14.0 INITIAL TEST PROGRAM

14.1 Introduction

This chapter addresses the initial test program (ITP) for structures, systems, and components (SSCs) and design features for both the nuclear portion of the North Anna Power Station (NAPS), Unit 3, and the balance of plant. The information includes major phases of the test program, including preoperational tests, initial fuel loading and initial criticality, low-power tests, and power-ascension tests. This chapter describes the scope of the ITP, as well as the general plans for accomplishing it.

The technical aspects of the ITP include the test program to verify the functional requirements of plant SSCs and the sequence of testing. The sequence of testing is to be organized such that the safety of the plant does not depend on untested SSCs. In addition, the measures demonstrate the following: (1) the ITP is accomplished with adequate numbers of qualified personnel, (2) adequate administrative controls will be established to govern the ITP, (3) the test program is used, to the extent practicable, to train and familiarize the plant's operating and technical staff with the operation of the facility, and (4) the adequacy of plant operating and emergency procedures is verified, to the extent practicable, during the period of the ITP.

This chapter also provides information on the inspections, tests, analyses, and acceptance criteria (ITAAC) that are intended to demonstrate that, when the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformance with the combined license (COL); the Atomic Energy Act of 1954, as amended (the Act); and the regulations of the U.S. Nuclear Regulatory Commission (NRC).

14.2 Initial Plant Test Program

14.2.1 Introduction

The ITP includes preoperational tests, initial fuel loading and initial criticality, low-power tests, and power-ascension tests. The applicant addresses the scope of the ITP, as well as its general plans for accomplishing it. The technical aspects of the ITP include (1) ITP objectives to verify the functional requirements of plant SSCs, and (2) the sequence of the ITP. The sequence of testing is organized so that the safety of NAPS Unit 3 (NAPS-3) does not depend on untested SSCs.

14.2.2 Summary of Application

Section 14.2 of the COL final safety analysis report (FSAR) incorporates by reference Section 14.2 of the Economic Simplified Boiling-Water Reactor (ESBWR) Design Control Document (DCD), Revision 5. In addition, in FSAR Section 14.2, the applicant provided the following supplemental information:

COL Items

- STD COL 14.2-1-A Description—Initial Test Program Administration
- STD COL 14.2-2-H Startup Administrative Manual

In FSAR Section 14.2.2.1, "Startup Administrative Manual (SAM)," the applicant provided the following: "A description of the ITP administration is provided in Appendix 14AA. The SAM will

be developed and made available to the NRC 60 days prior to scheduled start of the preoperational test program."

- STD COL 14.2-3-H Test Procedures

In FSAR Section 14.2.2.2, "Test Procedures," the applicant provided the following: "Approved test procedures for satisfying the commitments of this section will be developed and available for review no later than 60 days prior to their intended use for preoperational tests and no later than 60 days prior to scheduled fuel loading for power ascension tests."

- NAPS COL 14.2-4-H Test Program Schedule and Sequence

In FSAR Section 14.2.7, "Test Program Schedule and Sequence," the applicant provided the following: "The detailed testing schedule will be developed and made available for review prior to actual implementation. The schedule may be updated and continually optimized to reflect actual progress and subsequent revised projections. The implementation milestones for the ITP are provided in Section 13.4."

- NAPS COL 14.2-5-A Site Specific Tests
- NAPS COL 14.2-6-H Site Specific Test Procedures

In FSAR Section 14.2.9, "Site Specific Preoperational and Startup Tests," the applicant addressed the following two COL items for site specific test procedures:

> Specific testing to be performed and the applicable acceptance criteria for each preoperational and startup test are documented in test procedures to be made available to the NRC approximately 60 days prior to their intended use for preoperational tests, and not less than 60 days prior to scheduled fuel load for initial startup tests. Site specific preoperational tests are in accordance with the system specifications and associated equipment specifications for equipment in those systems provided by the licensee that are not part of the standard plant described in DCD Section 14.2.8. The tests demonstrate that the installed equipment and systems perform within the limits of these specifications.

Supplemental Information

- STD SUP 14.2-2

In FSAR Section 14.2.5, "Test Records," the applicant provided the following: "Startup test reports are prepared in accordance with Regulatory Guide (RG) 1.16."

- STD SUP 14.2-4

In FSAR Section 14.2.8.1.36, "AC Power Distribution System Preoperational Test, General Test Methods and Acceptance Criteria," the applicant provided the following: "Proper operation of the automatic transfer capability of the normal preferred power source to the alternate preferred power source."

- NAPS SUP 14.2-1

In FSAR Section 14.2.1.4, "Organization and Staffing," the applicant provided the following: "Section 13.1, provides additional information regarding responsibilities, qualifications, and organization for implementing the preoperational and startup testing program."

- NAPS SUP 14.2-2

In FSAR Section 14.2.9.2, "Site Specific Startup Tests," the applicant provided information to address the cooling tower performance test.

- NAPS SUP 14.2-3

In FSAR Section 14.2.9.1, "Site specific Pre-Operational Tests," the applicant provided information to address the station service water system preoperational test and the cooling tower preoperational test.

14.2.3 Regulatory Basis

The regulatory basis of information incorporated by reference is addressed within the final safety evaluation report (FSER) related to the ESBWR DCD.

The regulatory bases for acceptance of the supplemental information related to operational programs are established in accordance with Section 14.2, "Initial Plant Test Program—Design Certification and New License Applicants," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (hereafter referred to as the SRP); Section C.I.14, "Verification Programs," of RG 1.206, "Combined License Applications of Nuclear Power Plants (LWR Edition)"; and RG 1.68, "Initial Test Program for Water-Cooled Nuclear Power Plants."

