14.0 INITIAL TEST PROGRAM

This chapter of the combined license (COL) Final Safety Analysis Report (FSAR) addresses information concerning the initial test program (ITP) for structures, systems, and components (SSCs) and design features for both the nuclear portion of the North Anna 3 Power Station, 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. The COL applicant thus describes the scope of the ITP, as well as the 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, "Combined License Applications for Nuclear Power Plants (LWR Edition)," Regulatory Position C.I.14, "Verification Programs," dated June 2007, the COL applicant describes the technical aspects of the ITP in sufficient detail to show that (1) the test program adequately verifies the functional requirements of plant SSCs, and (2) 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 be accomplished with 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 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 associated acceptance criteria met, the facility will have been constructed and will operate in conformity with (1) the COL; (2) the Atomic Energy Act of 1954, as amended; and (3) the U.S. Nuclear Regulatory Commission (NRC) regulations.

14.1 Initial Test Program for Preliminary Safety Analysis Reports

Section 14.1 of the North Anna 3 COLA FSAR, Revision 8, incorporates by reference, with no departures or supplements, Section 14.1, "Initial Test Program For Preliminary Safety Analysis Reports," of Revision 10 of the certified Economic Simplified Boiling-Water Reactor (ESBWR) Design Certification Document (DCD), referenced in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," Appendix E. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC 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 E, Section VI.B.1, all nuclear safety issues have been resolved relating to ITP for Preliminary Safety Analysis Reports that the applicant has incorporated by reference.

[1] See *"Finality of Referenced NRC Approvals"* in SER Section 1.2.2 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 (DC).

14.2 Initial Plant Test Program for Final Safety Analysis Reports

14.2.1 Introduction

This FSAR section presents an overview of the North Anna 3 ITP.

14.2.2 Summary of Application

Section 14.2, "Initial Plant Test Program for Final Safety Analysis Reports," of the North Anna 3 COL FSAR, Revision 8, incorporates by reference Section 14.2, of the ESBWR DCD, Revision 10.

In addition, the North Anna 3 FSAR Section 14.2, provides the following:

COL Items

- STD COL 14.2-1-A Description – Initial Test Program Administration

The applicant developed and provided a description of the ITP administration in Appendix 14AA of the North Anna 3 COL FSAR, Revision 8.

- NAPS COL 14.2-1-A Description – Initial Test Program Administration

The applicant provided the site-specific administrative controls to be included in the Startup Administrative Manual (SAM) related to the initial test program as Appendix 14AA, "Description of Initial Test Program Administration," to address STD COL 14.2-1-A.

- STD COL 14.2-2-A Startup Administrative Manual

The applicant provided a milestone for completing the Startup Administration Manual (SAM).

- CWR COL 14.2-3-A Test Procedures

In the North Anna 3 COL FSAR, the applicant addressed the STD COL-14.2-3-A as CWR COL 14.2-3-A indicating the information is consistent with the reference COL. The applicant provided milestones for making approved test procedures satisfying the requirements of the ITP. The applicant addressed this COL information as information consistent with the Reference COL applicant, Fermi Unit 3 Station (COL 14.2-3-A), in its COL FSAR, Revision 8 for North Anna 3.

- STD COL 14.2-4-A Test Program Schedule and Sequence

The applicant provided a license condition to develop and make detailed testing schedules available for NRC review prior to actual implementation. The implementation milestones for the ITP are provided in the North Anna 3 COL FSAR, Revision 8, Section 13.4, "Operational Program Implementation."

- NAPS COL 14.2-5-A Site Specific Tests

The applicant described the site specific preoperational and initial startup tests not addressed in DCD Section 14.2.8.

- NAPS COL 14.2-6-A Site Specific Test Procedures

The applicant specified that site specific testing will be performed and acceptance criteria for each preoperational and startup test are documented in test procedures available 60 days prior to their intended use.

Supplemental Information

- STD SUP 14.2-2 Test Records

The applicant specified that startup test reports are prepared in accordance with RG 1.16, "Reporting of Operating Information – Appendix A Technical Specifications".

- STD SUP 14.2-4 AC Power Distribution System Preoperational Test General Test Methods and Acceptance Criteria

The applicant specified proper operation of the automatic transfer capability of the normal preferred power source to the alternate preferred power source.

- NAPS SUP 14.2-1 Organization and Staffing

The applicant provided additional information regarding responsibilities, qualifications, and organization for the pre-operational and startup testing program.

- NAPS SUP 14.2-2 Site-Specific Performance Test

The applicant specified that the objective of this test is to demonstrate acceptable performance of the waste heat rejection portion of the circulating water system (CWS or CIRC); (i.e., the dry cooling array and the hybrid cooling tower and basin).

- NAPS SUP 14.2-3 Site-Specific Pre-Operational Tests

The applicant specified site-specific pre-operational tests for the Station Water System (SWS) and the Cooling Tower.

- NAPS SUP 14.2-4 Plant Service Water System (PSWS) Preoperational Test Purpose

The applicant specified the verification of proper operation of the PSWS.

- NAPS SUP 14.2-5 Plant Service Water System Performance Test Purpose

The applicant specified the verification of performance of the PSWS under expected reactor power operation load conditions.

14.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG–1966, "Final Safety Evaluation Report Related to the Certification of the Economic Simplified Boiling-Water Reactor."

The regulatory basis for acceptance of supplemental information related to operational programs is addressed in the following documents:

- Section 14.2 of NUREG–0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)," the Standard Review Plan (SRP);
- Regulatory Position C.I.14, of RG 1.206; and
- RG 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants."

The regulatory basis for applicant development of administrative controls that will be used to govern the ITP is addressed in SRP Sections 14.2.3.B.ii and iii, and in RG 1.206, Regulatory Position C.I.14. The applicable regulatory requirements for the information being reviewed in this section are 10 CFR 52.79(a)(28) and Criterion XI of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

14.2.4 Technical Evaluation

As documented in NUREG–1966, the NRC staff reviewed and approved Section 14.2 of the certified ESBWR DCD. The staff reviewed Section 14.2, of the North Anna 3 COL FSAR, Revision 8, and checked the referenced ESBWR DCD to ensure that the combination of the information in the North Anna 3 COL FSAR, Revision 8 and the information in the ESBWR DCD, appropriately 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 the information incorporated by reference addresses the relevant information related to this section.

The North Anna 3 ITP includes a test program that will verify the functional requirements of plant SSCs. The ITP also includes the applicant's plans for the sequence of testing. The staff noted that the sequence of testing is organized in such a manner that the safety of the plant does not depend on any untested SSCs. In addition, the staff noted the following:

- The ITP is to be conducted with an adequate number of qualified personnel.
- Appropriate administrative controls have been established to govern the ITP.

- The test program will be used to train and familiarize the plant's operating and technical staff with general operation of the facility.

- The adequacy of plant operating and emergency procedures will be verified, to the extent practicable, during the ITP performance period.

