

14. VERIFICATION PROGRAMS

This chapter of the combined license (COL) Final Safety Analysis Report (FSAR) 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 Regulatory Position Cl.14, "Verification Programs," dated June 2007, the COL applicant describes 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.

This FSAR Chapter 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.¹ 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

¹ 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.

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

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

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 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, Regulatory Position 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."

As documented in NUREG-1503, NRC staff reviewed and approved Section 14.2.2 of the certified ABWR DCD. The staff reviewed Section 14.2.2 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.¹ The staff's review confirmed that the

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- (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 [JTG], 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 discuss 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 Section 14.2, SRP Acceptance Criteria 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 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 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 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 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 Section 14.2, the FSAR Sections 14.2.2. 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 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, Regulatory Position 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, Section 14.2 provides guidance and acceptance criteria to NRC staff for reviewing a proposed design certification or COL applicant’s ITP. Because the COL applicants referencing the ABWR design certification 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 design certification 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 certified ABWR DCD. 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.¹ 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:

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

Tier 2 Departure Not Requiring Prior NRC Approval

- STD DEP 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 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

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), 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 below.

In addition, in FSAR Subsection 14.2.13.2, "Test Procedures/Startup Administrative Manual," the COL applicant provides 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).

Although NRC staff agreed that the provision of these documents is necessary to meet COL License Information Item 14.2, the staff determined these post COL items would be more appropriately captured, in part, as license conditions in accordance with RG 1.206, Regulatory Position C.III.4.3, Item (3). The staff issued RAI 14.02-14 stating that certain post COL items in FSAR Section 14.2.13, "COL Information Items," would be subject to license conditions. This RAI was tracked as an open item in the SER with open items. For resolution of this open item, see Subsections 14.2.13.4 and 14.2.13.5 of this SER.

14.2.3.5 *Post Combined License Activities*

The staff proposed a license condition for the provision of the preoperational and start-up test procedures. See Subsection 14.2.13.5 for proposed License Condition 14-1.

14.2.3.6 *Conclusion*

The NRC staff's finding related to information incorporated by reference is in NUREG-1503. NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information relating to the ITP test procedures, 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 ITP test procedures 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.

The staff determined that STP Units 3 and 4 COL FSAR Section 14.2.3; SAM Sections 3.2 and 4.5 through 4.8; and proposed License Condition 14-1 satisfy COL License Information Item 14.2, Item (4) in certified ABWR DCD Section 14.2.5 and Subsection 14.2.13.2. This information meets the requirements of and acceptance criteria 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." Therefore, FSAR Section 14.2.3 and SAM Sections 3.2 and 4.5 through 4.8 are acceptable.

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 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 (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, Regulatory Position 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 Section 14.2, SRP Acceptance Criteria Item 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 Regulatory Position CI.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.¹ 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
 - 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

¹ 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.

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 Criterion (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, NUREG–0800 Section 14.2, SRP Acceptance Criteria 3.E.v 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 SAM, Revision 2 (ML091700122). In STP Units 3 and 4 SAM Subsection 4.5.3.3, “Performance of Tests,” 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 14.02-2** 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 TPCN requires a change to the technical specification (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** dated June 17, 2009 (ML091700122), adds the following information to STP Units 3 and 4 SAM Section 4.8.1, “Test Procedure Change Notice (TPCNs),”:

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 are 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, as well as the quality assurance criteria set forth in Appendix B to 10 CFR Part 50. Although 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, 10 CFR 50.62, and any other rules that apply to non-safety-related SSCs that are important to safety to SAM 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** dated June 17, 2009, 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 non-safety-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 are 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 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 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 (5) is acceptable and meets the requirements and acceptance criteria in NUREG–0800 Section 14.2 SRP Acceptance Criteria 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 STP Units 3 and 4 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 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 one Tier 2 departure that does not require prior NRC approval. This departure is 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 certified ABWR DCD. 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.¹ 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.

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

The applicant's evaluation 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 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.”

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 COL FSAR Section 14.2.5; SAM Sections 4.9.2; and proposed License Condition 14-2 adequately address COL License Information Item 14.2, Item (6). 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." 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 STP Units 3 and 4 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 certified ABWR DCD. 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.¹ 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

STP Units 3 and 4 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."

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 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, 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.

¹ 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 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, 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 that does not require prior NRC approval. This departure is 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 certified ABWR DCD. 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.¹ 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,

¹ 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.

refer to COL application 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 A to 10 CFR Part 52 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.

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 STP Units 3 and 4 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 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 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 Item 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 that does not require prior NRC approval. This departure is 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.¹ The staff's review confirmed

¹ 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.

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 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.

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 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 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 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, the information 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 in 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.¹ 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, 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 STP Units 3 and 4 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, in COL FSAR Subsection 14.2.13.2, the applicant provides the following:

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

COL License Information Item

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

In the 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 the 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"; SAM Section 3.3, "Post Fuel Load Responsibilities"; and 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, Regulatory Position 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 certified ABWR DCD. 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.¹ 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.

In accordance with ABWR DCD COL License Information Item 14.2, Item (7); RG 1.206 Regulatory Position C.III.4.3, Item (3); and RG 1.68, NRC staff determined that certain milestones in the test program related to pre-critical and initial criticality testing would be captured as license conditions. The staff issued RAI 14.02-14 stating that certain post COL

¹ 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

items in FSAR Section 14.2.13, "COL Information Items," would be subject to license conditions. For resolution of this RAI, see Subsections 14.2.13.4 and 14.2.13.5 of this SER.

14.2.10.5 *Post Combined License Activities*

The staff has proposed a license condition for pre-critical and criticality testing. See Subsection 14.2.13.5 for proposed License Condition 14-2.

14.2.10.6 *Conclusion*

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

The staff concluded that the relevant information in COL FSAR Subsection 14.2.13.2; SAM Sections 3.3 and 4.1; and proposed License Condition 14-2 adequately address COL License Information Item 14.2, Item (7). This information meets the requirements and acceptance criteria of NUREG-0800 Section 14.2, SRP Acceptance Criteria Item 4.A; RG 1.68, Appendix A, Items 2 and 3; and RG 1.206, Regulatory Position C.I.14.2.10.

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 STP Units 3 and 4 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 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.

14.2.11.4 *Technical Evaluation*

As documented in NUREG–1503, NRC staff reviewed and approved Section 14.2.11 of the certified ABWR DCD. 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 topic¹. 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.

Although the NRC staff agreed that the provision of the schedule is necessary to meet COL Information Item 14.2, the staff determined this post COL item would be more appropriately captured, in part, as a license condition in accordance with RG 1.206 Regulatory Position C.III.4.3, Item (3). The staff issued RAI 14.02-14 stating that certain post COL items in FSAR Section 14.2.13, "COL Information Items," would be subject to license conditions. For the resolution of this RAI, see Subsections 14.2.13.4 and 14.2.13.5 of this SER.

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.

¹ 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.

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 the rated temperature and pressure (i.e., approximately 5 percent power)
3. Power ascension tests from 5 to 100 percent of the 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 percent of the rated thermal power, reactor internal pumps (RIPs) operating at 10 percent of the minimum pump speed
4. Mid Power – 50 to 75 percent of the rated thermal power, RIPs operating at the minimum speed to the rated speed
5. High Power – 100 percent of the rated thermal power, from the minimum RIP speed to the maximum core flow

These test plateaus are the plant operating conditions at which the required startup tests are performed. In the SAM, 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.

14.2.11.5 *Post Combined License Activities*

The staff proposed a license condition for the provision of the schedule, relative to the initial fuel load date, for conducting each major phase of the ITP. See Subsection 14.2.13.5 for proposed License Condition 14-3.

14.2.11.6 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 test program schedule, 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 test program schedule that were incorporated by reference have been resolved.

The staff concluded that the relevant information in COL FSAR Section 14.2.11; SAM Section 4.0; and proposed License Condition 14-3 adequately addresses COL License Information Item 14.2, Item (8). This information meets the requirements of and acceptance criteria in NUREG–0800 Section 14.2, SRP Acceptance Criteria Item 3.C, "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, FSAR Section 14.2.11 and SAM Sections 4.0 and 4.1 are acceptable.

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).