The regulatory requirements of 10 CFR 52.79, "Contents of Applications; Technical Information in Final Safety Analysis Report," for COL applications (COLAs) require the applicant to include plans for preoperational testing and initial operations in the FSAR. Section C.I.14 of RG 1.206 provides guidance on information pertaining to the ITP to be included in the FSAR for the NRC staff to perform safety evaluations for COLAs.

SRP Section 14.2.3.B.ii and iii, and in RG 1.206, Section C.I.14, state that the COL applicant should describe measures to ensure that adequate administrative controls will be established to govern the ITP.

14.2.4 Technical Evaluation

The NRC staff reviewed FSAR Section 14.2, "Initial Plant Test Program," of the NAPS-3 COLA and checked the referenced DCD to ensure that the combination of the DCD and the information in the COLA represent the complete scope of information relating to this review topic.[1] The staff's review confirmed that the information contained in the application and

[1] See SER Section 1.2.2, "Finality of Referenced NRC Approvals," for a discussion of the staff's review related to verification of the scope of information to be included within a COLA that references a design certification.

incorporated by reference addresses the required information related to Section 14.2. The staff is reviewing the ESBWR DCD on Docket No. 52-010. The staff's SER on the ESBWR design certification application (DCA) will document the staff's technical evaluation of the information incorporated by reference related to this section.

The staff's review of information contained in the FSAR resulted in the issuance of ten requests for additional information (RAIs). In summary, the staff reviewed the applicant's responses to these RAIs, found the responses to be acceptable, and considers the RAIs to be resolved. Specific topics of Section 14.2 are addressed below.

Evaluation of Site Specific Preoperational and Startup Tests

- NAPS COL 14.2-5-A Site Specific Tests

FSAR Section 14.2.9 is divided into three subsections for site specific preoperational and startup tests. The site specific preoperational and startup tests include the following:

- 14.2.9.1.1 Station Water System Pre-Operational Test
- 14.2.9.1.2 Cooling Tower Preoperational Test
- 14.2.9.2.1 Cooling Tower Performance Test

RG 1.68, Section C.1, "Criteria for Selection of Plant Features To Be Tested," provides the criteria for the selection of plant features to be tested during the ITP. FSAR Section 14.2.9 contains the site specific ITP testing that will be required for SSCs outside the ESBWR DCD. The site specific test abstracts appear in the three subsections listed above. During its review, the staff issued **RAI 14.2-02** and asked the applicant to confirm that no additional site specific SSCs or design features meet the criteria in RG 1.68, Section C.1, and, if additional testing is identified, to add such testing to Section 14.2 of the FSAR.

On August 7, 2008, the applicant responded to **RAI 14.2-02**. The applicant stated, "the criteria in RG 1.68, Section C.1, for the selection of plant features to be tested during the ITP were reviewed against the site specific SSCs, design features, and performance capabilities to determine if any additional testing is required. There were no additional site specific SSCs, design features, or performance capabilities identified that meet these criteria." The staff finds that this response is acceptable, and **RAI 14.2-02** is resolved.

The NRC staff reviewed FSAR Sections 14.2.9.1.1 and 14.2.9.1.2 for the station water system preoperational testing and cooling tower preoperational testing, respectively. A detailed evaluation of 14.2.9.1.1 is contained in Section 9.2.1 of this SER. The staff also reviewed Section 14.2.9.2.1 for the cooling tower performance testing. The staff did not identify the need for any additional information in these test abstracts and, therefore, they are acceptable.

Evaluation of Startup Administration Manual

- STD COL 14.2-1-A Description—Initial Test Program Administration
- STD COL 14.2-2-H Startup Administrative Manual
- STD COL 14.2-3-H Test Procedures
- NAPS COL 14.2-4-H Test Program Schedule and Sequence

At public meetings on May 13 and May 22, 2008, the applicant and other representatives of the design-centered working group (DCWG) presented a proposed test program administrative controls document (proposed FSAR Appendix 14AA, "Description of Initial Test Program Administration," dated May 22, 2008) for staff consideration. Staff review of the proposal indicates that it is consistent with the guidance provided in SRP Section 14.2. The staff issued **RAI 14.02-3** and requested that the applicant formally submit this document on the docket as FSAR Appendix 14AA.

On August 7, 2008, the applicant responded to **RAI 14.2-03**. The applicant stated that it will include the referenced test program administrative document as Appendix 14AA of the FSAR, as requested. This document conforms to the guidance in SRP Section 14.2 and RG 1.206. The staff finds that this response is acceptable, and **RAI 14.2-03** is resolved.

In the proposed FSAR Appendix 14AA, Section 14AA.3.4, "Test Procedure Changes," the applicant provided guidance on changes to test procedures. During the review of the administrative controls for the ITP, the staff issued **RAI 14.2-07** and requested that the applicant provide a description in the FSAR, Appendix 14AA, Section 14AA.3.4, of the change control process (like that found in 10 CFR 50.59, "Changes, Tests and Experiments") for evaluating major test procedure changes for test abstracts in the ITP. In accordance with 10 CFR 50.59(c)(1)—

> a licensee may make changes to test procedures as described in the FSAR without obtaining a license amendment, only if:
>
> (i) a change to the technical specifications (TS) incorporated in the license is not required, and
>
> (ii) the change, test or experiment does not meet any of the criteria in (10 CFR) 50.59(c)(2).

The COL applicant should add a requirement to FSAR Section 14AA.3.4 to evaluate and obtain a license amendment, if it is determined that a major test procedure change could result in a TS amendment in accordance with 10 CFR 50.59(c)(1) or it meets one of the eight criteria in 10 CFR 50.59(c)(2)(i) through (viii).