The NRC staff's technical evaluation of the FSAR sections affected by COL Items STD COL 14.2-1-A, NAPS COL 14.2-1-A, STD COL 14.2-2-A, STD COL 14.2-3-A, STD COL 14.2-4-A, NAPS COL 14.2-5-A, NAPS COL 14.2-6-A and supplemental information items 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, NAPS SUP 14.2-4, and NAPS SUP 14.2-5 is discussed in Sections 14.2.4.1 through 14.2.4.8. The NRC staff's evaluation of the NAPS-3 COL FSAR includes changes from Revision 2 to Revision 8.

14.2.4.1 Organization and Staffing

The staff reviewed the information in the NAPS-3 COL FSAR, Revision 8, as follows:

Supplemental Information

- NAPS SUP 14.2-1

In FSAR Section 14.2.1.4 "Organization and Staffing," the applicant added the following:

> Section 13.1 provides additional information regarding responsibilities, qualifications, and organization for implementing the preoperational and startup testing program.

The staff found the administrative addition of a pointer to Section 13.1 of the FSAR, regarding organization and staffing, acceptable.

14.2.4.2 Startup Administrative Manual

The staff reviewed the information in the NAPS-3 COL FSAR, Revision 8, as follows:

COL Items

- STD COL 14.2-1-A Description – Initial Test Program Administration

The applicant developed and provided a description of the ITP administration in Appendix 14AA of the North Anna 3 FSAR, Revision 8.

Section 14.2.2.1 "Startup Administrative Manual," of the DCD states in part that:

> A description of the initial test program administration is developed and made available to the NRC by the COL Applicant. This includes a discussion and description of the process and organizational controls and requirements that are included in the Startup Administrative Manual. See Section 14.2.10, COL Information Item 14.2-1-A.

The staff reviewed STD COL 14.2-1-A related to COL Information Item 14.2-1 and noted that in Revision 0 of North Anna 3 COL FSAR, the applicant did not include such administrative controls.

At public meetings on May 13 and May 22, 2008, the applicant and other design-centered working group (DCWG) representatives proposed a test program administrative document (proposed FSAR Appendix 14AA, "Description of Initial Test Program Administration," dated May 22, 2008). On June 23, 2008, the staff issued a request for additional information (RAI) 14.02-3 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML082060489), requesting the applicant to formally submit this DCWG Appendix on the docket. In the response letter dated August 7, 2008, to RAI 14.02-3 (ADAMS Accession No. ML082240413), the applicant stated that it will include the referenced test program administrative document as Appendix 14AA of the FSAR in the next revision of the North Anna 3 COL FSAR. The NRC staff subsequently reviewed North Anna 3 COL FSAR, Revision 8, and verified that the applicant has incorporated Appendix 14AA in Chapter 14. The staff confirmed that it provides an adequate discussion and description of the process and organizational controls and requirements that are to be included in the SAM consistent with the guidance provided in SRP Section 14.2. Therefore, RAI 14.2-03 is resolved and closed.

In North Anna 3 COL FSAR, Appendix 14AA, the applicant replaced STD COL 14.2-1-A as North Anna COL 14.2-1-A, indicating that the organization information is site-specific. The applicant revised Section 14AA.2, "Organization and Staffing," to include site-specific organizational description of the principal management positions (including any augmenting organizations) responsible for planning, executing, and documenting preoperational and startup testing activities, as well as revised Section 14AA.2.2, "Responsibilities," to include responsibilities and interfaces, and the degree of participation of each identified organizational unit that will be responsible for the administration and technical direction of the ITP in order to be aligned with that of Engineering, Procurement Construction contract and Chapter 13.

In addition, the applicant revised Table 13.1-201, "Generic Position/Site Specific Position Cross Reference," of Section 13.1, "Organizational Structure of Applicant," referenced in FSAR Section 14AA.2, to include the qualification and experience requirements for the preoperational and startup test engineer positions to meet the qualification requirements of inspection and test personnel defined in American Society of Mechanical Engineers (ASME) NQA-1-1994," Quality Assurance Requirements for Nuclear Facility Applications," and also added the preoperational and startup test managers positions including their associated education and experience. Table 13.1-201 was updated to align the startup and preoperational test personnel information consistent with North Anna 3 COL FSAR, Appendix 17AA "North Anna Power Station Unit 3 Quality Assurance Program Description," and Dominion's current organization and resource estimates.

The staff reviewed the changes made in Table 13.1-201 and FSAR Section 14AA.2 of North Anna 3 COL FSAR and determined that the administrative control changes adequately define the organizations that will carry out the ITP; describe the authorities, responsibilities, and interfaces; and delineate training and qualification requirements for organizations participating in the implementation of the ITP, consistent with the guidance in RG 1.68. Additionally, the staff found that the applicant's commitment to RG 1.8, Revision 3, "Qualification and Training of Personnel for Nuclear Power Plants," which provides training and qualification guidance for nuclear power plant personnel, including personnel participating in ITP activities, found in

Table 1.9-202 of the North Anna 3 COL, is adequate.

The staff reviewed the proposed North Anna 3 COL FSAR, Appendix 14AA and noted that in Section 14AA.3.4, "Test Procedure Changes," that the COL applicant provided description of changes to test procedures; however, Section 14AA.3.4 did not include a description of the 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)).

On July 28, 2008, the staff initiated RAI 14.02-7 (ADAMS Accession No. ML082110133), requesting the COL applicant to include in Section 14AA.3.4, "Test Procedure Changes," the requirements to evaluate and obtain a license amendment, if it is revealed 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).

In a response letter dated September 11, 2008 to RAI 14.02-7 (ADAMS Accession No. ML082610417), the applicant proposed to revise FSAR Section 14AA.3.4, "Test Procedure Changes," with the following additional information:

> Review and approval requirements for procedure changes that do not change the intent are established in administrative procedures in the SAM.
>
> 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. Timely notification of the NRC is made when procedures are changed that have been sent to the NRC.

The staff found that this revision to FSAR Section 14AA.3.4 is acceptable, and therefore, RAI 14.02-7 is resolved and closed.

The staff reviewed the North Anna 3 COL FSAR, Appendix 14AA and determined that the applicant has provided an adequate discussion and description of the process and organizational controls and requirements that are to be included in the SAM. The staff also determined that the applicant provided an adequate description of the change control process similar to 10 CFR 50.59 for evaluating major test procedure changes for test abstracts in the ITP.

The staff evaluated STD COL 14.2-1-A and North Anna 3 COL 14.2-1-A according to relevant NRC regulations and acceptance criteria defined in SRP Section 14.2 along with the guidance in RGs 1.68 and 1.206, Section C.I.14, and finds that the applicant has satisfactorily addressed the ESBWR DCD COL Item 14.2-1-A.

- STD COL 14.2-2-A Startup Administrative Manual

Section 14.2.2.1 "Startup Administrative Manual," of the DCD states in part that:

> The COL Applicant will provide a milestone for completing the Startup Administrative Manual and making it available for Nuclear Regulatory Commission (NRC) inspection (COL 14.2-2-A). [Note: The official designation of this manual may differ for the plant owner/operator referencing the ESBWR design certification Startup Administration Manual (SAM); [the term SAM is used throughout this discussion for illustrative purposes only.]