14.2.12.2 Summary of Application

In addition, the applicant provides the following:

- STD DEP T1 3.4-1 Safety-Related 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

- 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”

- 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 2.4-4 RHR, HPCF, and RCIC/Turbine/Pump NPSH

This departure revises the test abstracts for the residual heat removal (RHR) and high-pressure core flooder (HPCF) preoperational tests to remove the 50 percent blockage criterion during the test. This departure affects the following test abstracts:

- FSAR Subsection 14.2.12.1.8, "Residual Heat Removal System Preoperational Test"
- FSAR Subsection 14.2.12.1.10, "High Pressure Core Flooder System Preoperational Test"

- 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 changes the medium voltage electrical distribution system from a single 6.9-kilovolt (kV) system to a dual-voltage system with 13.8 kV and 4.16 kV. 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."

- STP DEP 10.2-1 Turbine Design

This departure affects the following test abstracts:

- FSAR Subsection 14.2.12.1.64, "Main Turbine Control System Preoperational Test"

- FSAR Subsection 14.2.12.1.70, “Main Turbine and Auxiliaries Preoperational Test”

- STP DEP 10.2-3 Turbine Digital Control

This departure affects the test abstract in FSAR Subsection 14.2.12.1.70, “Main Turbine and Auxiliaries 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 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 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, 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.”

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.¹ 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, refer to COL application 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 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),

¹ 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.

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 (ML092430075), 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. Verification that the applicant's proposed changes are included in the next revision of the COL FSAR was tracked as a confirmatory item in the SER with open items. The staff verified that Revision 4 of the COL FSAR Subsection 14.2.12.1.12 reflects the changes discussed in the response to RAI 14.02-9. Therefore, **RAI 14.02-09** is resolved.

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 (ML093340072), is a supplemental response to revise Departure 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

Departure 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. Verification that the applicant's proposed changes are included in the next revision of the COL FSAR was tracked as a confirmatory item in the SER with open items. The staff verified that Revision 4 of COL FSAR Section 14.2.12 reflects the changes specified in the response to RAI 14.02-10. Therefore, RAI 14.02-10 is resolved.

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 requested the COL applicant to cite the appropriate departure associated with these changes. The applicant's response to RAI 14.02-11 dated November 24, 2009 (ML093340072) states that STD DEP T1 3.4-1 is applicable to Subsections 14.2.12.1.16 and 14.2.12.1.17. The staff agrees that the changes made to Subsections 14.2.12.1.16 and 14.2.12.1.17 are consistent with the changes described in the departures report for STD DEP T1 3.4-1 and are acceptable. RAI 14.02-11 is resolved and closed.

- STD DEP T1 2.4-3 RCIC Turbine/Pump

NRC staff evaluated Departure STD DEP T1 2.4-3 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 and system performance.

FSAR Subsection 14.2.12.1.9, Reactor Core Isolation Cooling 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.

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, Section VIII.A. The staff determined that the changes to the RCIC system preoperational test are acceptable.

FSAR Subsection 14.2.12.2.22, RCIC System Performance

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.

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 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 that FSAR Subsection 14.2.12.2.22 is acceptable.

- STD DEP T1 2.4-4 RHR, HPCF, and RCIC Turbine/Pump NPSH

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

- FSAR Subsection 14.2.12.1.8, "Residual Heat Removal System Preoperational Test"
- FSAR Subsection 14.2.12.1.10, "High Pressure Core Flooder System Preoperational Test"

The test abstracts for the RHR and HPCF were revised to remove the criterion that the temporary strainer be 50 percent plugged throughout the test. The changes to these test abstracts were made as a result of RAI 06.02.02-22 and are consistent with the STP Units 3 and 4 suction strainer design and RG 1.82 Revision 3 guidance. These changes are therefore acceptable. The STP Units 3 and 4 suction strainer design and this departure are evaluated in Section 6.2.1 of this SER.

- 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. The staff's review of the elimination of the hydrogen control system is in SER Section 6.2.5. As a result of the design change, 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 determined that 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 are consistent with the elimination of the hydrogen control system and are 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, refer to COL application 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, refer to COL application 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 “General Test Methods and Acceptance Criteria” in FSAR Subsection 14.2.12.1.50, “Fuel Handling and Reactor Component Servicing Equipment Test.” The COL applicant has changed the list of reactor component servicing equipment (i.e., by 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 10 CFR Part 52, Appendix A, Section VIII.B.5 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 10.2-1 Turbine Design

While reviewing COL FSAR Revision 3 Section 14.2.12, the staff found that the description in FSAR Section 10.2 of the turbine intermediate stop and intercept valves is not properly reflected in the test abstracts in Subsections 14.2.12.1.64, “Main Turbine Control System Preoperational Test,” and 14.2.12.1.70, “Main Turbine Auxiliary Preoperational Test.” Departure STD DEP 10.2-1 revises the description of the combine intermediate valve (CIV) to indicate that each CIV consists of two valves: an intermediate stop valve (ISV) and an intercept valve (IV), each with its own valve disk and actuation contained in a common valve body to provide for enhanced performance, reliability, and maintainability. In RAI 14.02-15, the staff requested the applicant to revise the test description by replacing the designation of the CIV with intermediate stop and intercept valves for the test abstracts in Subsections 14.2.12.1.64 and 14.2.12.1.70.

The applicant’s response to RAI 14.02-15 dated September 16, 2010 (ML102630022), states that in ABWR DCD Tier 1 Subsection 2.10.7(2), the “combined intermediate valves (CIVs) consist of intercept valves (IVs) and intercept stop valves (ISVs) [IVs trip and modulate/ISVs trip].” The applicant adds, “Tier 1 ITAAC in Table 2.10.7(2) makes reference to the individual IVs and ISVs.” The applicant notes that Departure STD DEP 10.2-1 changes Tier 2 references from CIVs to ISVs and IVs. This change is reflected in Subsections 10.2.2.2, 10.2.2.5, and 10.2.3.6. However, the Tier 2 “Individual Test Descriptions” in Chapter 14 were not revised. Furthermore, although the test descriptions are consistent with the Tier 1 (ITAAC) “Testing Requirements,” as defined in DCD Tier 1 Section 2.10.7, because the IVs and ISVs have separate valve disks and operators, the test descriptions will be revised for clarity and consistency with the changes made by Departure STP DEP 10.2-1. In addition, Departure STP DEP 10.2-1 will be revised to include the description of the relationship between the CIV and the ISV/IV for consistency between Tier 1 and Tier 2.

According to the applicant's response to RAI 14.02-15, the test descriptions in FSAR Subsections 14.2.12.1.64 and 14.2.12.1.70 will be revised to remove the CIVs and to add the IVs and the ISVs. The staff determined that these changes to the test descriptions are consistent with the design descriptions in FSAR Subsections 10.2.2.2, 10.2.2.6, 10.2.3.5, and 10.2.3.6. Therefore, these changes are acceptable and RAI 14.2-15 is resolved. Verification that the applicant's proposed changes are included in the next FSAR revision is being tracked as **Confirmatory Item 14.02-15**.

The applicant's evaluation in accordance with 10 CFR Part 52, Appendix A, Section VIII.B.5 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 10.2-3 Turbine Digital Control

In the response to RAI 14.02-15 discussed above, the applicant states that Departure STP DEP 10.2-3 replaces the mechanical overspeed trip with the electrical overspeed trip devices. The applicant adds that Test Description 14.2.12.1.70 (3)(h) for the Main Turbine Auxiliary Preoperational Test will be revised to change the reference from the "mechanical overspeed trip and electrical backup overspeed trip" to the "primary and emergency overspeed protection functions" consistent with the response to RAI 10.02-5. The staff determined that this change to the test descriptions in FSAR Subsection 14.2.12.1.70 is consistent with the design descriptions in FSAR Section 10.2 and is thus acceptable. Therefore, RAI 14.2-15 is resolved. Verification that the applicant's proposed changes are included in the next FSAR revision is being tracked as part of **Confirmatory Item 14.02-15**.

The applicant's evaluation in accordance with 10 CFR Part 52, Appendix A, Section VIII.B.5 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 the 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 found that in FSAR Subsection 14.2.12.1.75, the COL applicant deletes 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 the operation of solidifying, packaging, compacting, and incinerating processes as specified in Section 11.4. The COL applicant deletes "demineralizer regeneration" from acceptance criteria (h). In acceptance criteria (j), the applicant deletes "between designated locations using simulated waste variation" since the solid radwaste no longer performs the simulated waste variation, as noted in Chapter 11. The applicant also deletes the radwaste system from acceptance criteria (k), since radwaste system isolation valves are already covered by the containment isolation system upon the receipt of a simulated containment isolation initiation signal.