On September 11, 2008, the applicant responded to **RAI 14.2-07**. The applicant proposed to revise FSAR Section 14AA.3.4, "Test Procedure Changes," with the following information:

> All test procedure intent changes will be revised against the following criteria (consistent with 10 CFR 50.59 and the design certification rule):
>
> - Departure from Tier 1 information
> - Departure from Tier 2 information that significantly decreases the level of safety in accordance with 10 CFR 50.59(c)(1) and meets any one of eight criteria in 10 CFR 50.59(c)(2)(i) through (viii) or 10 CFR [Part] 52, Design Certification Appendix, Section VIII.B.5.b.
> - Departure from Tier 2* information
> - Departure from Technical Specifications.

> Preoperational test procedure intent changes involving Tier 1, Tier 2*, Technical Specifications, or Tier 2 that require a license amendment must be approved by the NRC prior to procedure completion and approval. Startup test procedure intent changes involving Tier 1, Tier 2*, Technical Specifications, or Tier 2 that require a license amendment must be approved by the NRC prior to procedure use.

The staff finds that this revision to FSAR Section 14AA.3.4 is acceptable, and **RAI 14.2-07** is resolved.

Evaluation of Test Records

- STD SUP 14.2-2

SRP Section 14.2, paragraph II.3.F, "Review, Evaluation, and Approval of Test Results," states that the applicant should develop procedures to control the review, evaluation, and approval of test results for each phase of the test program, and RG 1.16, "Reporting of Operating Information—Appendix A Technical Specifications," issued August 1975, addresses startup test reports. FSAR Section 14.2.2.5, "Test Records," states, "Startup test reports are prepared in accordance with RG 1.16." The staff review indicates that FSAR Section 14.2.2.5 does not include provisions to ensure that design organizations participate in the resolution of design-related problems that result in, or contribute to, a failure to meet test acceptance criteria. As such, the staff issued **RAI 14.02-04** and asked the applicant to revise FSAR Section 14.2.2.5 to include such provisions.

On August 7, 2008, the applicant stated, in part, that it will include the description of the ITP administration as Appendix 14AA of the FSAR, as requested in **RAI 14.2-03**. Appendix 14AA, Section 14AA.4.2, includes provisions to ensure that design organizations participate in the resolution of design-related problems that result in, or contribute to, a failure to meet test acceptance criteria. In response to **RAI 14.2-03**, the applicant will revise FSAR Chapter 14 to incorporate Appendix 14AA. Section 14AA.4.2, which addressed this RAI, was attached to the August 7, 2008, response.

The staff reviewed FSAR Section 14AA.4.2 and found that the applicant stated that General Electric-Hitachi Nuclear America, LLC (GEH), and other design organizations participate in the resolution of design-related problems that result in, or contribute to, a failure to meet test acceptance criteria. The staff found that this response was acceptable, and **RAI 14.2-04** is resolved.

Evaluation of Site Specific ITP Test Abstracts

- NAPS COL 14.2-6-H Site Specific Test Procedures
- STD SUP 14.2-2
- STD SUP 14.2-4
- NAPS SUP 14.2-1
- NAPS SUP 14.2-2
- NAPS SUP 14.2-3

Revision 0 of FSAR Section 14.2.9.1.4 contained the following statement:

Performance is observed and recorded during a series of individual component and integrated system tests to demonstrate the following:

- Proper operation of initiating, transfer, and trip devices
- Proper operation of relaying and logic
- Proper operation of equipment protective devices, including permissive and prohibit interlocks
- Proper operation of instrumentation and alarms used to monitor system and equipment status
- Proper operation and load carrying capability of breakers, switchgear, transformers, and cables
- The capability of transfer between onsite and offsite power sources as per design

Based on its review, the staff determined that additional information was required to complete its review in this area. The staff issued **RAI 14.02-1**, and asked the applicant to address the following additional items or provide justification for their exclusion: (a) availability of alternating current (ac) and direct current power to the switchyard equipment; (b) design limits of switchyard voltage, stability and switchyard interface agreements and protocols; (c) operation of current transformers and potential transformers; (d) operation of high-voltage disconnect switches and ground switches; and (e) proper operation of the automatic transfer capability of normal preferred power source to the alternate preferred power source.

In response to this RAI, the applicant proposed to delete this test from the FSAR and address the above RAI by cross-reference in the FSAR to ESBWR DCD test Section 14.2.8.1.36, "AC Power Distribution System Preoperational Test," since this DCD test abstract is exactly the same as FSAR test Section 14.2.9.1.4. In addition, the COL applicant added STD SUP 14.2-4, "Proper operation of the automatic transfer capability of the normal preferred power source to the alternate preferred power source," related to this test.

The staff found that this response was acceptable, given that the DCD describes this test and the FSAR incorporates it by reference, and **RAI 14.02-1** is resolved.

Revision 0 of FSAR Section 14.2.9.1.3, "Personnel Monitors and Radiation Survey Instruments Preoperational Test," described the preoperational test for personnel monitors and radiation survey instruments. The staff issued **RAI 14.02-5** in order to determine the general types of personnel monitors and radiation survey instruments that are covered by this preoperational test. The staff also issued **RAI 14.02-6** to determine why the applicant did not specify a preoperational test in FSAR Section 14.2.9.1.3 for the testing of laboratory equipment used to analyze or measure radiation levels and radioactivity levels.

In the response to these RAIs, and to supplemental RAIs 14.02-9 and 14.02-10 that requested further clarification for testing of the monitoring systems and laboratory equipment, the applicant stated that, after further evaluation, since personnel monitors, radiation survey instruments, and laboratory equipment are purchased as standard plant commercial grade equipment, and are routinely replaced over the life of the plant, this equipment does not meet the RG 1.68 criteria

for plant features to be tested in the ITP and, therefore, is not subject to the ITP. Accordingly, in Revision 1 to the FSAR, the applicant deleted Section 14.2.9.1.3 from the FSAR and modified FSAR Table 1.9-202 to take exception to RG 1.68, Appendix A, Items 1.k(2) "personnel monitors and radiation survey instruments" and 1.k(3) "laboratory equipment used to analyze or measure radiation levels and radioactivity concentrations."