The applicant replaced the above section in Section 14.2.2.1 of the ESBWR DCD with a milestone for developing and providing the SAM no later than 60 days prior to initial use for preoperational test and scheduled fuel loading for initial startup tests. In Section 14.2.2.1 of the FSAR, the applicant stated that:

> The Startup Administration Manual will be developed and made available for review 60 days prior to scheduled start of the preoperational test program.

In addition, the applicant identified a license condition for STD COL 14.2-2-A. The applicant addressed the license condition for STD COL 14.2-2-A in Part 10: "Tier 1/ITAAC/Proposed License Conditions," Revision 7, dated June 2014, Section 3.2.1," Start-up Administrative Manual," of NAPS-3 COL application, Revision 8, and is also addressed below in Post Combined License Activities. The licensee will track the development of the SAM in order to address this COL information item in accordance with applicable guidance.

14.2.4.3 Test Procedures

The staff reviewed the information in the NAPS-3 COL FSAR, Revision 8, as follows:

COL Item

- STD COL 14.2-3-A Test Procedures

The staff reviewed STD COL 14.2.3-A related to COL Information Item 14.2.3.

Section 14.2.2.2 "Test Procedures," of the DCD states in part that:

> The COL Applicant will provide milestones for making available to the NRC approved test procedures satisfying the requirements for the ITP (COL 14.2-3-A).

The applicant replaced the above sentence of the ESBWR DCD with a milestone for developing and providing approved test procedures no later than 60 days prior to the intended use for preoperational test and scheduled fuel loading for initial startup tests. In Section 14.2.2.2 of the FSAR, the applicant stated that:

> Approved test procedures for satisfying this section will be developed and available for review no later than 60 days prior to their intended use for preoperational tests and scheduled fuel loading for initial startup tests.

In the North Anna 3 COL FSAR, the applicant addressed the STD COL-14.2-3-A as CWR COL 14.2-3-A indicating the information is consistent with the reference COL.

In addition, the applicant identified a license condition for STD COL 14.2-3-A. The applicant addressed the license condition for STD COL 14.2-3-A in Part 10: "Tier 1/ITAAC/Proposed License Conditions," Revision 7, dated June 2014, Section 3.2.2, "Preoperational and Startup Test Procedures," of the NAPS-3 COL application Revision 8, and is also listed below in Post Combined License Activities. The licensee will track the development of test procedures in order to address this COL information item in accordance with applicable guidance.

The staff evaluated STD COL 14.2-3-A according to the relevant NRC regulations and acceptance criteria defined in SRP Section 14.2 along with the guidance in RGs 1.68 and 1.206, Section C.I.14, and finds that the applicant has satisfactorily addressed DCD COL Item 14.2-3-A.

14.2.4.4 Test Records

The staff reviewed the information in the North Anna 3 COL FSAR, Revision 8, as follows:

Supplemental Information

- STD SUP 14.2-2 Test Records

In FSAR Section 14.2.2.5, "Test Records," the applicant added the following:

> Startup test reports are prepared in accordance with RG 1.16.

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. RG 1.16, addresses startup test reports.

Upon review of Revision 0 of North Anna 3 COL FSAR, Section 14.2.2.5, the NRC staff determined that Section 14.2.2.5 did 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. Therefore on June 28, 2008, the staff issued RAI 14.02-4 (ADAMS Accession No. ML081750645), and asked the applicant to revise FSAR Section 14.2.2.5 to include such provisions.

In response letter dated August 7, 2008 to RAI 14.02-04 (ADAMS Accession No. ML082240413), the applicant stated, in part, that it will include the description of the ITP administration as Appendix 14AA of the FSAR. 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 14.2-04, the applicant proposed to revise FSAR Chapter 14 to incorporate Appendix 14AA.

In North Anna 3 COL FSAR, Appendix 14AA, Section 14AA.4.2 the applicant included the statement that General Electric-Hitachi Nuclear America, LLC, 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.

The staff reviewed North Anna 3 COL FSAR, Appendix 14AA, Revision 8, and determined that the applicant's inclusion of design organizations participation in the resolution of design-related problems resulting in or contributing to, a failure to meet test acceptance criteria has addressed the responsibility for design organization participation in test reviews. The staff found that this response is acceptable, and therefore RAI 14.2-04 is resolved and closed.

The staff determined that the COL applicant's supplemental information STD SUP 14.2-2 regarding the development of startup test reports is acceptable because it meets the regulatory basis in SRP Section 14.2, Item 3.f.v, "Review, Evaluation, and Approval of Test Results."

14.2.4.5 Test Program Schedule and Sequence

The staff reviewed the information in the North Anna 3 COL FSAR, Revision 8, as follows:

COL Item

- STD COL 14.2-4-A Test Program Schedule and Sequence

The applicant provided a license condition to develop and make detailed testing schedules available for NRC review prior to actual implementation. The implementation milestones for the ITP are provided in Section 13.4 of the North Anna 3 COL FSAR, Revision 8.

Section 14.2.7 "Test Program Schedule and Sequence," of the DCD states in part that:

> The COL applicant will provide a milestone for completing the detailed testing schedule and making it available to the NRC (COL 14.2-4-A).

In FSAR Section 14.2.7, "Test Program Schedule and Sequence," the applicant replaced the last paragraph with a description stating that a detailed testing schedule will be developed and made available for review prior to actual implementation. The applicant added that the schedule may be updated and continually optimized to reflect actual progress and subsequently revised projections and that the implementation milestones for the ITP are provided in Section 13.4.

In Table 13.4-204, "Operational Programs Required by NRC Regulations," of Section 13.4 in North Anna 3 COL FSAR, the ITP schedule is identified as a license condition.

The applicant identified a license condition for STD COL 14.2-4-A. The applicant addressed the license condition for STD COL 14.2-4-A, in Part 10: "Tier 1/ITAAC/Proposed License Conditions," Revision 7, dated June 2014, Section 3.6, "Operational Program Readiness," of the North Anna 3 COL application Revision 8, and is also listed below in Post Combined License Activities. The licensee will track the development of the detailed testing schedule in order to address this COL information item in accordance with applicable guidance.

The staff evaluated STD COL 14.2-4-A according to the relevant NRC regulations and acceptance criteria defined in SRP Section 14.2 along with the guidance in RGs 1.68 and 1.206, Section C.I.14, and finds that the applicant has satisfactorily addressed DCD COL Item 14.2-4-A.

14.2.4.6 AC Power Distribution System Preoperational Test General Test Methods and Acceptance Criteria

The staff reviewed the information in the North Anna 3 COL FSAR, Revision 8, as follows:

Supplemental Information

- STD SUP 14.2-4 AC Power Distribution System Preoperational Test General Test Methods and Acceptance Criteria

In FSAR Section 14.2.8.1.36, "AC Power Distribution System Preoperational Test General Test Methods and Acceptance Criteria," the applicant added the following:

Proper operation of the automatic transfer capability of the normal preferred power source to the alternate preferred power source.

The staff noted that the test requirement is consistent with the ESBWR DCD. The COL applicant also added STD SUP 14.2-4 to track supplemental preoperational test information in FSAR Section 14.2.8.1.36. The staff determined that the supplemental information item adequately addressed the need to verify the proper operation of the automatic transfer capability of the normal preferred power source to the alternate preferred power source. Therefore, the staff determined that STD SUP 14.2-4, which added the site-specific test acceptance criteria, is acceptable.