The applicant's evaluation in accordance with 10 CFR Part 52, Appendix A, Section VIII.B.5 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 10 CFR Part 52, Appendix A, Section VIII.B.5 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 the rated pressure, as described in Subsection 14.2.12.2.5 and in 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 Departure STD DEP 14.2-1. Therefore, the staff determined that prior NRC review and approval are not required, which is consistent with the requirements in 10 CFR Part 52, Appendix A, Section VIII.B.5. The applicant's process for evaluating departures and other changes to the DCD is 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., misspellings, 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 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) was 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 the 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 are 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 the applicant to submit a comprehensive test program for these three test abstracts to the NRC for review. The applicant responded to these RAIs in a letter dated July 29, 2009 (ML092150965). The staff's review found that additional information was needed, and these RAIs were tracked as open items in the SER with the open items.

The applicant's response to RAI 14.02-06 and RAI 14.02-08 was replaced by a supplemental response dated May 19, 2010 (ML101410205). The May 19, 2010, supplemental response to RAI 14.02-6 and RAI 14.02-8 describes the applicant's revised approach for the reactor internals Flow Induced Vibration (FIV) Program. STP Unit 3 is designated as the prototype ABWR plant in accordance with RG 1.20, Revision 3. STP Unit 4 is a Category I, non-prototype plant. The COL applicant's response also proposes changes to the FSAR by removing the supplemental information from Subsection 14.2.12.1.2 and replacing the supplemental information in Subsection 14.2.12.1.52 with the following:

STP 3 is designated as the prototype ABWR plant in accordance the guidance in Regulatory Guide 1.20, Revision 3. STP 4 is considered a Category I, non-prototype plant.

For STP 3, the report provided in Reference 3.9-13 summarizes the analytical portion of the program in terms of maximum vibrational response levels of overall structures and 4 components and the measurement and inspection plans.

For STP 4, Reference 3.9-14 summarizes the analytical models and validation and predictive analysis results for the reactor internals, and includes the inspection plan.

The COL applicant's response also proposes removing the supplemental information from Subsection 14.2.12.1.12 and replacing the supplemental information in Subsection 14.2.12.1.52 with the following:

STP 3 is designated as the prototype ABWR plant in accordance the guidance in Regulatory Guide 1.20, Revision 3. STP 4 is considered a Category I, non-prototype plant.

For STP 3, Reference 3.9-13 summarizes the analytical models, predictive analysis results, and the measurement and inspection plans.

For STP 4, Reference 3.9-14 summarizes the analytical models and predictive analysis results, and includes the inspection plan.

The staff verified that Revision 4 of the STP Units 3 and 4 COL FSAR Tier 2, Section 14.2, reflects the changes specified in the revised response to RAI 14.02-06 and RAI 14.02-08. Reactor internals flow-induced vibration pre-operational and startup testing for STP Units 3 and 4 is described in Section 3.9.2 of the FSAR and is reviewed Chapter 3 of this SER. Thus, RAI 14.02-06 and RAI 14.02-08 are resolved. See SER Section 3.9.2 for additional detail.

In FSAR Subsection 14.2.12.1.77 Item (2), "Prerequisites," the COL applicant provides supplemental changes to the test abstract 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 design changes, the staff determined that the changes to the test abstract in FSAR Subsection 14.2.12.1.77 are necessary 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 **Confirmatory Item 14.02-15**, 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.

In addition, the staff compared the information in the application to the relevant NRC regulations and the associated acceptance criteria 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." The staff found that the applicant has adequately addressed the COL license information items, Tier 1 departures, and the supplementary information. In addition, the staff found it reasonable that the identified Tier 2 departures are characterized as not requiring prior NRC approval per 10 CFR 52, Appendix A, Section VIII.B.5. Therefore, the staff concluded that the application is in compliance with NRC regulations.

However, as a result of **Confirmatory Item 14.02-15**, the staff was unable to finalize the conclusions in accordance with the NRC requirements.

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, 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.

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).

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).

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).”

To address ABWR DCD COL License Information Item 14.2, Items (5) through (9), the COL applicant 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.

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 Positions C.1, C.2, and C.8 describe prerequisites, milestones and power holds during the test program. 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.

To address COL License Information Item 14.2, Items (1) through (4), the COL applicant provides supplemental information in Section 14.2.13. The COL applicant proposes three commitments (COM 14.2-2 through COM 14.2-4) to provide the startup and preoperational test specifications and procedures. The staff reviewed the applicant's supplemental information and

proposed commitments. Although NRC staff agreed that the provision of these documents is necessary to address COL License Information Item 14.2, the staff determined that these post COL items would be more appropriately captured, in part, as license conditions in accordance with RG 1.206 Regulatory Position C.III.4.3, Item (3). The staff issued **RAI 14.02-14** stating that certain post COL items in FSAR Section 14.2.13, "COL Information Items," would be subject to license conditions and requested the applicant to inform NRC staff as to whether or not the proposed standard license conditions are considered appropriate to support the STP Units 3 and 4 COL.

To address ABWR DCD COL License Information Item 14.2, Items (5) through (9), the COL applicant submitted the SAM, which delineates the processes used to administer the STP Units 3 and 4 ITP. These processes include the (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) 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 also discussed 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"

In accordance with ABWR DCD COL License Information Items 14.2, Items (5) through (9); RG 1.206 Regulatory Position C.III.4.3, Item (3); and RG 1.68, NRC staff determined that certain milestones in the test program would be captured as license conditions. The staff also determined that submission of the test program schedule would be controlled by a license condition. The staff issued **RAI 14.02-14** stating that certain post COL items in FSAR Section 14.2.13, "COL Information Items," would be subject to license conditions and requested the applicant to 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.

In the response to RAI 14.02-14 dated May 13, 2010 (ML101340650), the applicant provides comments on the staff's proposed license conditions and proposes the following alternative license conditions:

License Condition for Preoperational and Startup Test Specifications and Procedures

Site-specific preoperational and startup test specifications, containing testing objectives and acceptance criteria, will be made available for NRC review at least 6 months prior to the start of the Initial Test Program. 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. Approved startup test procedures will be available for NRC review approximately 60 days prior to fuel loading.

License Condition for the Review of Test Results

The licensee is responsible for review and evaluation of individual test results, as well as final review of overall test results, and for review of selected milestones or hold points within the test phases. Test exceptions or results which do not meet acceptance criteria are identified to the affected and responsible organizations, and corrective actions and retests, as required, are performed.

License Condition for the Test Program Schedule

The licensee shall submit a schedule, no later than 12 months after issuance of the COL, and updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the Initial Test Program in STP COL FSAR Table 13.4S-1, Item 19, has been fully implemented or the plant has been placed in commercial service, whichever comes first. This schedule shall address the approved preoperational and startup test procedures in accordance with FSAR Section 14.2.3.

License Condition for Test Changes

Any changes to the Initial Test Program described in Chapter 14 of the FSAR made in accordance with the provisions of 10 CFR 50.59 or Section VIII of Appendix A to 10 CFR Part 52 shall be reported in accordance with 50.59(d), within one month of such change.

NRC staff reviewed the proposed alternate license conditions and concluded that they generally contain the necessary attributes to achieve sufficient oversight by the licensee management and assure adequate and timely notification to the NRC. However, the staff made revisions to the license conditions to ensure that portions of the test program are completed and the results are evaluated and communicated before proceeding to the next phase of testing, in accordance with ABWR DCD COL License Information Items 14.2, Items (6) and (7), and RG 1.68. The revised license conditions are in Subsection 14.2.13.5 of this SER. Therefore, the staff considered the applicant's response acceptable, and RAI 14.02-14 is resolved. Based on this information, the staff determined that the applicant has adequately addressed ABWR DCD COL License Information Item 14.2, Items (1) through (8), which are therefore acceptable.

To address COL Information Item 14.2, Item (9), FSAR Subsection 14.2.13.2 states that the SAM delineates the processes to administrate the ITP, including the "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 has adequately addressed ABWR DCD COL License Information Item 14.2, Item (9), and it is therefore acceptable.

14.2.13.5 *Post Combined License Activities*

The staff proposes the following license conditions to address COL License Information Item 14.2, Items (1) through (8):

- License Condition (14-1) – Site-specific preoperational and startup test specifications containing test objectives and acceptance criteria will be made available for NRC review at least 6 months before the start of the Initial Test Program. Approved preoperational test procedures will be available for NRC review approximately 60 days before their intended

use. Approved startup test procedures will be available for NRC review approximately 60 days before fuel loading.