In lieu of testing this equipment as part of the ITP, the applicant determined that the Radiation Protection Program (RPP) provides for adequate testing of both laboratory and portable instrumentation used for radiation protection. The applicant's RPP is described in Nuclear Energy Institute (NEI) 07-03A, Revision 1, "Generic FSAR Template Guidance for Radiation Protection Program Description," which is incorporated in the North Anna 3 FSAR. NEI 07-03A, Revision 1, provides descriptions of the types of radiation protection instruments and equipment that will be used in the plant. The applicant stated that each new survey instrument or personnel monitor is tested prior to being placed in service to assure conformance with performance requirements

The applicant's RPP specifies, in Section 12.5.3.2 of NEI 07-03A, Revision 1, that "radiation monitoring instrumentation and equipment are selected, maintained and used to provide the appropriate detection capabilities, ranges, sensitivities and accuracies required for the types and levels of radiation anticipated at the plant and in the environs during routine operations, major outages, abnormal occurrences, and postulated accident conditions." NEI 07-03A, Revision 1, also specifies the types of instruments and equipment that will be available (i.e., tested and ready for service) at specified milestones for the RPP. On the basis of the applicant's response to RAIs 14.02-5 and 14.02-6 (and to the supplemental RAIs 14.02-9 and 14.02-10), the staff finds that the applicant's laboratory and portable instrumentation used for radiation protection will be adequately tested and maintained under the applicant's RPP and, therefore, does not need to be included in the ITP. Therefore, the staff finds the COL applicant's response to be acceptable and RAIs 14.02-5, 14.02-6, 14.02-9 and 14.02-10 are resolved.

To effectively test radiation monitors and survey instruments with range selection for proper functioning, the testing must include the selection of the correct operating range of the device. During its review, the staff determined that the test abstract (described in Section 14.2.9.1.3 of the FSAR) did not describe this. Accordingly, the staff issued **RAI 14.02-8** and asked the applicant to revise the "General Test Methods and Acceptance Criteria" in Section 14.2.9.1.3 of the FSAR to specifically include a statement regarding the "proper functioning and operation of range selection and response in each range."

In the September 19, 2008, response to **RAI 14.02-08**, the applicant stated that, in response to **RAI 14.02-5**, the applicant made a determination to delete FSAR Section 14.2.9.1.3 in its entirety. However, as stated in the response to **RAI 14.02-5**, the applicable standards for testing radiation monitors and survey instruments, including a description of the proper functioning and operation of range selection and response in each range, appear in American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE) N323A, "Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments," dated December 31, 1997 (referenced in Table 1.9-22 of the DCD), and ANSI/IEEE N323D, "Installed Radiation Protection Instrumentation," issued in 2003 (added to Table 1.9-204 of the FSAR in response to **RAI 14.02-5**). The staff reviewed this response and found that it was acceptable; therefore, the issues regarding selection of the correct operating range to test radiation monitoring equipment discussed in **RAI 14.02-8** are resolved.

Accordingly, the staff finds that the COL items (STD COL 14.2-1-A, STD COL 14.2-2-H, STD COL 14.2-3-H, NAPS COL 14.2-4-H, NAPS COL 14.2-5-A, and NAPS COL 14.2-6-H) are adequately addressed by the information contained in FSAR Section 14.2.

14.2.5 Post Combined License Activities

The applicant identified the following post-COL activities:

- STD COL 14.2-2-H Startup Administrative Manual
- STD COL 14.2-3-H Test Procedures
- NAPS COL 14.2-4-H Test Program Schedule and Sequence
- NAPS COL 14.2-6-H Site Specific Test Procedures

The NRC staff noted that these items will be resolved in the FSAR or identified as license conditions. In the final SER, the staff will determine the specific commitments to be included as conditions to the license.

It is anticipated that the above items will be addressed as follows:

- The SAM will be developed and made available to the NRC 60 days before the scheduled start of the preoperational test program.

- Approved test procedures for satisfying the ITP will be developed and available to the NRC no later than 60 days before their intended use for preoperational tests and no later than 60 days before scheduled fuel loading for power-ascension tests

- The detailed testing schedule will be developed and made available to the NRC before its actual implementation. The schedule may be updated and continually optimized to reflect actual progress and subsequent revised projections. FSAR Section 13.4 contains the implementation milestones for the ITP.

- Specific testing to be performed and the applicable acceptance criteria for each preoperational and startup test are documented in test procedures to be made available to the NRC approximately 60 days before their intended use for preoperational tests and not less than 60 days before scheduled fuel load for initial startup tests. Site specific preoperational tests are in accordance with the system specifications and associated equipment specifications for equipment in those systems provided by the licensee that are not part of the standard plant described in DCD Section 14.2.8. The tests demonstrate that the installed equipment and systems perform within the limits of these specifications.

14.2.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant has addressed the required information relating to the startup test program, and no outstanding information is expected to be addressed in the COL FSAR related to this section.

The staff is reviewing the information in DCD Section 14.2 on Docket No. 52-010. The staff will document the results of its technical evaluation of the information related to the "Initial Plant Test Program," incorporated by reference in the FSAR, in the staff SER on the DCA for the

ESBWR. The SER on the ESBWR DCD is not yet complete. **This is being tracked as Open Item 1-1.** The staff will update Section 14.2 of this SER to reflect the final disposition of the DCA.

In addition, the staff compared the information within the COL application to the relevant NRC regulations, the acceptance criteria defined in SRP Section 14.2, and the NRC RGs. The staff concludes that the application complies with NRC regulations related to the ITP. The staff concludes that the applicant has provided sufficient information on the ITP to satisfy 10 CFR 52.79.

