14.03.06-5** requesting the applicant to provide ITAAC for lightning and grounding protection for the offsite power system or discuss why these ITAAC are not required. The applicant's response (STPNOC Letter U7-C-STP-NRC-090071, dated July 22, 2009) to RAI 14.03.06-5 adds Item 8 to COL application Part 9, Section 3.0 Table 3.0-2 addressing lightning and grounding protection. The staff found the applicant's response acceptable. Therefore, **RAI 14.03.06-5** is resolved. Verification that these changes are incorporated in the next FSAR revision is being tracked as **Confirmatory Item 14.3.6-5**.

STP FSAR Subsection 8A.1.3 states that ground resistance measurements will be performed per the guidance in the Institute of Electrical and Electronics Engineers Std. 81 to determine that the required value of one ohm or less has been met and additions to the system will be made, if necessary, to meet the target resistance after site preparation and before construction of the permanent buildings. The staff issued **RAI 14.03.06-6** requesting the applicant to confirm that ground resistance measurements will be performed in accordance with the above cited FSAR subsection, and that the acceptance criteria will be less than 1 ohm as specified in the same subsection. The applicant's response (STPNOC Letter U7-C-STP-NRC-090185, dated October 29, 2009) states that COL application Part 9 Section 3.0, Table 3.0-2 will be modified to add an ITAAC for ground resistance measurements of the offsite power system. The staff found the applicant's response acceptable. Therefore, **RAI 14.03.06-6** is resolved. Verification that these changes are incorporated in the next FSAR revision is being tracked as **Confirmatory Item 14.3.6-6**.

The staff issued **RAI 14.03.06-4** requesting the applicant to revise Table 3.0-2 ITAAC Item 6 to eliminate any confusion because the power, instrumentation, and control circuits being tested are not identified. If there are multiple groupings of instrumentation and control circuits, they should be identified by some means to clarify the purpose of this ITAAC. The applicant's response (STPNOC Letter U7-C-STP-NRC-090028, dated April 2, 2009) states that the ITAAC was revised to indicate that the circuits being tested for independence are the offsite transmission power, instrumentation, and control circuits of the preferred and alternate offsite power sources. The staff agreed with the applicant's response and with the revision to this ITAAC. Therefore, **RAI 14.03.06-4** is resolved.

In **RAI 14.03.05-3**, the staff requested the applicant to revise Table 3.0-2 ITAAC item 7 to indicate (1) which onsite or offsite DC systems local to the switchyard this ITAAC is concerned with, and (2) why an inspection is not required to verify the as-built installation. The applicant's response (STPNOC Letter U7-C-STP-NRC-090028, dated April 2, 2009) states that (a) Table 3.0-2 uses the template in Table C.III.7-3 of RG 1.206 for offsite power system ITAAC applied to a plant referencing the certified ABWR design; (b) a number of the design commitments in that table are verified by analyses; and (c) the compatibility of the design commitment for the I&C system loads for the switchyard DC system with the capacity and capability design requirements is similarly best verified by analyses, without an explicit inspection to verify the as-built installation. The applicant also revised the ITAAC to indicate that the DC systems referred to in the ITAAC are the ones in the switchyard. The staff agreed with the applicant's response and with the revision to this ITAAC. Therefore, **RAI 14.03.05-3** is resolved.

With respect to Table 3.0-2 Offsite Power System, the applicant was requested in **RAI 14.3.2-4** to provide additional information regarding Seismic Category I structures that either support or enclose Category IE electrical SSC. If such structures are present, their corresponding structural related ITAAC in Table 3.0-2 should be provided with the same level of detail and





Part 9, Table 3.0-6 Turbine Service Water System

Section 9.2.16 of this SER evaluates this ITAAC.

- Part 9, Table 3.0-7 Communication System

There is no entry required for this system. Section 3.0 of Part 9 of the STP Units 3 and 4 COL application references Part 9 Section 4.0, "Emergency Planning ITAAC." The evaluation of this Emergency Planning ITAAC is in Section 13.3 of this SER.

- Part 9, Table 3.0-8 Site Security

There is no entry required for this system. Section 3.0 of Part 9 of the STP Units 3 and 4 COL application references Part 9 Section 5.0, "Physical Security ITAAC." The evaluation of the Physical Security ITAAC will be addressed in the FSER after Phase 4 of the NRC staff's review.

- Part 9, Table 3.0-9 Circulating Water System

Section 10.4.5 of this SER evaluates this ITAAC.

- Part 9, Table 3.0-10 HVAC SYSTEM

In STP Units 3 and 4 COL application Part 9, Table 3.0-10 states that there is no ITAAC entry for this system. ABWR DCD Tier 1, Section 2.15.5 identifies the interface requirements for installing toxic gas monitors in the outside air intakes of the Control Room Habitability Area HVAC system. However, site-specific Tier 2 Departure STP DEP 9.4-1, "Service Building HVAC System," modifies the certified ABWR DCD. The departure removes the toxic gas monitors and the Technical Support Center (TSC) alarm because the applicant concluded that there is no identified serious toxic gas threat associated with the nearby industrial, transportation, or military facilities. As a result of this departure, the applicant does not include the interfacing ITAAC.