- License Condition (14-2)

Pre-critical and Criticality Testing

- Following completion of pre-critical and criticality testing, the licensee shall review and evaluate individual test results and shall confirm that the test results are within the range of acceptable values predicted or otherwise confirm that the tested systems perform their specific functions in accordance with the FSAR.
- The licensee shall provide written notification to the Director of the Office of New Reactors (or the equivalent NRC management) within fourteen (14) calendar days of completion of the pre critical and criticality testing. Upon the submission of this notification, the licensee is authorized to perform low-power testing as described in the FSAR and to operate the facility at reactor steady-state core power levels not in excess of [XX] megawatts thermal (5 percent power), in accordance with the conditions specified herein.

Low-Power (<5 percent of the RTP) Testing

- Following completion of low-power testing (<5 percent of the RTP), the licensee shall review and evaluate individual test results and shall confirm that the test results are within the range of acceptable values predicted or otherwise confirm that the tested systems perform their specific functions in accordance with the FSAR.
- The licensee shall provide written notification to the Director of the Office of New Reactors (or the equivalent NRC management) within fourteen (14) calendar days of completion of the low-power testing. Upon the submission of this notification, the licensee is authorized to perform power ascension testing as described in the FSAR and to operate the facility at reactor steady-state core power levels not in excess of [XXXX] megawatts thermal (100 percent power), in accordance with the conditions specified herein.

At-Power (5 to 100 percent of the RTP) Testing

- Following completion of at-power testing (at or above 5 percent of the RTP up to and including testing at 100 percent of the RTP), the licensee shall review and evaluate individual test results and shall confirm that the results are within the range of acceptable values predicted or otherwise confirm that the tested systems perform their specific functions in accordance with the FSAR.
- The licensee shall provide written notification to the Director of the Office of New Reactors (or equivalent NRC management) within fourteen (14) calendar days of completion of the at power testing.
- License Condition (14-3) – The licensee shall submit to the appropriate Director the Office of New Reactors (or equivalent NRC management), a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of NRC inspections of the Initial Test Program. The schedule shall be updated every 6 months until 12 months before

scheduled fuel loading, and every month thereafter until this operational program in STP COL FSAR Table 13.4S-1, Item 19, has been fully implemented.

- License Condition (14-4) – Within 1 month of a change, any changes to the Initial Startup Test Program described in Chapter 14 of the STP COL FSAR that are made in accordance with the provisions of 10 CFR 50.59 or Section VIII of Appendix A to 10 CFR Part 52 shall be reported in accordance with 10 CFR 50.59(d).

14.2.13.6 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 the COL license information items for the ITP, 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 have been resolved.

On the basis of the review of the STP COL application and the referenced DCD, the staff found that the applicant has adequately addressed COL License Information Items 14.1 and 14.2, in accordance with Section 14.2 of NUREG-0800.

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, 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, in 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 the Nuclear Energy Institute Template NEI 06-13A, "Template for an Industry Training Program Description." The staff endorsed the use of NEI 06-13A (ML082950140), 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 first-of-a kind (FOAK) system tests in compliance with RG 1.206, Regulatory Position 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 Units 3 and 4 COL FSAR Section 14.2S.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 (CRD) System 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 design certification 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 design certification 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 14.2S.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 SRP Acceptance Criteria Item 5C in NUREG-0800 Section 14.2; and the guidance in RG 1.206, Regulatory Position 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 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 item 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, Regulatory Position 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 COM 14.-1 in Section 14.2.11 of this SER.

14.2S.3.6 *Conclusion*

NRC staff reviewed the application and checked the reference DCD. The staff concluded that 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 the Test Program Schedule guidance in NUREG-0800, Section 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 14.2S-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 Regulatory Position 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 Subsection 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 14.2S.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 that Subsection 14.2S.12.1.79 is 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 to RAI 14.02-7 dated July 29, 2009 (ML092150965), 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 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 NEI 07–03A,

“Generic FSAR Template Guidance for Radiation Protection Program Description,” Revision 0. 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. 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 RAI 14.02-5 is closed.

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 Criteria Item 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, Regulatory Position 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 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 1.1-1 Definition of As-Built

This departure modifies the FSAR Tier 1, Section 1.1 definition of as-built to clarify that the determination of physical properties of an as-built SSC may be based on measurements, inspections, or tests that take place before installation in cases where it is technically justifiable, provided that subsequent fabrication, handling, installation, and testing do not alter the properties.

- STD DEP T1 2.1-2 Reactor Pressure Vessel System 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 MSIV Closure and Scram on High Radiation

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

- STD DEP T1 2.4-1 Residual Heat Removal 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 2.4-4 RHR, HPCF, and RCIC Turbine/Pump NPSH

This change makes the ITAAC for the RHR, HPCF, and RCIC systems consistent with the STP Units 3 and 4 suction strainer design and with RG 1.82 Revision 3. The ITAAC uses a

mechanistic evaluation of debris blockage for determination of the adequate net positive suction head (NPSH) margin.

- 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 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, LOCA hydrogen release.

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

This departure revises the seismic category of the radwaste building (RWB) 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 reactor building safety-related diesel generator (RBSRDG) 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.

- STP 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 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 Part 52, Appendix A, Sections VIII.A.4 and VIII.B.6, respectively.

In addition, the departure regarding the definition of “as-built” is evaluated against the guidance in NEI 08–01 Revision 4, dated July 2010.

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.¹ 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, refer to COL application Part 07, Section 5.0 for a listing of all FSAR sections affected by these Tier 1 departures.

- STD DEP T1 1.1-1 Definition of As-Built

This Tier 1 departure modifies the Tier 1, Section 1.1 definition of as-built to clarify that the determination of physical properties of an as-built structure, system, or component may be based on measurements, inspections, or tests that occur prior to installation in cases where it is technically justifiable, provided that subsequent fabrication, handling, installation and testing do not alter the properties. The staff compared the Tier 1 definition of “as-built” proposed by the applicant in the COL application to the definition of “as-built” in NEI 08–01 Revision 4, and confirmed that the definition is in accordance with the latest guidance endorsed by the staff. Based on this evaluation, the staff found this Tier 1 departure acceptable.

¹ 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 5.3.3. Based on this evaluation, the staff found this Tier 1 departure acceptable.

- This Tier 1 departure is evaluated in Chapter 7 and Section 14.3S of this SER. Based on the evaluation in Chapter 7 and Section 14.3S of this SER, the staff found this Tier 1 departure acceptable.

- 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.

- 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.

- 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 Sections 6.2.1 and 7.3. Based on these evaluations, the staff found this Tier 1 departure acceptable.

- 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. Based on this evaluation, the staff found this Tier 1 departure acceptable.

- This Tier 1 departure is necessary in order to make the Tier 1 design information consistent with the associated Tier 2 information. This Tier 1 departure is evaluated in Section 6.2.1 of this SER. Based on the evaluation in SER Section 6.2.1, the staff found this Tier 1 departure acceptable.

- 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. Based on the evaluation in Section 14.3S of this SER, the staff found this Tier 1 departure acceptable.

- 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 6.2.5. 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 8.3 and 9.4. Based on this evaluation, the staff found this Tier 1 departure acceptable.

- 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.

- STP 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

Tier 2* Departure

The following Tier 2* departure identified by the applicant 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, refer to COL application 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 Sections 3.8 and 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 this section.

14.3.6 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 this section, 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 have been resolved.

On the basis of the review of the STP COL application and the referenced DCD, the staff found that the applicant has adequately addressed Tier 1 and Tier 2* departures, in accordance with Section 14.3 of NUREG-0800.

As a result of Confirmatory item 14.03-1, 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

COL application 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 Part 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 Residual Heat Removal 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 2.4-4 RHR, HPCF and RCIC Turbine/Pump NPSH

This departure modifies the ITAAC for the RHR (Table 2.4.1), HPCF (Table 2.4.2), and RCIC (Table 2.4.4) systems to be consistent with the STP Units 3 and 4 suction strainer design and RG 1.82, Revision 3.