14.3 Inspections, Tests, Analyses, and Acceptance Criteria

14.3.1 Introduction

Regulations in 10 CFR 52.80, "Contents of Applications; Additional Technical Information," require a COLA to include ITAAC as follows: the proposed inspections, tests, and analyses, including those applicable to emergency planning, that the licensee shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will be operated in conformity with the COL, the provisions of the Act, and the Commission's rules and regulations. Section 14.3 of the ESBWR DCD describes the selection criteria and processes used to develop the ESBWR ITAAC. The ESBWR DCD identified the specific ITAAC as Tier 1 information that is certified by the rulemaking process in 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." For the COL-specific ITAAC, the COL applicant (1) proposed selection methodology and criteria for establishing the ITAAC that are necessary and sufficient to provide that reasonable assurance and (2) proposed a complete set of ITAAC that addresses the entire facility, including ITAAC on emergency planning and physical security design features.

The NAPS-3 COLA addresses ITAAC in two parts of the application: (1) FSAR Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria," contains the selection methodology and criteria for establishing the ITAAC and (2) Part 10 incorporates Tier 1 by reference and contains the COL-specific ITAAC. This section of the FSER contains the staff's evaluation of both the FSAR and Part 10.

14.3.2 Summary of Application

Section 14.3 of the NAPS-3 FSAR, Revision 1, incorporates Section 14.3 of the ESBWR DCD, Revision 5, by reference, with no departures. In addition, the applicant provided the information below in FSAR Section 14.3.

COL Items

- STD COL 14.3-1-A Emergency Planning ITAAC

In Section 14.3.8, "Overall ITAAC Content for Combined License Applications," the applicant stated the following:

> The requirements for inclusion of Emergency Planning ITAAC (EP-ITAAC) in a COLA are provided in 10 CFR 52.80(a). In SRM-SECY-05-0197, the NRC-(sic) approved generic EP-ITAAC for use in COL and ESP applications. This set of

EP-ITAAC was considered in the development of the plant-specific EP-ITAAC, which are tailored to the ESBWR design. The plant-specific EP-ITAAC are included in a separate part of the COLA.

- STD COL 14.3-2-A Site Specific ITAAC

In Section 14.3.9, "Site Specific ITAAC," the applicant stated the following:

> The selection criteria and methodology provided in this section of the referenced DCD were utilized as the site specific selection criteria and methodology for ITAAC. These criteria and methodology were applied to those site specific (SS) systems that were not evaluated in the referenced DCD. The entire set of ITAAC for the facility, including DC-ITAAC, EP-ITAAC, PS-ITAAC, and SS-ITAAC, is included in a separate part of the COLA.

- NAPS COL 14.3A-1-1 Establish a Schedule for Design Acceptance Criteria ITAAC Closure

In Appendix 14.3A, "Design Acceptance Criteria ITAAC Closure Process," Section 14.3A.1, "Design Acceptance Criteria ITAAC Closure Options," the applicant stated, "Unit 3 is scheduled to be the first standard ESBWR plant licensed and will use the standard approach. A Design Acceptance Criteria ITAAC closure schedule will be provided for Unit 3 within one year after ESBWR design certification."

Section 1, "Tier 1, Information," of Part 10, "Tier 1 Information and Inspections, Tests, Analyses, and Acceptance Criteria," of the NAPS-3 COLA, Revision 1, incorporates the ESBWR DCD Tier 1 by reference.

Section 2, "COLA ITAAC," of Part 10 of the NAPS-3 COLA, Revision 1, states that ITAAC for the COLA are provided in tabular form, consistent with the format of RG 1.206, Table C.II.1-1, and are addressed in Sections 2.1, "Design Certification ITAAC"; 2.2, "Emergency Planning ITAAC"; 2.3, "Physical Security ITAAC"; and 2.4, "Site Specific ITAAC." In addition, the applicant stated that completion of the ITAAC is a proposed condition of the COL to be satisfied before fuel load.

Section 2.1, "Design Certification ITAAC," incorporates, by reference, Tier 1 of the ESBWR DCD.

Section 2.2, "Physical Security ITAAC," incorporates, by reference, the physical security ITAAC contained in Tier 1 of the ESBWR DCD.

Section 2.3, "Emergency Planning ITAAC," states that the EP-ITAAC appear in Table 2.3-1, "ITAAC for Emergency Planning."

Section 2.4, "Site Specific ITAAC," states that Sections 2.4.1 through 2.4.13 contain the site specific ITAAC. In addition, the applicant stated that it evaluated the site specific systems against selection criteria in FSAR Section 14.3 and that, if a site specific system described in the FSAR does not meet an ITAAC selection criterion, it provides only the system name and the statement "No entry for this system."

In Section 2.4.1, “ITAAC for Backfill Under Category I Structures,” the applicant stated the following:

> Backfill under Category I structures is installed up from competent bearing layer to meet average and minimum soil density requirements specified in Table 2.4.1-1.
>
> Table 2.4.1-2 provides a definition of the inspections, tests and/or analyses, together with associated acceptance criteria, for backfill under Category I structures ITAAC.

In Section 2.4.2, “ITAAC for Plant Service Water System” (portion outside scope of certified design), the applicant stated that 1) the Plant Service Water System (PSWS) is the heat sink for the Reactor Component Cooling Water System; 2) the PSWS does not perform any safety-related function; 3) there is no interface with any safety-related component; 4) the PSWS cooling towers and basins are not within the scope of the certified design; 5) a specific design for this portion of the PSWS is described in FSAR Section 9.2.1; and, 6) interface requirements are necessary for supporting the post-72-hour cooling function of the PSWS. In addition, the applicant stated the following:

> The plant-specific portion of the PSWS shall meet the interface requirement of removing 2.02×10^7 MJ (1.92×10^{10} BTU) over a period of 7 days without active makeup. Table 2.4.2-1 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria for the PSWS.