At this point, NRC staff is unable to reach a finding on this ITAAC. The toxic gas issue is being tracked in STP Section 9.4 of this SER as an open item under STP DEP 9.4-1. The staff will review the applicant's analysis justifying the removal of the toxic gas monitors and the TSC alarms. If the staff establishes a toxic gas threat, the applicant will need to include the deleted instrumentation and the ITAAC to satisfy the interface requirements.

- Part 9, Table 3.0-11 Backfill under Category I Structures

Due to the site characteristics at STP Units 3 and 4, structural soil fills are required under all Seismic Category I structures. COL application Part 2 of FSAR Tier 2 has very detailed specifications regarding foundation soil fills under different buildings. COL application Part 9 Item 1 of Table 3.0-11 of Section 3.0, "Site-Specific ITAAC," states, "Backfill under category I structures is compacted to not less than 95% of maximum dry density..." This item should be expanded to include the specific method and approach as well as the quantitative acceptance criteria to be implemented by the ITAAC task. The staff issued **RAI 14.3.2-6** requesting the applicant to provide a more complete and detailed ITAAC for the backfill of each building.

The applicant's response (STPNOC Letter U7-C-STP-NRC-090150, dated September 21, 2009) to **RAI 14.3.2-6** states that among the Seismic Category I structures, only the RSW piping tunnels and the diesel generator fuel oil storage vaults will have backfill under them. The applicant also provides Table 2.5, which lists the sections in the COL application (FSAR Revision 2) that are relevant to structural fills. The applicant also revises COL application Part 9 Section 3.0, Table 3.0-11. The staff's evaluation noted that the applicant's response to RAI 14.3.2-6 includes the pertinent references regarding structural soil fills, modifies Table 3.0-11, and commits to revise the pertinent sections of the STP Units 3 and 4 COL application, Part 9, thereby adequately responding to the staff's request for clarification. The staff found the applicant's response acceptable. Therefore, **RAI 14.3.2-6** is resolved. Verification that these changes are incorporated in the next FSAR revision is being tracked as **Confirmatory Item 14.3.2-6**.

The staff noted that ABWR DCD Revision 4, Subsection 2.16.2 contains the general ITAAC for the diesel generator fuel oil storage vaults. However, COL application Part 9 Revision 2, Section 3.0 should include the ITAAC for the as-built reconciliation and flood safety of the tanks. The diesel storage tanks are Seismic Category I structures that do not interact with any certified systems but do warrant an ITAAC, per SRP Subsection 14.3.2.II acceptance criteria. The staff generated a supplemental **RAI 14.3.2-9** asking the applicant to incorporate additional design requirements and a corresponding ITAAC table with pertinent contents for the exterior diesel tanks and vaults, which augment the ITAAC in the DCD. RAI 14.3.2-9 is being tracked as **Open Item 14.3.2-9**.

- Part 9, Table 3.0-12 Breathing Air System (BAS)

COL application Part 9, Table 3.0-12 in Section 3.0 includes ITAAC for the BAS. The BAS is not a safety-relevant system, but it uses primary containment penetrations that are safety-related. Therefore, this system shall be designed so that its failure will not impair any Seismic Category I SSCs under service or accident conditions, including the containment penetrations. NRC staff issued **RAI 14.3.2-7** requesting the applicant to expand Item 2 of Table 3.0-12 to reflect the safety-related condition, especially regarding the containment penetrations.

The applicant's response (STPNOC Letter U7-C-STP-NRC-090150, dated September 21, 2009) to **RAI 14.3.2-7** states that additional or revised ITAAC for the BAS are not warranted because they would be beyond what the NRC previously approved for the system that provides the breathing air function in Tier 1 of the certified ABWR DCD. Specifically, the design-basis functions for the certified design station service air system (SAS) described in ABWR DCD Tier 2, Section 9.3.7 include providing for plant breathing air requirements. Table 2.11.11 of the ABWR DCD, Tier 1, includes three ITAAC items for the certified design SAS, including ITAAC that will ensure the proper performance of the SAS containment isolation components.

The staff's review concurred with the applicant's statement that the corresponding ITAAC are included as part of the SAS system, as the BAS uses the same containment penetrations. The applicant's response to RAI 14.3.2-7 justifies why a modification of the ITAAC in question is not warranted, thereby adequately responding to the staff's request for clarification. The staff found the applicant's response acceptable. Therefore, **RAI 14.3.2-7** is resolved.

NRC staff concluded that the proposed ITAAC, will ensure that the system will perform in accordance with its design. Therefore the proposed ITAAC is acceptable.

### **14.3S.3.1      *Post Combined License Activities***

There are no Post COL activities related to this section.

### **14.3S.3.2      *Conclusion***

The staff found that the generic DCD and the related NRC FSER in NUREG–1503 address the ITAAC.

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 ITAAC. With the exceptions of **Open Items 14.3.2-8 and 14.3.2-9, and Confirmatory Items 14.3-1, 14.3.2-2, 14.3.2-3, 14.3.2-5, 14.3.2-6, 14.3.5-4 through 14.3.5-7, 14.3.6-5 and 14.3.6-6**, 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 ITAAC that were incorporated by reference have been resolved.

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