- 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 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 SSCs:

- 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)
- 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)

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

- Backfill under Seismic Category 1 structures
- Breathing Air System (BAS)
- Waterproofing Membrane
- Design Reports for ASME Class 1, 2 and 3 Components
- Settlement
- Pipe Break Analysis for the As-Designed Plant

The ITAAC for these systems are in Tables 3.0-1 through 3.0-16 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*

COL application 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*

The STP Units 3 and 4 COL application incorporates by reference the ABWR DCD and the safeguards information of the Standard Safety Analysis Report (SSAR). The applicant provides design descriptions and information related to physical security protection systems or features in the following portions of the COL application:

- Part 8 of the COL application, Revision 4, contains the STP Units 3 and 4 physical security plan, training and qualification plan, and safeguards contingency plan.
- Part 9 of the COL application, Section 5, "Physical Security ITAAC," contains Table 5.01, and the STP letter dated October 12, 2010 (ML102870125), contains the final list of the physical security ITAAC.

In addition, the STP Interdiction Capability Evaluation (ICE) contains certain descriptions of site-specific security structures.

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 require prior NRC approval and 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.

The NRC regulation for protecting nuclear power reactors is in 10 CFR Part 73, "Physical Protection of Plants and Materials." The regulation includes specific security and performance requirements that, when adequately implemented, are designed to protect nuclear power reactors against acts of radiological sabotage; prevent the theft or diversion of special nuclear material; and protect safeguards information against unauthorized releases.

The STP Units 3 and 4 design descriptions, commitments, and acceptance criteria for the security features, including the plant's layout and determination of vital equipment and areas, for a certified design that are based on physical protection systems or hardware provided for meeting requirements of the following Commission regulations:

- 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."
- 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."
- 10 CFR 73.1(a)(1), "Radiological sabotage."
- 10 CFR 73.55, "Requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage"; and Appendices B, C, G, and H.
- 10 CFR Part 74, "Material Control and Accounting of Special Nuclear Material."
- 10 CFR 100.21(f).

Regulatory requirements and acceptance criteria related to physical protection systems or hardware are in NUREG-0800 Section 14.3.12, "Physical Security Hardware – Inspections, Tests, Analyses, and Acceptance Criteria," Revision 1 dated January 2010.

Regulatory guidance documents that are applicable to this evaluation are the following:

- RG 1.206, "Combined License Applications for Nuclear Power Plants," June 2007.
- RG 1.91, "Evaluations of Explosions Postulated to Occur at Transportation Routes Near Nuclear Power Plants," February 1978.
- RG 4.7, "General Site Suitability Criteria for Nuclear Power Stations," April 1998.
- RG 5.12, "General Use of Locks in the Protection and Control of Facilities and Special Nuclear Materials," November 1973.
- RG 5.29, "Material Control and Accounting for Nuclear Power Reactors."
- RG 5.62 (Revision 1), "Reporting of Safeguards Events," November 1987.
- RG 5.65, "Vital Area Access Controls, Protection of Physical Security Equipment and Key and Lock Controls," September 1986.

- RG 5.66 (Revision 1), "Access Authorization Program for Nuclear Power Plants," July 2009.
- RG 5.7 (Revision 1), "Entry/Exit Control for Protected Areas, Vital Areas, and Material Access Areas," May 1980.
- RG 5.44 (Revision 3), "Perimeter Intrusion Alarm Systems," October 1997.
- Information Notice No. 86-83, "Underground Pathways into Protected Areas, Vital Areas, and Controlled Access Areas," September 19, 1986.
- Regulatory Information Summary 2005-04, "Guidance on the Protection of Unattended Openings that Intersect a Security Boundary or Area," April 14, 2005.

The COL applicant is required to describe commitments for establishing and maintaining a physical protection system (engineered and administrative controls), organization, programs, and procedures for implementing a site-specific strategy that demonstrate, if adequately implemented, provides high assurance for protection of the plant against the design-basis threat (DBT). The site-specific physical protection system described must be reliable and available and implement the concept of defense-in-depth protection in order to provide a high assurance of protection. The security operational programs and the physical security protection system are required to meet specific performance requirements of 10 CFR Part 26, 10 CFR 73.54, 10 CFR 73.55, 10 CFR 73.56, 10 CFR 73.57, 10 CFR 73.58. †

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 STP Units 3 and 4 COL application Part 9, 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.¹ 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 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, refer to COL application 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

¹ 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.

non-class 1E uninterruptible power supply being tested will become inoperable, and both dual-redundant controller channels will 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 COL 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 the 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 dated April 2, 2009 (ML090960322), 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 Departure 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 Residual Heat Removal 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 2.4-4 RHR, HPCF and RCIC Turbine/Pump NPSH

The evaluation of this departure is in Section 6.2.1 of this SER.

- 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 startup 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 startup tests meets the intent of the test requirements specified in the DCD based on the following:

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

2. Preoperational and startup tests of the as-built electrical system are at the normal operating voltage.
3. 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 volt direct current (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** dated July 22, 2009 (ML092050077), states that 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 was tracked as **Confirmatory Item 14.03-1** in the SER with open items. The staff reviewed Revision 4 of the COL application, and verified that Part 9 reflects the changes identified in the response to RAI 14.03.-1. However, COL application Part 2, Tier 1 Table 2.12 was not updated to incorporate the changes proposed in the response to RAI 14.03-1. Therefore, verification that these changes are incorporated in the next revision of COL application is continuing to be tracked as **Confirmatory Item 14.03-1**.

The staff found that the ITAAC, as revised by the July 22, 2009 RAI response, for the electrical power distribution system and the DC power supply system are consistent with 10 CFR 52.80(a), SRP Section 14.3.6, and RG 1.206. However, as a result of Confirmatory Item 14.03-1, the staff is unable to finalize their conclusions at this time.

- 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 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 the 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 containment atmospheric monitoring (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 PICS, thereby eliminating the need for a dedicated PCS. Similar to the PCS, the PCFs are classified as non-safety-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 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 to 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** dated September 24, 2009 (ML092710226), 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 non-safety-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. Verification that the proposed changes are included in the next revision of the COL application was tracked as a confirmatory item in the SER with open items. The staff verified that Revision 4 of the FSAR, Tier 1 Section 2.7.5, reflects the change identified in the response to RAI 14.03.05-4. Therefore, **RAI 14.03.05-4** is resolved.

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** dated April 2, 2009 (ML090960322), 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** dated September 24, 2009 (ML092710226), 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 in a letter dated February 9, 2009 (ML090430154). 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** dated September 24, 2009 (ML092710226), states that the revised Tier 1 Section 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 Section 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 Section 3.4.A acceptable. Verification that the proposed changes are included in the next revision of the COL application was tracked as a confirmatory item in the SER with open items. The staff verified that Revision 4 of FSAR, Tier 1, Section 3.4A, reflects the change identified in the response to RAI 14.03.05-5. Therefore, **RAI 14.03.05-5** is resolved.

The applicant's RAI response also states that the ITAAC design commitment is correct as described in Tier 1 Table 3.4, ITAAC Item 3. The ELCS is comprised of four divisions of inputs and digital trip functions (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 digital trip module (DTM) and system logic unit (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 inspections, tests, analyses (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** dated September 24, 2009 (ML092710226), 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 Section 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. In Table 3.4, ITAAC Item 4, the ITA and acceptance criteria 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 4.c(1) remains functionally the same as in the DCD. ITA 4.c(2) repeats the testing of 4.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 4.c(2) and Acceptance Criterion 4.c(2) will be restored to Tier 1 Table 3.4 with the nomenclature changes, and Tier 1 Section 3.4.A will be updated accordingly. The staff found the proposed changes to the FSAR are consistent with the ESF output channel bypass of the design described in the ABWR DCD. These changes are therefore acceptable. Verification that the proposed changes are included in the next revision of the COL application was tracked as a confirmatory item in the SER with open items. The staff verified that Revision 4 of COL FSAR Tier 1, Section 3.4, reflects the changes identified in the response to RAI 14.03.05-6. Therefore, RAI 14.03.05-6 is resolved.

- Based on STD DEP T1 3.4-1, the applicant has changed the EMS to the 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 in 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** 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. Verification that the proposed changes are included in the next revision of the COL application was tracked as a confirmatory item in the SER with open items. The staff verified that Revision 4 of COL FSAR Tier 1 Table 3.4 reflects the change identified in the response to RAI 14.03.05-7. Therefore, **RAI 14.03.05-7** is resolved.

- Enclosure 4f of the applicant's response to the letter dated February 9, 2009 (ML090430154), 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/ITAC. 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** dated September 24, 2009, reevaluates the Tier 1 ITAAC for conformance to SRP Sections 14.3 and 14.3.5 guidance, which supersedes a similar previous evaluation (documented in Enclosure 4f to the letter dated February 9, 2009). 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 7 of Tier 2. NRC staff concluded that the proposed ITAAC will ensure that the system will perform in accordance with its design. Therefore, Departure 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.