In Section 2.4.3, “Circulating Water System” (portion outside the scope of the certified design), the applicant stated, “No entry for this system.”

In Section 2.4.4, “Station Water System” (including intake structure and servicing equipment), the applicant stated, “No entry for this system.”

In Section 2.4.5, “Yard Fire Protection System” (portions outside scope of certified design), the applicant stated, “No entry for this system.”

In Section 2.4.6, “Potable & Sanitary Water Systems,” the applicant stated, “No entry for this system.”

In Section 2.4.7, “Offsite Power,” the applicant stated, “No entry for this system.”

In Section 2.4.8, “Communications Systems (Emergency Notification System),” the applicant stated that Table 2.3-1, “ITAAC for Emergency Planning,” addresses this system.

In Section 2.4.9, “Makeup Water System,” the applicant stated, “No entry for this system.”

In Section 2.4.10, “Mobile Liquid Radwaste System” (portion outside scope of certified design), the applicant stated, “No entry for this system.”

In Section 2.4.11, “Mobile Solid Radwaste System” (portion outside scope of certified design), the applicant stated, “No entry for this system.”

In Section 2.4.12, “Hydrogen Water Chemistry System,” the applicant stated, “No entry for this system.”

In Section 2.4.13, “Meteorological Monitoring System,” the applicant stated, “No entry for this system.”

14.3.3 Regulatory Basis

The FSER related to the DCD describes the regulatory basis for the information incorporated by reference.

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’s FSAR to demonstrate that the design meets the interface requirements established under 10 CFR 52.47, “Contents of Applications; Technical Information.”

- 10 CFR 52.80(a) requires that a COLA contain the proposed inspections, tests, and analyses, including those applicable to emergency planning, that the licensee shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and acceptance criteria met, the facility has been constructed and will operate in conformity with the COL, the provisions of the Act, and the Commission’s rules and regulations.

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

14.3.4 Technical Evaluation

The NRC staff reviewed FSAR Section 14.3 and Part 10 of the NAPS-3 COLA and checked the referenced DCD to ensure that the combination of the DCD and the information in the COLA represent the complete scope of information relating to this review topic.[1] The staff’s review confirmed that the information contained in the application and incorporated by reference addresses the required information related to Section 14.3, and Part 10. The staff is reviewing the ESBWR DCD on Docket No. 52-010. The staff will document its technical evaluation of the information incorporated by reference related to this section in the staff SER on the DCA for the ESBWR.

The staff reviewed the information below contained in the FSAR.

COL Items

- STD COL 14.3-1-A Emergency Planning ITAAC

The staff found that Part 10, Section 2.3, “Emergency Planning ITAAC,” Table 2.3-1, “ITAAC for Emergency Planning,” contains the plant-specific EP-ITAAC. Section 13.3 of this SER provides the staff evaluation of the EP-ITAAC.

- STD COL 14.3-2-A Site Specific ITAAC

In Section 14.3.9, the applicant stated that the site specific selection criteria and methodology used for the NAPS-3 ITAAC were those provided in the DCD and that it had applied them to those site specific systems that were not evaluated in the DCD.

The staff finds it acceptable that the site specific selection criteria and methodology for the NAPS-3 ITAAC were those the COL applicant used in the DCD and that they were applied to those site specific systems that were not evaluated in the DCD. However, the staff is reviewing Section 14.3 of the ESBWR DCD on Docket No. 52-010, and the staff will document its technical evaluation of the information incorporated by reference related to this section in the staff SER on the DCA for the ESBWR. The SER on the ESBWR is not yet complete. **This is being tracked as Open Item 1-1.** The staff will update Section 14.3 of this SER to reflect the final disposition of the DCA.

- NAPS COL 14.3A-1-1 Establish a Schedule for Design Acceptance Criteria ITAAC Closure

In Appendix 14.3A, the applicant stated, "A Design Acceptance Criteria ITAAC closure schedule will be provided for Unit 3 within one year after ESBWR design certification."

The staff review found that, for selected design acceptance criteria (DAC), a closure schedule provided within 1 year would not support the NRC's need to project staff resource and budget requirements to verify DAC/ITAAC closure. In an ESBWR DCWG public meeting on September 4, 2008, the staff expressed this concern to industry and stated that there were unique needs associated with closing out DAC for (1) piping design, (2) human factors engineering, and (3) digital instrumentation and controls. At subsequent ESBWR DCWG public meetings, the staff and industry discussed the resolution of this DAC closure schedule issue. At the public meeting on April 1, 2009, the industry proposed resolutions for the piping design and human factors engineering that the staff determined to be acceptable. For piping DAC, the NRC staff will be notified at least 6 months before (1) scheduled completion of all ASME Code design reports for risk-significant piping packages, and (2) scheduled completion of all the pipe-break hazard analyses. For human factors engineering DAC, the NRC will be notified at least 6 months before the scheduled completion of each results summary report. At the public meeting on May 14, 2009, the industry proposed a resolution for digital instrumentation and controls that the staff determined to be acceptable. For instrumentation and controls DAC, the NRC staff will be notified at least 6 months before the scheduled completion of each baseline review report and software plan designated as DAC. The COL applicant agreed to incorporate the acceptable resolutions for the DAC closure schedule to address COL 14.3A-1-1 in the next revision to the NAPS-3 COLA. This issue is being tracked as **Confirmatory Item 14.3A-1**.

The staff reviewed the following information contained in Part 10 of the COLA:

- Section 1, "Tier 1 Information"

In Section 1, the applicant stated that DCD Tier 1 is incorporated by reference.