14.2.4.7 Plant Service Water System Preoperational Test and Purpose

The staff reviewed the information in the North Anna 3 COL FSAR, Revision 8, as follows:

Evaluation of Supplemental Information

- NAPS SUP 14.2-4 — Plant Service Water System Preoperational Test Purpose
- NAPS SUP 14.2-5 — Plant Service Water System Performance Test Purpose

In the North Anna 3 COL FSAR, Revision 6, the applicant added site-specific supplemental information that included details regarding preoperational and performance tests for the Alternate Heat Sink (AHS). Specifically, the applicant included AHS in the descriptions of the test objectives in Section 14.2.8.1.51 "Plant Service Water System Preoperational Test Purpose," and in Section 14.2.8.2.18, "Plant Service Water System Performance Test Purpose," of the FSAR. Further, the applicant replaced the first paragrph of Section 14.2.8.1.51 of the ESBWR DCD with the following description:

> The objective of this test is to verify proper operation of the PSWS including the AHS and its ability to supply design quantities of cooling water to the RCCWS and TCCWS heat exchangers.

In addition, the applicant added the following details and statement regarding AHS testing in FSAR Section 14.2.8.1.51:

- Proper operation of control interlocks and equipment protective devices in AHS fans, motors, and valves;
- Proper operation of the AHS fans, motors, and valves in all design operating modes;
- Automatic transfer between PSWS trains and components in response to Anticipated Operational Occurrences (AOOs); and
- Proper operation of water hammer mitigating design features.

> However, due to insufficient heat loads during preoperational test phase, the heat exchanger and the AHS performance verification is deferred until the startup phase.

In Section 14.2.8.2.18, "Plant Service Water System Performance Test Purpose," of North Anna 3 COL FSAR, the applicant replaced the first paragraph of Section 14.2.8.2.18 of the ESBWR DCD with the following description:

> The objective of this test is to verify performance of the PSWS including the AHS along with the RCCWS, and the TCCWS under expected reactor power operation load conditions.

Further, the applicant replaced the second sentence in the third paragraph of ESBWR DCD with the following description:

> Pertinent parameters shall be monitored in order to provide a verification of proper system flow balancing and heat exchanger and AHS performance under near design or special conditions, as appropriate.

The staff noted that the applicant's site-specific supplemental information NAPS SUP 14.2-4 and NAPS SUP 14.2-5 regarding preoperational and performance test for the AHS did not represent a reduction in commitment and were added based on the applicant's incorporation of its response dated August 3, 2009, to RAI 09.02.01-12 (ADAMS Accession No. ML092180975). In RAI 09.02.01-12 (ADAMS Accession No. ML091910257), dated July 8, 2009, the staff requested the applicant provide additional information to describe how the design capability of the plant-specific AHS will be verified by the initial plant test program. In addition, design features which minimize an AHS/PSWS water hammer event need to be tested to verify that a water hammer event does not occur when the PSWS pump starts. The staff's review of North Anna 3 response to RAI 09.02.01-12 is discussed in SER Section 9.2.1.4. The staff determined that the applicant's supplementary information (NAPS SUP 14.2-4 and NAPS SUP 14.2-5) relating to the AHS is acceptable.

North Anna 3 COL FSAR, Section 9.3.11.4, "Tests and Inspections," describes the tests and inspections for the Zinc Injection System. Since testing of the zinc injection system is not identified in either DCD Section 14.2.8 or the comparable section of the North Anna 3 COL FSAR (consistent with the guidance contained in RG 1.68 Appendix A Item 1.n (6)), the staff issued RAI 14.02-17) (ADAMS Accession No. ML14318A601) requesting that the applicant revise the appropriate section of the North Anna 3 COL FSAR to describe the testing of the Zinc Injection System. Section 14.2.8.1.46, "Reactor Water Chemistry Control Systems Preoperational Test," of the ESBWR DCD describes the objectives of the preoperational test for the Oxygen Injection System, but not for the Zinc Injection System. In the applicant's response to RAI 14.02-17, dated January 8, 2015 (ADAMS Accession No. ML15009A235), the applicant stated that the North Anna 3 FSAR Section 14.2 will be revised to include testing of the Zinc Injection System. In addition, the applicant proposed to address testing of the Hydrogen Water Chemistry System and the On-line Noble Chem. Specifically, the applicant proposed to replace the first sentence of Section 14.2.8.1.46 of the DCD with the following:

> The objective of this test is to verify proper operation of the Oxygen Injection System, Zinc Injection System, Hydrogen Water Chemistry System (HWCS) and the On-line Noble Chem.

In addition, the applicant proposed to replace the second sentence of the DCD Section entitled, "General Test Methods and Acceptance Criteria" with the following:

> Actual oxygen, zinc, hydrogen and On-line Noble Chem™ injection demonstrations and/or simulations shall be limited to only those cases where it is deemed practicable or appropriate with regards to the aforementioned precautions.

The staff finds the applicant's response to RAI 14.02-17 to be acceptable since the applicant proposes to amend North Anna 3 COL FSAR, Section 14.2.8.1.46 to include the Zinc Injection System, as well as the HWCS and the On-line Noble Chem™, as systems that will receive preoperational testing, in accordance with the guidance of RG 1.68 pertaining to chemistry control systems. Therefore, the staff determined that the applicant's supplementary information (NAPS SUP 14.2-4 and NAPS SUP 14.2-5) relating to the Zinc Injection System is acceptable.

The applicant has committed to incorporate the above described changes to the North Anna 3 FSAR in a future COLA submittal. **[This is Confirmatory Item 14.2-1].**

14.2.4.8 Site Specific Preoperational and Startup Tests

The NRC staff reviewed the information in the NAPS-3 COL FSAR, Revision 8, as follows:

COL Items

- NAPS COL 14.2-5-A Site Specific Tests

Section 14.2.9 "Site-Specific Preoperational and Start up Tests," of the DCD states in part that:

> The COL Applicant will define any required site specific preoperational and startup testing. See Section 14.2.10 for COL Information item 14.2-5-A. Testing of such systems and components should be adequate to demonstrate conformance to such requirements as defined throughout the specific chapters of the Standard Safety Analysis Report (SSAR). Below are systems that may require such testing:
>
> - Electrical switchyard and equipment;
> - Station Water System;
> - Personnel monitors and radiation survey instruments; and
> - The automatic dispatcher control system (if applicable)"

The applicant deleted FSAR Section 14.2.9.1.4 and moved preoperational tests for electrical switchyard equipment to FSAR Section 14.2.8.1.36. For additional details on preoperational testing of electrical equipment, see FSER Section 14.2.4.6. The applicant added site-specific supplemental information in North Anna 3, SUP 14.2-3 and North Anna 3, SUP 14.2-2 in FSAR Section 14.2.9.1.1, "Station Service Water Preoperational Test," and FSAR Section 14.2.9.2.1, "Cooling Tower Preoperational Test." The applicant also deleted FSAR Sections 14.2.9.1.3 since the COL applicant took exception to guidance in 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." The applicant did not

address the automatic dispatcher control system testing since it is not applicable to North Anna 3.