In STP Units 3 and 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 14.03.02-1** 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 versus STP Units 3 and 4 FSAR ITAAC actions taken in addressing the interface requirements for site-specific structures. The applicant's response to **RAI 14.03.02-1** dated September 21, 2009 (ML092660093), justifies and explains the pertinent sections of the STP Units 3 and 4 COL FSAR, thereby adequately responding to the staff's request for clarification. The staff concluded that the applicant has satisfactorily responded to **RAI 14.03.02-1**. Therefore, **RAI 14.03.02-1** is resolved.

ITAAC are required for all Tier 1-certified systems to ensure that 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 10 partially or wholly out-of-scope systems (referred to as site-specific elements) are listed in ABWR DCD Tier 2 Section 1.1.2, Revision 4. Out of the 10 systems, only 3 have safety-related functions. Another five systems do interact with in-scope SSCs, while the remaining two are independent site-specific SSCs. COL application Revision 2, Part 9 Section 3.0, provides ITAAC tables for all 10 out-of-scope site-specific systems. ITAAC tables were generated in two different ways; some of the systems have specific entries, while others are designated with "No entry for this system." In **RAI 14.03.02-2**, the staff requested the applicant to explain the reasons for using these two different approaches. In the response to this RAI dated September 21, 2009

(ML092660093), the applicant states that “No entry for this system” is used whenever no interface requirements are specified in the ABWR DCD. Other entries under the column “Design Requirement” of the ITAAC tables reflect the interface conditions required per the 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 their design descriptions. Site-specific SSCs that are independent cannot directly or indirectly interfere with certified SSC systems. Such SSCs, if not safety-related, do not require ITAAC. Therefore, no entries are required for those SSC systems. The staff found that the applicant’s response to **RAI 14.03.02-2** justifies the use of different ITAAC tabular forms and commits to revising the pertinent sections of the STP Units 3 and 4 COL FSAR as described in this response, thereby adequately satisfying the staff’s request for clarification. Verification that the proposed changes are included in the next revision of the COL application was tracked as a confirmatory item in the SER with open items. The staff verified that Revision 4 of COL application Part 9 reflects the changes identified in the response to RAI 14.03.02-2. Therefore, **RAI 14.3.2-2** is resolved.

General Requirement Regarding the As-Built Plant

NUREG–0800, Section 14.3.2, SRP Acceptance Criteria Item 3 requires applicants to provide ITAAC to reconcile the as-built plant with the structural design basis. In addition, SRP Acceptance Criteria 11 requires applicants to perform a structural analysis to reconcile the as-built configuration. The staff issued **RAI 14.03.02-8** requesting the applicant to discuss how STP Units 3 and 4 intends to implement this ITAAC requirement and to provide the corresponding ITAAC table addressing the as-built configuration reconciliation ITAAC for each site-specific SSC, as applicable. The applicant’s response to this RAI dated September 21, 2009, states that ITAAC are provided for the site-specific SSCs in COL application Part 9, Section 3.0, which requires structural analyses reconciling the as-built configurations of these site-specific structures with their structural design bases. The staff’s review confirmed that the ITAAC tables in Section 3.0 of STP Units 3 and 4 COL application Part 9 contain items requiring as-built reconciliation, when applicable, for site-specific SSCs. The intent of RAI 14.03.02-8, however, was for the applicant to provide the procedures that will be applied to accomplish the as-built reconciliation (e.g., to provide a new ITAAC item that requires under “Design Requirements,” the licensee to perform a structural analysis to reconcile as-built data with the structural design basis; under “Inspections, Tests, Analysis,” the licensee to describe the design data and parameters that are going to be reconciled; and, under “Acceptance Criteria,” the licensee to specify the acceptable tolerances and deviations.) Therefore, the applicant’s response was considered incomplete and needed to be augmented. The staff issued **RAI 14.03.02-10** requesting the applicant to provide the procedures that will be applied to accomplish the as-built structural reconciliation as previously noted. This RAI was tracked as **Open Item 14.03.02-8** in the SER with open items

The applicant’s response to RAI 14.03.02-8 dated September 21, 2009 (ML092660093), states that Tables 3.0-1 and 3.0-5 in COL application Part 9, Section 3.0 provide ITAAC stating that a structural analysis report will be prepared to document that the as-built, site-specific Seismic Category I structures (the UHS and the RSW piping tunnels) are able to withstand the structural design-basis loads. The staff reviewed the contents of ITAAC Tables 3.0-1 and 3.0-5. The staff also reviewed the response to **RAI 14.03.02-10** which provided a description of the structural analysis report for site-specific seismic category I structures similar to the descriptions provided for the reactor and control buildings in DCD Section 3H.5.3. Since the revised ITAAC and the new description of the structural analysis report meet SRP Section 14.3.2, Acceptance Criteria II(3) and II(11), the issues identified in RAIs 14.03.02-8 and 14.03.02-10 are resolved.

Based on the above review, the staff determined that the applicant's responses to RAIs **14.03.02-8** and **14.03.02-10** are acceptable because they meet NUREG-0800 Section 14.3.2, SRP Acceptance Criteria II(3) and II(11). The staff verified that Revision 4 of COL application Part 9 reflects the changes identified in the responses to RAIs **14.03.02-8** and **14.03.02-10**. Therefore, **Open Item 14.03.02-8** is closed and RAI 14.03.02-10 is resolved.

- COL Application Part 9, Table 3.0-1 Ultimate Heat Sink

The review of the structural, electrical and control aspects of this ITAAC is documented below. The NRC staff's review of the systems aspects of ITAAC items 1, 2 and 3b of this ITAAC is in Section 9.2.5 of this SER.

In COL application Part 9, Section 3.0 Table 3.0-1, "Design Requirement," Item 5 states that "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 14.03.02-3** 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 14.03.02-3**, dated September 21, 2009 (ML092660093), commits to including additional details of the UHS Basin, the RSW pump house, and the UHS cooling tower enclosure. The applicant's response modifies Item 5 and commits to revising the pertinent sections of STP Units 3 and 4 COL application Part 9. The staff found the applicant's response acceptable. Verification that the proposed changes are included in the next revision of the COL application was tracked as a confirmatory item in the SER with open items. The staff verified that Revision 4 of COL application Part 9 reflects the changes identified in the applicant's response to RAI 14.03.02-3. Therefore, **RAI 14.03.02-3** is resolved. 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 to RAI 14.03.06-3 dated April 2, 2009 (ML090960322), 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 of the other conditions stated in the design commitment. The applicant's response to **RAI 14.03.07-1** dated April 2, 2009, revises this ITAAC Item 2(a) to include (1) an analysis that evaluates the UHS for sufficient capacity to meet its required normal and safety functions; and (2) 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 to this RAI 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 acceptance criteria 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 to this RAI 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.

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

- COL Application 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.

DCD Tier 1 Section 2.12.1, "Electric Power Distribution System," 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 operations:

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 to RAI 14.03.06-5 dated July 22, 2009 (ML092050077), adds Item 8 to COL application Part 9 Section 3.0 Table 3.0-2, which addresses lightning and grounding protection. The staff found the applicant's response acceptable. Verification that the proposed changes are included in the next revision of the COL application was tracked as a confirmatory item in the SER with open items. The staff verified that Revision 4 of COL application Part 9 Table 3.0-2 reflects the changes identified in the response to RAI 14.03.06-5. Therefore, **RAI 14.03.06-5** is resolved.

STP FSAR Section 8A.1.3 states that ground resistance measurements will be performed per the guidance in the Institute of Electrical and Electronics Engineers (IEEE) Standard (Std) 81 to determine that the required value of 1 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 dated October 29, 2009 (ML093430299), 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. Verification that the proposed changes are included in the next revision of the COL application was tracked as a confirmatory item in the SER with open items. The staff verified that Revision 4 of COL application Part 9 Table 3.0-2 reflects the changes identified in the response to RAI 14.03.06-6. Therefore, **RAI 14.03.06-6** is resolved.