The staff is reviewing Tier 1 of the ESBWR DCD on Docket No. 52-010, and the staff will document its technical evaluation of this information in the staff SER on the DCA for the ESBWR. The SER on the ESBWR is not yet complete. **This is being tracked as Open Item 1-1.**

- Section 2, “COLA ITAAC”
- Section 2.1, “Design Certification ITAAC”

In Section 2.1, the applicant stated that DCD Tier 1, which is incorporated by reference, contains the design certification ITAAC.

The staff is reviewing Tier 1 of the ESBWR DCD on Docket No. 52-010, and the staff will document its technical evaluation of this information in the staff SER on the DCA for the ESBWR. The SER on the ESBWR is not yet complete. **This is being tracked as Open Item 1-1.**

- Section 2.2, “Physical Security ITAAC”

Section 13.6 of this SER contains the staff’s evaluation of the physical security ITAAC.

- Section 2.3, “Emergency Planning ITAAC”

Section 13.3 of this SER contains the staff’s evaluation of the EP-ITAAC.

- Section 2.4, Site Specific ITAAC

In Section 2.4, the applicant stated that, if a site specific system described in the FSAR does not meet an ITAAC selection criterion, it will provide only the system name and the statement “No entry for this system.”

The staff review found that the COL applicant applied the selection criteria and methodology provided in the ESBWR DCD as the site specific selection criteria and methodology for ITAAC. The COL applicant included systems that have no safety-related, risk-significant, or regulatory-compliance function and, by the statement “no entry for this system,” identified them as not needing ITAAC. The staff reviewed these “no entry” systems, in accordance with the guidance contained in SRP Section 14.3. The staff finds the inclusion of these “no entry” systems, without any associated ITAAC, to be in conformance with SRP Section 14.3 and, therefore, acceptable. The “no entry” systems are addressed individually in the paragraphs below.

- Section 2.4.1, “ITAAC for Backfill Under Category I Structures”

Section 2.5.4 of this SER contains the staff’s evaluation of ITAAC for backfill.

- Section 2.4.2, “ITAAC for Plant Service Water System”

Section 9.2.1 of this SER contains the staff’s evaluation of PSWS ITAAC.

- Section 2.4.3, “Circulating Water System” (portion outside scope of certified design)

Section 10.4.5 of this SER contains the staff’s evaluation of the circulating water system design. The staff finds “No entry for this system” to be acceptable.

- Section 2.4.4, “Station Water System” (including intake structure and servicing equipment)

Section 9.2.10 of this SER contains the staff’s evaluation of the station water system design. The staff finds “No entry for this system” to be acceptable.

- Section 2.4.5, “Yard Fire Protection System” (portions outside scope of certified design)

Section 9.5.1 of this SER includes the staff’s evaluation of the design of the yard fire protection system. The staff finds “No entry for this system” to be acceptable.

- Section 2.4.6, “Potable & Sanitary Water Systems”

Section 9.2.4 of this SER contains the staff’s evaluation of the design of the potable and sanitary water systems. The staff finds “No entry for this system” to be acceptable.

- Section 2.4.7, “Offsite Power”

Section 8.2 of this SER contains the staff’s evaluation of the offsite power design. The staff finds “No entry for this system” to be unacceptable.

The staff notes that Section 4, “Interface Material,” of DCD Tier 1, Revision 5, states that an applicant for a COL that references the ESBWR certified design must provide design features or characteristics that comply with the interface requirements for the plant design and ITAAC for the site specific portion of the facility design. However, no interface requirements were identified for the offsite power system in the certified design. In DCD **RAI 14.3-394** and **RAI 14.3-394 S1**, the NRC staff asked GEH to revise Section 4 of the ESBWR DCD Tier 1 to include interface requirements for the offsite power system to demonstrate the capacity and capability of the offsite power system. In response to **RAI 14.3-394 S1**, on December 9, 2008, GEH stated that the interface requirements are to be included in the next revision of the DCD. **This is being tracked as Open Item 1-1.**

Under 10 CFR 52.79(d)(2) and 10 CFR 52.80(a), the COL applicant is required to provide site specific ITAAC related to interface requirements established for the design. Also in response to DCD **RAI 14.3-394 S1**, GEH stated that a COL applicant referencing the ESBWR certified design shall develop an ITAAC to verify that the as-built offsite portion of the preferred power supply (PPS) from the transmission network to the interface with the onsite portions of the PPS will satisfy the applicable provisions of General Design Criterion (GDC) 17, “Electric Power Systems,” in Appendix A, “General Design Criteria for Nuclear Power Plants,” to 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities.”

The ITAAC shall verify the following statements:

a. At least two independent circuits supply electric power from the transmission network to the interface with the onsite portions of the PPS.

b. Each offsite circuit interfacing with the onsite portions of the PPS is adequately rated to supply the load requirements during design-basis operating modes.

c. During steady-state operation, the offsite portion of the PPS is capable of supplying

voltage at the interface with the onsite portions of the PPS that will support operation of safety-related loads during design-basis operating modes.

d. During steady state operation, the offsite portion of the PPS is capable of supplying required frequency at the interface with the onsite portions of the PPS that will support operation of safety-related loads during design-basis operating modes.

e. The fault-current contribution of the offsite portion of the PPS is compatible with the interrupting capability of the onsite fault-current interrupting devices.