In the COL FSAR, the applicant states the following:

> This section describes the site specific preoperational and initial startup tests not addressed in DCD Section 14.2.8.

The applicant identified supplemental information in North Anna 3, SUP 14.2-2 and North Anna 3, SUP 14.2-3 regarding the preoperational and initial startup tests not addressed in DCD Section 14.2.8. North Anna 3, SUP 14.2-3 contains the test abstracts for "Station Water System Pre-Operational Test," and "Cooling Tower Preoperational Test." North Anna 3, SUP 14.2-2 contains the test abstract for "Cooling Tower Performance Test."

The staff noted that, in addition to the individual test descriptions in Sections 14.2.8 of the FSAR, the applicant defined its required site-specific preoperational and startup testing, as noted in North Anna 3, SUP 14.2-2 and North Anna 3, SUP 14.2-3.

The staff evaluated North Anna 3, COL 14.2-5-A according to the relevant NRC regulations and acceptance criteria defined in SRP Section 14.2 along with the guidance in RGs 1.68 and 1.206, Section C.I.14, and finds that the applicant satisfactorily addressed DCD COL Item 14.2- 5-A.

- NAPS COL 14.2-6-A Specific Testing - Test Procedures

Section 14.2.9 of the DCD states in part that:

> If site-specific preoperational or startup tests are identified as necessary, the appropriate procedures will be prepared by the same method and to the same standard as discussed in Section 14.2.2.2. The COL Applicant will provide milestones for making available to the NRC approved test procedures satisfying the requirements for the ITP (COL 14.2- 6-A).

In the COL FSAR, the applicant states the following:

> 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, or as otherwise specified in license conditions. 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.

The applicant identified a license condition for North Anna 3, COL 14.2-6-A, as discussed below in Post Combined License Activities. The licensee will track the development of test procedures for each preoperational and startup test in order to address this COL information item in accordance with applicable guidance.

The staff evaluated STD COL 14.2-6-A according to the relevant NRC regulations and acceptance criteria defined in SRP Section 14.2 along with the guidance in RG s 1.68 and 1.206, Sec tion C.I.14, and finds that the applicant has satisfactorily addressed DCD COL Item 14.2-6-A.

Supplemental Information

- NAPS SUP 14.2-2 Site-Specific Startup Tests
- NAPS SUP 14.2-3 Site-Specific Pre-Operational Tests

As noted above for North Anna 3, COL 14.2-5-A, the applicant provided these supplemental information items regarding site-specific performance and pre-operational tests. The applicant included this supplemental information in the FSAR in order to describe the site specific preoperational and initial startup tests not addressed in DCD Section 14.2.8 per the requirements of STD COL 14.2-5-A.

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 Sections listed above. In RAI 14.2-02, issued on June 23, 2008 (ADAMS Accession No. ML081750645), the staff requested that the applicant confirm that there are no more additional site specific SSCs or design features that would 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.

In the response letter dated August 7, 2008 to RAI 14.2-02 (ADAMS Accession No. ML082240134), 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 found that this response is acceptable, and therefore, RAI 14.2-02 is resolved and closed.

The applicant identified two site-specific pre-operational tests in the FSAR:

- 14.2.9.1.1 Station Water System Pre-Operational Test

FSER Section 9.2.10 provides the technical discussion of the Station Water System. In North Anna 3, COL FSAR, Revision 6, the applicant for consistency with the EF3 COL application, added to the Station Water System Pre-Operational Test abstract, the following:

- Proper operation of traveling screens and motorized self-cleaning strainers

The staff reviewed the test abstract for the Station Water System Pre-Operational Test and finds that it contains adequate guidance to develop test procedures to verify that the station water system will operate as designed.

- 14.2.9.1.2 Cooling Tower Preoperational Test

FSER Section 10.4.5.2.1 provides the technical discussion of the CIRC which includes the cooling towers. The staff reviewed the test abstract for the Cooling Tower Preoperational test and finds that it contains adequate guidance to develop test procedures to verify that the cooling tower will operate as designed.

The applicant identified one site-specific startup test in the FSAR:

- 14.2.9.2.1 Cooling Tower Performance Test

FSER Section 10.4.5.2.1 provides the technical discussion of the CIRC which includes the cooling towers. The staff reviewed the site-specific startup test abstract for the Cooling Tower Performance Test. The staff finds that the test abstract provides adequate guidance to develop test procedures to verify proper operation of the waste heat rejection portion of the CIRC.

The staff found that the applicant's site-specific supplemental information in NAPS SUP 14.2-2 and NAPS SUP 14.2-3 regarding site-specific performance and preoperational tests were consistent with applicable regulations and guidance. Therefore, the staff determined that the applicant's supplementary information is acceptable.

Evaluation of the Deletion of two Site-Specific Preoperational Tests

- FSAR Section 14.2.9.1.3, "Personnel Monitors and Radiation Survey Instruments Preoperational Test," (Deleted in Revision 1 to FSAR 14.2.9, per NAPS SUP 14.2-3)

- FSAR Section 14.2.9.1.4, "Electrical Switchyard System Preoperational Test" (Deleted in Revision 1 to FSAR 14.2.9 per NAPS SUP 14.2-3)

In 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 dated July 15, 2008 (ADAMS Accession No ML081970390), 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 dated July 15, 2008 (ADAMS Accession No. ML081970390), 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 applicant's response dated August 28, 2008 (ADAMS Accession No. ML082460847), to these RAIs, and to supplemental RAIs 14.02-9 and 14.02-10, dated February 10, 2009 (ADAMS Accession No. ML090430159), 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 0, "Generic FSAR Template Guidance for Radiation Protection Program Description," which has been incorporated by the applicant in Appendix 12BB of the NAPS-3 COL FSAR accordingly. NEI 07-03A, Revision 0, provides adequate 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 as described in NEI 07-03A, specifies, in Section 12.5.3.2 "Monitoring Instrumentation and Equipment," of NEI 07-03A, Revision 0, 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, 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 and closed.

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 include this description. Accordingly on August 8, 2008, the staff issued RAI 14.02-8 (ADAMS Accession No. ML082210547), 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 response letter dated September 19, 2008, to RAI 14.02-08 (ADAMS Accession No. ML082700252), the applicant made a determination to delete FSAR Section 14.2.9.1.3 in its entirety. However, in response to RAI 14.02-5, the applicant stated that 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, are described in the following standards documents:

- 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

- ANSI/IEEE N323D, "Installed Radiation Protection Instrumentation," issued in 2003

ANSI/IEEE N323A is referenced in Table 1.9-22 of the ESBWR DCD and is incorporated by reference by the COL applicant. Since the North Anna 3, FSAR did not contain a reference to ANSI/IEE N323D, the applicant added it to Table 1.9-204 of the FSAR in response to RAI 14.02-5. The NRC staff reviewed Revision 8 of the North Anna 3 COL FSAR and verified that the COL applicant has added a reference to ANSI/IEEE N323D in Table 1.9-204. Therefore, RAI 14.02-8 is resolved and closed.