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 I&C circuits, they should be identified by some means to clarify the purpose of this ITAAC. The applicant's response dated April 2, 2009 (ML090960322), 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 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 14.03.02-4** to provide additional information regarding Seismic Category I structures that either support or enclose Category IE electrical SSCs. 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 scope of coverage as those discussed in **RAI 14.03.02-3**. The applicant's response to RAI 14.03.02-4 dated September 21, 2009 (ML092660093), states that "As indicated in COLA Part 2 (Tier 2), Figure 8.2-1, the Seismic Category I structures that either support or enclose portions of the Offsite Power System are the Reactor Building and the Control Building." As ITAAC for these Class I buildings are provided in the ABWR DCD, no additional or revised ITAAC are warranted for the plant-specific portion of the offsite power system. In evaluating the above applicant's response, the staff considered the following: (1) the offsite power system is nonsafety-related; and (2) there are no site-specific Seismic Category I SSCs related to the offsite power system. Therefore, the staff found the applicant's response acceptable, and **RAI 14.03.02-4** is resolved

Based on the above information, 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.

- COL Application Part 9, Table 3.0-3 Makeup Water Preparation System

Section 9.2.8 of this SER evaluates this ITAAC.

- COL Application Part 9, Table 3.0-4 Potable and Sanitary Water System

ABWR DCD Tier 1 Section 2.11.23 does not specify any interface requirements for the potable and sanitary water system (PSWS). Therefore, in STP Units 3 and 4 COL application Part 9, Table 3.0-4 states that there is no ITAAC entry for this system. Because the PSWS is not safety-related, and no interface requirements are identified in the DCD, NRC staff agreed that the PSWS requires no ITAAC.

- COL Application Part 9, Table 3.0-5 Reactor Service Water System

The staff reviewed the electrical and control aspects of this ITAAC and found that there were no issues. The structural aspects of this ITAAC are evaluated below. The NRC staff's review of the systems aspects of this ITAAC is in Section 9.2.15 of this SER.

The piping system runs inside of a tunnel structure below grade from the UHS pump house to the reactor cooling water heat exchangers inside the control building. The design requirements are similar to those of the UHS. In addition, all tunnel openings (including those between the three independent divisions) are required to be sealed to withstand the load cases from GDC 2 and GDC 4. A 3-hour fire rating is also required. In COL application Part 9 Table 3.0-5 under the "Design Requirement," Item 8 states that "Tunnel structures used to route piping are designed for design-basis seismic loads and are protected against site flooding." Given the importance of the RSW-related structures and the complexity of the required load cases, the

staff issued **RAI 14.03.02-5** requesting the applicant to provide a more complete and detailed ITAAC task in Table 3.0-5.

The applicant's response to RAI 14.03.02-5 dated September 21, 2009 (ML092660093), commits to including additional details on the RSW piping tunnels. The staff's evaluation noted that the applicant's response modifies Item 8 and commits to revising 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. Verification that the proposed changes are included in the next revision of the COL application was tracked as a confirmatory item in the SER with open items. The staff verified that in Revision 4 of COL application Part 9, Table 3.0-5 reflects the changes identified in the response to RAI 14.03.02-5. Therefore, **RAI 14.03.02-5** 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.

- COL Application Part 9, Table 3.0-6 Turbine Service Water System
Section 9.2.16 of this SER evaluates this ITAAC.

- COL Application 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." Section 13.3 of this SER evaluates this ITAAC.

- COL Application Part 9, Table 3.0-8 Site Security

Section 3.0 of the COL application Part 9 references Part 9 Section 5.0, "Physical Security ITAAC." The evaluation of the Physical Security ITAAC is addressed later in this SER section under "Physical Security ITAAC."

- COL Application Part 9, Table 3.0-9 Circulating Water System

Section 10.4.5 of this SER evaluates this ITAAC.

- COL Application 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.

The toxic gas issue was tracked in STP Section 9.4 of this SER as an open item under Departure STP DEP 9.4-1. The staff reviewed the applicant's analysis justifying the removal of the toxic gas monitors. The details of the staff's review of the applicant's site-specific supplement that addresses COL License Information Item 6.8 ("Toxic Gases") are documented in Section 6.4 of this SER. The staff concluded that no hazardous chemicals with quantities exceeding the immediate danger to life and health criteria of RG 1.78 were identified, and there

is no toxic gas threat to the control room. Therefore, the applicant will not need to include the deleted instrumentation and the ITAAC to satisfy the interface requirements.

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

The structural aspects of this ITAAC are evaluated below. The NRC staff's review of other aspects of this ITAAC is in Section 2.5.4 of this SER.

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, Tier 2 (FSAR) has very detailed specifications regarding foundation soil fills under different buildings. COL application Part 9 of Table 3.0-11 Item 1 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 14.03.02-6** requesting the applicant to provide a more complete and detailed ITAAC for the backfill of each building.

The applicant's response to **RAI 14.03.02-6** dated September 21, 2009 (ML092660093), 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. In this response, the applicant also provides a table that lists the sections in the COL application 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 14.03.02-6 includes the pertinent references regarding structural soil fills, modifies Table 3.0-11, and commits to revising 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. Verification that the proposed changes are included in the next revision of the COL application was tracked as a confirmatory item in the SER with open items. The staff verified that in Revision 4 of COL application Part 9, Table 3.0-11 reflects the changes identified in the response to RAI 14.03.02-6. Therefore, **RAI 14.03.02-6** is resolved.

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

COL application Part 9, Table 3.0-12 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. The staff issued **RAI 14.03.02-7** 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 to **RAI 14.03.02-7** dated September 21, 2009, 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 provisions for plant-breathing air requirements. In ABWR DCD Tier 1, Table 2.11.11 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 14.03.02-7 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 14.03.02-7** 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.

- COL Application Part 9, Table 3.0-13 Waterproofing Membrane

Section 3.4 of this SER evaluates this ITAAC.

- COL Application Part 9, Table 3.0-14 Design Reports for ASME Class 1, 2, and 3 Components

Section 3.9.3 of this SER evaluates this ITAAC.

- COL Application Part 9, Table 3.0-15 Settlement

Section 2.5.4 of this SER evaluates this ITAAC.

- COL Application Part 9, Table 3.0-16 Pipe Break Analysis for the As-Designed Plant

Sections 3.6.1 and 3.6.2 of this SER evaluate this ITAAC.

- COL Application Part 9, Table 3.0-17 Diesel Generator Fuel Oil Storage Vaults

The staff noted that ABWR DCD Revision 4 Section 2.16.2 contains the general ITAAC for the DG fuel oil storage vaults. However, in COL application Part 9 Revision 2, Section 3.0 did not 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 acceptance criteria in NUREG-0800 Section 14.3.2. The staff issued **RAI 14.03.02-9** requesting 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. This issue was tracked as **Open Item 14.03.02-9** in the SER with open items.

The applicant's response to this RAI dated March 30, 2010 (ML100920023), states that the ITAAC for the diesel storage tank is included in DCD Tier 2 Section 14.3.2. The ITAAC for the oil transfer tunnel is in DCD Tier 1, Section 2.15.10. The ITAAC for the as-built reconciliation of the site-specific DG fuel oil storage vaults is included in the new proposed Table 3.0-17 of COL application Part 9, Section 3.0.

The staff reviewed the texts of DCD Tier 2 Section 14.3.2; the ITAAC for the oil transfer tunnel in DCD Tier 1 Section 2.15.10, including Items 9 and 10 of ITAAC Table 2.15.10; and the ITAAC for the as-built reconciliation of the site-specific DG fuel oil storage vaults included in the proposed table in the response to RAI 14.02.03-9, which will be included in the next revision of COL application Part 9, Section 3.0. Based on this review, the staff determined that the applicant has provided the pertinent information requested in RAI 14.03.02-9, and is in compliance with the provisions of SRP Section 14.3.2. The modified ITAAC Table 3.0-17 included in Revision 4 of COL application Part 9 Section 3, also includes the requirements for flood-protected openings that were requested in RAI 03.04.02-6. Therefore, the staff concludes that the response is acceptable and **Open Item 14.03.02-9** is resolved and closed.

- COL Application Part 9, Table 3.0-18 Main Turbine System

This ITAAC will be added to the COL Application, Part 9 in the next revision of the FSAR as stated in STP's response to RAI 10.02-6, Revision 1 dated February 21, 2011 (ML110550621). Verification that this ITAAC will be included in the next revision of the COL Application, Part 9 is being tracked as Confirmatory Item 14.03-2. Section 10.2 of this SER evaluates this ITAAC.