To facilitate inclusion of this information in the NAPS-3 COLA, the staff asked, in **RAI 14.3.6-1**, that the COL applicant provide an ITAAC to verify the above-listed items, so that the as-built offsite portion of the PPS from the transmission network that interfaces with the onsite portions of the PPS will satisfy the applicable provisions of GDC 17. On March 18, 2009, the applicant proposed COLA ITAAC 2.4.7, "ITAAC for offsite power systems." The applicant further stated that, following formal incorporation of the interface requirements for the offsite power into the ESBWR DCD, it will revise Part 10 of the COLA to incorporate the corresponding site specific ITAAC. On the basis of its review, the staff finds that the applicant adequately addressed the site specific ITAAC for the offsite power system, which is consistent with the guidance in RG 1.206. The offsite power system ITAAC is being tracked as **Confirmatory Item 14.03.06-1**.

In addition, the staff compared the interfaces for standard design within the NAPS-3 COLA to the relevant NRC regulations, guidance in SRP Section 14.3, and other NRC regulatory guidance. The staff finds that the ITAAC provided by the COL applicant meets the interface requirements specified in the response to DCD **RAI 14.3-394 S1** and to be incorporated in the next revision of the ESBWR DCD. Therefore, the staff concludes that the COL applicant meets the requirements of 10 CFR 52.79(d)(2) and 10 CFR 52.80(a) and the guidance in SRP Section 14.3 and RG 1.206 pertaining to offsite power, pending satisfactory resolution of the confirmatory item.

- Section 2.4.8, "Communications Systems (Emergency Notification System)"

The staff's evaluation of the ITAAC for communications systems (emergency notification system) is included within the evaluation of the EP-ITAAC and is addressed in Section 13.3 of this SER.

- Section 2.4.9, "Makeup Water System"

Section 9.2.3 of this SER includes the staff's evaluation of the design of the makeup water system. The staff finds "No entry for this system" to be acceptable.

- Section 2.4.10, "Mobile Liquid Radwaste System" (portion outside scope of certified design)

In Revision 0 of the FSAR, the applicant adopted the conceptual design information described in ESBWR DCD Tier 2, Section 11.2, Revision 4, as the plant-specific design. This design approach has since been revised in ESBWR DCD, Section 11.2, Revision 5, and ESBWR DCD Tier 1, Section 2.10.1, by including specific design details for liquid waste management systems (LWMS) for permanently installed subsystems not previously described in Revision 4 of the DCD. The staff's review of Section 11.2.1 in the FSAR, Revision 1, indicates that it no longer refers to conceptual design information for the LWMS. However, the heading of Part 10,

Section 2.4.10, still refers to a mobile liquid radwaste system with a design that is outside the scope of the certified design. **RAI 14.03.07-1** requested an update of the designation of the LWMS in Part 10, Section 2.4.10, to make it consistent with the ESBWR DCD. In its response, the applicant proposed to delete Section 2.4.10 of Part 10 in a subsequent revision of the COLA. The staff found the response to be acceptable, and this RAI is tracked as **Confirmatory Item 14.03.07-1**.

- Section 2.4.11, "Mobile Solid Radwaste System" (portion outside scope of certified design)

In Revision 0 of the FSAR, the applicant adopted the conceptual design information described in ESBWR DCD Tier 2, Section 11.4, Revision 4, as the plant-specific design. This design approach has since been revised in ESBWR DCD, Section 11.4, Revision 5, and ESBWR DCD Tier 1, Section 2.10.2, by including specific design details for the solid waste management system (SWMS) for permanently installed subsystems not previously described in Revision 4 of the DCD. The staff's review of Section 11.4.1 of the FSAR, Revision 1, indicates that it no longer refers to conceptual design information for the SWMS. However, the heading of Part 10, Section 2.4.11, still refers to a mobile solid radwaste system with a design that is outside the scope of the certified design. In **RAI 14.03.07-2**, the staff requested an update of the designation of the SWMS in Part 10, Section 2.4.11, to be consistent with the ESBWR DCD. In its response, the applicant proposed to delete Section 2.4.11 from Part 10 in a subsequent revision of the COLA. The staff found the response to be acceptable, and this RAI is tracked as **Confirmatory Item 14.03.07-2**.

- Section 2.4.12, "Hydrogen Water Chemistry System"

Section 9.3.9 of this SER contains the staff's evaluation of the design of the hydrogen water chemistry system. The staff finds "No entry for this system" to be acceptable.

- Section 2.4.13, "Meteorological Monitoring System"

Section 2.3 of this SER includes the staff's evaluation of the design of the meteorological monitoring system. The staff finds "No entry for this system" to be acceptable.

14.3.5 Post-Combined License Activities

In Section 2 of Part 10 of the COLA, the applicant stated that completion of the COLA ITAAC is a proposed condition of the license to be satisfied before fuel load.

Before finalizing the SER, the staff will determine the specific set of commitments to be included as conditions to the license.

14.3.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant addressed the required information relating to ITAAC, and no additional information is needed.

The staff is reviewing the information in DCD Section 14.3 and Tier 1 on Docket No. 52-010. The staff will document the results of its technical evaluation of information related to ITAAC, incorporated by reference in the NAPS-3 COL FSAR, in the SER on the DCA for the ESBWR.

The SER on the ESBWR is not yet complete. **This is being tracked as Open Item 1-1.** The staff will update Section 14.3 of this SER to reflect the final disposition of the DCA.

Based on the staff's review, in accordance with SRP Section 14.3, of the applicant's implementation of the selection methodology and criteria for the development of ITAAC, which was incorporated by reference from Section 14.3 of the ESBWR DCD, the staff concludes that, pending resolution of the confirmatory items, the top-level design features and performance characteristics of the SSCs are appropriately included in the proposed ITAAC.

Pending resolution of the identified confirmatory items, the staff concludes that the design features and performance characteristics of the SSCs can be verified adequately by the proposed ITAAC; therefore, the staff concludes that the ITAAC proposed by the COL applicant for the facility meet the requirements of 10 CFR 52.79(d)(2) and 10 CFR 52.80(a).