Revision 0 of North Anna 3 COL 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

The NRC staff determined that additional information was required to complete its review in this area. On June 5, 2008, the NRC staff issued RAI 14.02-1 (ADAMS Accession No. ML081580132), 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 RAI 14.02-1 (ADAMS Accession No. ML082050559), 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. The NRC staff reviewed the North Anna 3, COL FSAR,

and verified that the applicant has deleted FSAR Section 14.2.9.1.4 and addressed the preoperational tests for electrical switchyard equipment in FSAR Section 14.2.8.1.36. Therefore, RAI 14.02-1 is resolved and closed.

License Conditions:

On May 27, 2010, in RAI 14.02-4 (ADAMS Accession No. ML101470123) to the Fermi 3 COL applicant, the staff identified license conditions that the applicant needs to address in its application. The NRC imposes license conditions for test activities that cannot be resolved during the COL applicant stage but are resolved after the COL is issued. In a North Anna 3 letter dated December 31, 2013, the applicant endorsed the Fermi 3 RAI response letter to RAI 14.02-4 on July 9, 2010 (ADAMS Accession No. ML101960646), and agreed that the license conditions proposed were appropriate. The applicant addressed these proposed license conditions in the North Anna 3 COL application, Part 10: "Tier 1/ITAAC/Proposed License Conditions," Revision 7, dated June 2014, Section 3.2, License Conditions for Initial Test Program," and are presented in Section 14.2.5 below.

14.2.5 Post Combined License Activities

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

Startup Administrative Manual, NAPS COL 14.2.2-A

> Prior to initiating the plant's initial test program (ITP), a site-specific SAM (procedures), which includes administrative procedures and requirements that govern the activities associated with the plant ITP is to be provided to on-site NRC inspectors 60 days prior to beginning of the preoperational test phase.

Preoperational and Startup Test Procedures, NAPS COL 14.2-3-A

> The licensee will make available to on-site NRC inspectors preoperational test procedures 60 days prior to their intended use and startup test procedures 60 days prior to fuel load.

Site-Specific Preoperational and Startup Test Procedures, NAPS COL 14.2.6-A

> The licensee will make available to on-site NRC inspectors site-specific preoperational test procedures 60 days prior to their intended use and startup test procedures 60 days prior to fuel load.

Power Ascension Test Phase Reports

In North Anna 3 COL application Revision 8, Part 10: "Tier 1/ITAAC/Proposed License Conditions," Revision 7, dated June 2014, Section 3.2.4, "Power Ascension Test Phase Reports," the applicant proposed the following license conditions related to RAI 14.02-4:

Nuclear Fuel Loading and Pre-critical Testing

- Upon notifying the Director of the Office of New Reactors (NRO), or the Director's designee, in writing of successful completion of preoperational testing, and upon a Commission finding in accordance with 10 CFR 52.103(g) that all the acceptance criteria in the ITAAC in Appendix C to this license are met, the licensee is authorized to perform pre-critical tests in accordance with the conditions specified herein.

- The licensee shall review and evaluate the results of the pre-critical tests identified and confirm that these test results are within the range of acceptable values predicted or otherwise confirm that the tested systems perform their specified functions in accordance with the FSAR.

Initial Criticality and Low-Power Testing

- Upon notifying the Director of NRO, or the Director's designee, in writing of successful completion of pre-critical testing, the licensee is authorized to operate the facility at reactor steady-state core power levels not to exceed 5-percent thermal power in accordance with the conditions specified herein, but solely for the purposes of conducting initial criticality and low-power testing.

- The licensee shall review and evaluate the results of the initial criticality and low-power tests and confirm that these test results are within the range of acceptable values predicted or otherwise confirm that the tested systems perform their specified functions in accordance with the FSAR.

Power Ascension Testing

- Upon notifying the Director of NRO, or the Director's designee, in writing of successful completion of the initial criticality and low-power testing, the licensee is authorized to operate the facility at reactor steady-state core power levels not to exceed 100-percent thermal power in accordance with the conditions specified herein, but only for purposes of performing power ascension testing.

- The licensee shall review and evaluate the results of the power ascension tests and confirm that these test results are within the range of acceptable values predicted or otherwise confirm that the tested systems perform their specified functions in accordance with the FSAR.

The licensee is responsible for the review and evaluation of the adequacy of test results presented in the Power Ascension Test Phase reports, as well as final review of overall test results in these reports. Test results, which do not meet acceptance criteria, are identified and corrective actions and retests are performed. The Power Ascension Test Phase reports shall be made available to on-site NRC inspectors.

Test Changes

In the North Anna 3 COL application Revision 8, of Part 10: "Tier 1/ITAAC/Proposed License Conditions," Revision 7, dated July 2014, Section 3.2.4, "Power Ascension Test Phase Reports," the applicant proposed the following license conditions related to RAI 14.02-4:

> Within 30 days of a change to the ITP described in FSAR Chapter 14, Initial Test Program, made in accordance with 10 CFR 50.59 or in accordance with 10 CFR Part 52, Appendix E, Section VIII, "Processes for Changes and Departures," the licensee shall report the changes or the Director of NRO, or the Director's designee, in accordance with 10 CFR 50.59(d).

Operational Program Readiness

In North Anna 3 COL application Revision 8, of Part 10: "Tier 1/ITAAC/Proposed License Conditions," Revision 7, dated June 2014, Section 3.6," Operational Program Readiness," the NRC staff has identified the following license condition which is related in part to STD COL 14.2-4-A:

> The licensee shall submit to the Director of the NRO, a schedule, no later than 12 months after issuance of the COL, for implementation of the operational programs listed in FSAR Table 13.4-201. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the operational programs in the FSAR table have been fully implemented. This schedule should also address:
>
> (a) The implementation of site specific Severe Accident Management Guidelines.
> (b) The spent fuel rack coupon monitoring program implementation.

14.2.6 Conclusion

The NRC staff's finding related to information incorporated by reference is in NUREG–1966. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirmed that the applicant has addressed the required information, and other than **Confirmatory Item 14.2-1**, there is no outstanding information expected to be addressed in the North Anna 3 COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to this section that were incorporated by reference have been resolved.

In addition, the staff concludes that the relevant information presented within the North Anna 3 COL FSAR is acceptable and meets the 10 CFR 52.79(a)(28), Criterion XI of Appendix B to 10 CFR Part 50 along with the guidance in RGs 1.68 and 1.206. The staff has evaluated the STD COL items, North Anna 3 COL items, STD SUP items, and North Anna 3, SUP items identified for this subsection according to the relevant NRC regulations and acceptance criteria defined in NUREG–0800, Section 14.2 and finds that the applicant has satisfactorily addressed these items.

14.3 Inspections, Tests, Analyses, and Acceptance Criteria

14.3.1 Introduction

Section 14.3 of the FSAR, discusses the criteria and methodology for selecting the SSCs to be included in the ITAAC. This section includes the definitions and general provisions, design descriptions, ITAAC, significant site parameters, and significant interface requirements in order to determine whether the resultant ITAAC are adequate to verify that a facility referencing the ESBWR design has been constructed and will be operated in compliance with the design certification and applicable regulations.