Physical Security ITAAC

- Detection and Assessment Hardware

STP submitted the following ITAAC for detection and assessment hardware in a letter dated October 12, 2010 (ML102870125):

- 2(a) – Physical barriers for the protected area perimeter will not be part of vital area barriers.
- 2(b) – Penetrations through the protected area barrier will be secured and monitored.
- 2(c) – Unattended openings that intersect a security boundary, such as underground pathways, will be protected by a physical barrier and monitored by intrusion detection equipment or provided surveillance at a frequency sufficient to detect exploitation.
- 3(a) – Isolation zones will exist in outdoor areas adjacent to the physical barrier at the perimeter of the protected area and will be designed of a sufficient size to permit observation and assessment on either side of the barrier.
- 3(b) – Isolation zones will be monitored with intrusion detection and assessment equipment that is designed to provide detection and assessment of activities within the isolation zone.
- 3(c) – Areas where permanent buildings do not allow sufficient observation distance between the intrusion detection system and the protected area barrier (e.g., the building walls are immediately adjacent to or are an integral part of the protected area barrier) will be monitored with intrusion detection and assessment equipment that is designed to detect the attempted or actual penetration of the protected area perimeter barrier before completed penetration of the barrier and assessment of detected activities.
- 4(a) – The perimeter intrusion detection system will be designed to detect penetration or attempted penetration of the protected area perimeter barrier before completed penetration of the barrier, and for subsequent alarms to annunciate concurrently in at least two continuously manned onsite alarm stations (central and secondary alarm stations).
- 4(b) – The perimeter assessment equipment will be designed to provide video image recording with real-time and playback capability that can provide assessment of detected activities before and after each alarm annunciation, at the protected area perimeter barrier.
- 4(c) – The intrusion detection and assessment equipment at the protected area perimeter will be designed to remain operable from an uninterruptible power supply, in the event of the loss of normal power.
- 5 – Isolation zones and exterior areas within the protected area will be provided with illumination to permit assessment in the isolation zones and observation of activities within exterior areas of the protected area.

- 6 – The external walls, doors, ceiling, and floors in the main control room, central alarm station, secondary alarm station, and the last access control function for access to the protected area will be bullet resistant, to at least Underwriters Laboratories Ballistic Standard 752, “The Standard of Safety for Bullet-Resisting Equipment,” Level 4, or National Institute of Justice Standard 0108.01, “Ballistic Resistant Protective Materials,” Type III.
- 9 – An access control system with a numbered photo identification badge system that will be installed and designed for use by individuals who are authorized access to protected areas and vital areas without escort.
- 10 – Unoccupied vital areas will be designed with locking devices and intrusion detection devices that annunciate in the central and secondary alarm stations.
- 11(a) – Intrusion detection equipment and video assessment equipment will annunciate and be displayed concurrently in at least two continuously manned onsite alarms stations (central and secondary alarm stations).
- 11(b) – Central and secondary alarm stations will be located inside the protected area and will be designed so that the interiors of both alarm stations are not visible from the perimeter of the protected area.
- 11(c) – Central and secondary alarm stations will be designed, equipped, and constructed such that no single act, in accordance with the design-basis threat of radiological sabotage, can simultaneously remove the ability of both the central and secondary alarm stations to (1) detect and assess alarms; (2) initiate and coordinate an adequate response to alarms; (3) summon offsite assistance; and (4) provide effective command and control.
- 11(d) – Both the central and secondary alarm stations will be constructed, located, protected, and equipped to the standards for the central alarm station (alarm stations need not be identical in design, but shall be equal and redundant, capable of performing all functions required of alarm stations).
- 14 – Intrusion detection systems recording equipment will record onsite security alarm annunciation including the location of the alarm, false alarm, alarm check, and tamper indication and the type of alarm, location, alarm circuit, date, and time.

The NRC staff's review determined that the applicant has adequately addressed SRP Section 14.3.12, Revision 1 dated January 2010 with regards to detection and assessment hardware ITAAC 2(a), 2(b), 2(c), 3(a), 3(b), 3(c), 4(a), 4(b), 4(c), 5, 6, 9, 10, 11(a), 11(b), 11(c), 11(d), and 14, and the ITAAC submitted by the STP match exactly to the guidance in NUREG-0800, Section 14.03.12. The STP letter dated October 12, 2010, proposes to replace COL application Part 9 Section 5, “Physical Security ITAAC,” in its entirety in the next revision of the COL application. Verification that the proposed changes are included in the next revision of COL application Part 9, Section 5, is being tracked as **Confirmatory Item 14.03.12-1**.

- Delay or Barrier Design

STP submitted the following ITAAC for the delay or barrier design in a letter dated October 12, 2010 (ML102870125):

- 1(a) – Vital equipment will be located only within a vital area.
- 1(b) – Access to vital equipment will require passage through at least two physical barriers.

- 7 – The vehicle barrier system will be designed, installed, and located at the necessary standoff distance to protect against the design-basis threat vehicle bombs.
- 8(a) – Access control points will be established and designed to control personnel and vehicle access into the protected area.
- 8(b) – Access control points will be established and designed with equipment for the detection of firearms, explosives, and incendiary devices at the protected area personnel access points.
- 13(a) – Security alarm devices, including transmission lines to annunciators, will be tamper-indicating and self-checking (e.g., an automatic indication is provided when failure of the alarm system or a component occurs or when on standby power); and alarm annunciation indicates the type of alarm (e.g., intrusion alarms, emergency exit alarms) and location.
- 13(b) – Intrusion detection and assessment systems will be designed to provide visual display and audible annunciation of alarms in both the central and secondary alarm stations.

The staff's review determined that the applicant has adequately addressed SRP Section 14.3.12 Revision 1 dated January 2010, delay or barrier design ITAAC 1(a), 1(b) 7, 8(a), 8(b), 13(a), and 13(b) and the ITAAC submitted by STP match exactly to the guidance in NUREG-0800, Section 14.03.12. The STP letter dated October 12, 2010, proposes to replace COL application Part 9 Section 5, "Physical Security ITAAC," in its entirety. Verification that the proposed changes are included in the next revision of COL application Part 9 Section 5 is being tracked as part of **Confirmatory Item 14.03.12-1**.

- Systems, Hardware, or Features Facilitating Security Response and Neutralization

STP submitted the following ITAAC for systems, hardware, or features facilitating security response and neutralization in a letter dated October 12, 2010 (ML102870125):

- 12 – The secondary security power supply system for alarm annunciator equipment and nonportable communications equipment will be located within a vital area.
- 15 – Emergency exits through the protected area perimeter and vital area boundaries will be alarmed with intrusion detection devices and secured by locking devices that allow prompt egress during an emergency.
- 16(a) – The central and secondary alarm stations will have conventional (land line) telephone service with the control room and local law enforcement authorities.
- 16(b) – The central and secondary alarm stations will be capable of continuous communication with on-duty security force personnel.
- 16(c) – Nonportable communications equipment in the central and secondary alarm stations will remain operable from an independent power source in the event of a loss of normal power.

The staff's review determined that the applicant has adequately addressed SRP Section 14.3.12 Revision 1 dated January 2010 systems, hardware, or features facilitating security response and neutralization ITAAC 12,15,16(a) and 16(b), and the ITAAC submitted by STP match exactly to the guidance in NUREG-0800, Section 14.03.12. The STP letter dated October 12, 2010, proposes to replace COL application Part 9 Section 5, "Physical Security

ITAAC,” in its entirety. Verification that the proposed changes are included in the next revision of COL application Part 9 Section 5 is being tracked as part of **Confirmatory Item 14.03.12-1**.

14.3S.3.5 *Post Combined License Activities*

As part of the site-specific ITAAC closure, the applicant will provide the details of Interface requirements for the portions of the site-specific systems that are not part of the certified design for NRC to review.

14.3S.3.6 *Conclusion*

The NRC staff’s finding related to information incorporated by reference, including the ITAAC, 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 ITAAC. With the exceptions of **Confirmatory Items 14.03-1, 14.03-2 and 14.03.12-1**, no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the ITAAC that were incorporated by reference have been resolved.

The staff’s review found that the applicant has adequately described the physical security systems or provided and/or facilitated the implementation of the site’s security programs. In addition, the applicant adequately describes the site-specific physical security ITAAC for meeting the requirements of 10 CFR 73.55 and provides the technical bases for establishing physical security ITAAC for protection against acts of radiological sabotage. The staff concluded that the applicant’s information provides adequate descriptions of objectives, prerequisites, test methods, required data, and acceptance criteria for security-related ITAAC for the approval of the STP Units 3 and 4 COL application.

The staff determined that the applicant’s ITAAC will adequately verify that STP Units 3 and 4 have been constructed and will be operated in compliance with the design and with the applicable regulations.

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