14.3.2 Summary of Application

Part 10 of the North Anna 3 COLA, Revision 8 includes the entire set of ITAAC which consists of four parts: Design Certification ITAAC, Emergency Planning ITAAC, Physical Security ITAAC, and Site-Specific ITAAC. The Tier 1 Design Certification ITAAC have been incorporated by reference in Part 10, Section 2.1, "Design Certification ITAAC", of the North Anna 3 COL FSAR, Revision 8. The NRC staff's finding related to Design Certification ITAAC incorporated by reference is in NUREG–1966.

The Emergency Planning ITAAC are presented in Part 10, Section 2.3, "Emergency Planning ITAAC", of the North Anna 3 COL FSAR, Revision 8, and listed in Table 2.3-1, "ITAAC For Emergency Planning". Evaluations of these ITAAC are contained in FSER Chapter 13.0, "Conduct of Operations", Section 13.3, "Emergency Planning." and discussed below regarding the evaluation of STD COL 14.3-1-A.

The Tier 1 Physical Security ITAAC for systems within the scope of the DCD are incorporated by reference in Part 10, Section 2.2, "Physical Security ITAAC", of the North Anna 3 COL FSAR, Revision 8 and the NRC staff's findings related to this information is incorporated by reference in NUREG–1966. In addition, the evaluation of the Site-Specific Physical Security ITAAC that have been identified by the applicant in Part 10, Section 2.2.1, "Site Specific Physical Security ITAAC", of the North Anna 3 COL FSAR, Revision 8 and listed in Table 2.2.1-1, "ITAAC for the Site-Specific Security System," can be found in FSER Chapter 13.0, "Conduct of Operations", Section 13.6, "Physical Security", and in 13.6A, "Site-Specific ITAAC for Physical Security."

The Site-Specific ITAAC for site-specific systems that were not evaluated in the referenced DCD are presented by the applicant in Part 10, Section 2.4 "Site-Specific ITAAC," of the North Anna 3 COL FSAR, Revision 8. The evaluations of these ITAAC are discussed below under the evaluation of STD COL 14.3-2-A.

Section 14.3, of the North Anna 3 FSAR, Revision 8, incorporates by reference Section 14.3 of the ESBWR DCD, Revision 10. In addition, the North Anna 3 FSAR, Revision 8, Section 14.3, provides the following:

COL Item

- STD COL 14.3-1-A Emergency Planning ITAAC

The applicant provided information regarding their Emergency Planning ITAAC based on industry guidance.

- CWR COL 14.3-2-A Site Specific ITAAC

The applicant provided information regarding their Site-Specific ITAAC for systems not evaluated in the DCD.

- NAPS COL 14.3A-1-1 Schedule for Design Acceptance Criteria (DAC) ITAAC Closure

The applicant provided a DAC ITAAC closure schedule.

14.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG–1966 and NUREG–1966, Supplement 1, the FSER related to the certified ESBWR DCD. In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for seismic classification are given in Section 14.3 of NUREG–0800.

The applicable regulatory requirements and guidance for the inspections, tests, analysis, and acceptance criteria are as follows:

- 10 CFR 52.79(d)(2), "Contents of applications, technical information in final safety analysis report", 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),"Contents of applications, additional technical information", 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.

- 52.99(a), "Inspection During Construction", as it relates to ITAAC completion schedule

- RG 1.206, Section C.II.1 as it relates to COL ITAAC and Section C.III.5 as it relates to DCA.

14.3.4 Technical Evaluation

As documented in NUREG–1966, NRC staff reviewed and approved Section 14.3 of the certified ESBWR DCD. The NRC staff reviewed Section 14.3 of the North Anna 3 COL FSAR, Revision 8, and checked the referenced ESBWR DCD to ensure that the combination of the information in the ESBWR DCD and the information in the North Anna 3 COL FSAR, Revision 8, appropriately represents the complete scope of information relating to this review topic.[1] The staff's review confirmed that the information contained in the application and the information incorporated by reference address the relevant information related to this section.

The staff reviewed the information in the North Anna 3 COL FSAR, Revision 8, as follows:

COL Item

- STD COL 14.3-1-A Emergency Planning (EP) ITAAC

The NRC staff evaluation for STD COL 14.3-1-A, "Emergency Planning ITAAC," is addressed in Section 13.3, "Emergency Planning," of Chapter 13, "Conduct of Operations," of the North Anna 3 SER. The staff's evaluation found that the information provided to address this COL item was acceptable. Therefore, for the purposes of this Chapter 14 SER evaluation, the staff finds that the applicant has addressed STD COL 14.3-1-A.

- STD COL 14.3-2-A Site Specific ITAAC

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 systems that were not evaluated in the referenced DCD. In Section 14.3.9 of the North Anna 3, COL FSAR, the applicant states that the selection criteria and methodology provided in Section 14.3 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 systems that were not evaluated in the referenced DCD. If a site-specific system described in the FSAR does not meet an ITAAC selection criterion, then the applicant includes just the system title and the statement "No entry for this system." The North Anna 3 COL application Part 10, Section 2.4 addresses the site-specific ITAAC for the following structures, systems, and components (SSCs).

2.4.1 ITAAC for Fill Concrete Under and Around Surrounding the Sides of Seismic Category I Structures

Section 2.5.4 of this SER contains the staff's evaluation of ITAAC for concrete fill. In addition the applicant addressed concerns from the NRC staff RAIs 02.05.04-12, 02.05.04-13 and 02.05.04-19 which address concrete fill under and around the Seismic Category I structures as follows:

- ITAAC for Fill Concrete Under and Around the Seismic Category I Structures

- Fill concrete placed under and around the sides of Seismic Category I Structures to a thickness greater than 5 feet is designed and tested as specified in FSAR Section 2.5.

The staff concludes that the applicant has satisfactorily addressed the foundation interface requirement and site-specific ITAAC for this item.

2.4.2 ITAAC for Structural Fill Surrounding Seismic Category I Structures.

Section 2.5.4 of this SER contains the staff's evaluation of ITAAC for Structural Fill Surrounding Seismic Category I Structures. The applicant specified structural fill surrounding the Seismic Category I structures as follows:

- ITAAC for Structural Fill Surrounding Seismic Category I Structures

  Structural fill surrounding the embedded walls for Seismic Category I structures meets properties
  for (1) the angle of internal friction; (2) the local effect on wall pressure as determined by the product of: peak ground acceleration α, (in g), Poisson' ratio v, and density γ; and (3) soil density.

The staff concludes that the applicant has satisfactorily addressed the foundation interface requirement and site-specific ITAAC for this item.

2.4.3 ITAAC for Plant Service Water System (Portion Outside the Scope of the Certified Design)

In COL Part 10, Section 2.4.3, the applicant has identified interface requirements and site-specific ITAAC for this system. In the staff's SER for Section 9.2.1, the staff concludes that the applicant has satisfactorily addressed the interface requirement and site-specific ITAAC for this system.

2.4.4 Circulating Water System (Portion Outside the Scope of the Certified Design)

In COL Part 10, Section 2.4.4, the applicant states that for the circulating water system there are no site-specific ITAAC required for this system. The staff concludes that the circulating water system does not perform a safety-related function and is not considered a system "important to safety" therefore, as-built verification, i.e., site-specific ITAAC, is not required.

2.4.5 Station Water System (Including Intake Structure and Servicing Equipment)

In COL Part 10, Section 2.4.5, the applicant states that for the station water system there are no site-specific ITAAC required for this system. The staff concludes that the station water system does not perform a safety-related function and is not considered a system "important to safety"; therefore, as-built verification, i.e., site-specific ITAAC, is not required.

2.4.6 Yard Fire Protection System (Portions Outside the Scope of the Certified Design)

In COL Part 10, Section 2.4.6, the applicant states that for the yard fire protection system there are no site-specific ITAAC required for this system. The staff concludes that the yard fire protection system does not perform a safety-related function and is not considered a system "important to safety"; therefore, as-built verification, i.e., site-specific ITAAC, is not required.

2.4.7 Potable & Sanitary Water Systems

In COL Part 10, Section 2.4.7, the applicant states that for the potable & sanitary water system there are no site-specific ITAAC required for this system. The staff concludes that the potable and sanitary water systems do not perform a safety-related function and are not considered a system "important to safety"; therefore, as-built verification, i.e., site-specific ITAAC, is not required.

2.4.8 Offsite Power Systems

In COL Part 10, Section 2.4.8, the applicant has identified interface requirements and site specific ITAAC for this system. ITAAC for North Anna 3 is based on these interface requirements incorporated in Table 2.4.8-1 in Part 10 of the North Anna 3 COL Revision 8. As discussed in the staff's SER for Section 8.2, the staff has found that the proposed ITAAC for this system will ensure that each as-built offsite circuit has sufficient capacity and capability. The staff concludes that the applicant has satisfactorily addressed the interface requirement and site-specific ITAAC for this system.

2.4.9 Communication Systems (Emergency Notification System)

In COL Part 10, Section 2.4.9, the applicant states that the site-specific ITAAC for this system is addressed in Table 2.3-1, Topic 3.0, Emergency Communications. The complete review of the applicant's site-specific emergency plan ITAAC is contained in SER Section 13.3. Based on that evaluation, the staff has found that the applicant has satisfactorily addressed the site-specific ITAAC for this system.

2.4.10 Makeup Water System

In COL Part 10, Section 2.4.10, the applicant states that for the makeup water system there are no ITAAC required for this system. The staff concludes that the makeup water system does not perform a safety-related function and is not considered a system "important to safety"; therefore, as-built verification, i.e., site-specific ITAAC, is not required.

2.4.11 (Deleted)

In order to be consistent with the ESBWR DCD, on March 9, 2009 the staff issued RAI 14.03.07-1 (ADAMS Accession No. ML09068031) requesting for the applicant to update this section to no longer refer to the use of a mobile liquid waste management system. Per the applicant's RAI response dated April 3, 2009 (ADAMS Accession No. ML090990451), the applicant deleted this section accordingly. The staff found that this response is acceptable, and therefore, RAI 14.03.07-1 is resolved and closed.

2.4.12 (Deleted)

In order to be consistent with the ESBWR DCD, on March 9, 2009 the staff issued RAI 14.03.07-2 (ADAMS Accession No. ML09068031) requesting for the applicant to update this section to no longer refer to the use of a mobile solid waste management system. Per the applicant's RAI response dated April 9, 2009 (ADAMS Accession No. ML090990451), the

applicant deleted this section accordingly. The staff found that this response is acceptable, and therefore, RAI 14.03.07-2 is resolved and closed.

2.4.13 Hydrogen Water Chemistry System

In COL Part 10, Section 2.4.13, the applicant states that for the hydrogen water chemistry system (HWCS) there are no site-specific ITAAC required for this system. The staff concludes that the HWCS does not perform a safety-related function and is not considered a system "important to safety"; therefore, as described in ESBWR DCD, Table 14.3-1, Revision 9, an ITAAC is not required for this system.

2.4.14 Meteorological Monitoring System

In COL Part 10, Section 2.4.14, the applicant states that for the meteorological monitoring system there are no site-specific ITAAC required for this system. The staff notes that there are several emergency plan ITAACs in COL Part 10, Section 2.3 that require the acquisition and evaluation of meteorological data. The staff concludes that additional site- specific ITAAC are not required for the meteorological monitoring system.

Based on the NRC staff evaluation of the information provided by the applicant related to the Site-Specific ITAAC cited above, the NRC staff determined that the information meets the requirements in 10 CFR 52.79(d)(2), 52.80(a) and the acceptance criteria in NUREG–0800, Chapter 14.3, "Inspections, Tests, analyses, and Acceptance Criteria. In addition, the staff has reviewed the applicant's information to address COL Item 14.3-2-A and found that it is acceptable and meets the relevant requirements and the guidance set forth in RG 1.206, Section C.II.1.

2.4.15 ITAAC for the Turbine Building

In COL Part 10, Section 2.4.15, the applicant has identified interface requirements and site-specific ITAAC for the North Anna 3 Turbine Building which is based on the interface requirements incorporated in Table 2.4.15-1 in Part 10 of the North Anna 3 COL Revision 8. As discussed in the staff's SER for Section 3.7.2, the staff has found that the proposed ITAAC for this building will ensure that the Unit 3 site-specific soil structure interaction (SSI) is adequate for the Turbine Building seismic design. The staff concludes that the applicant has satisfactorily addressed the interface requirement and site-specific ITAAC for this building.

2.4.16 ITAAC for the Radwaste Building

In COL Part 10, Section 2.4.16, the applicant has identified interface requirements and site-specific ITAAC for the North Anna 3 Radwaste Building which is based on the interface requirements incorporated in Table 2.4.16-1 in Part 10 of the North Anna 3 COL Revision 8. As discussed in the staff's SER for Section 3.7.2, the staff has found that the proposed ITAAC for this building will ensure that the Unit 3 site-specific soil structure interaction (SSI) is adequate for the Radwaste Building seismic design. The staff concludes that the applicant has satisfactorily addressed the interface requirement and site-specific ITAAC for this building.

2.4.17 ITAAC for the Service Building

In COL Part 10, Section 2.4.17, the applicant has identified interface requirements and site-specific ITAAC for the North Anna 3 Service Building which is based on the interface requirements incorporated in Table 2.4.17-1 in Part 10 of the North Anna 3 COL Revision 8. As discussed in the staff's SER for Section 3.7.2, the staff has found that the proposed ITAAC for this building will ensure that the Unit 3 site-specific soil structure interaction (SSI) is adequate for the Service Building seismic design. The staff concludes that the applicant has satisfactorily addressed the interface requirement and site-specific ITAAC for this building.

2.4.18 ITAAC for the Ancillary Diesel Building

In COL Part 10, Section 2.4.18, the applicant has identified interface requirements and site-specific ITAAC for the North Anna 3 Ancillary Diesel Building which is based on the interface requirements incorporated in Table 2.4.18-1 in Part 10 of the North Anna 3 COL Revision 8. As discussed in the staff's SER for Section 3.7.2, the staff has found that the proposed ITAAC for this building will ensure that the Unit 3 site-specific soil structure interaction (SSI) is adequate for the Ancillary Diesel Building seismic design. The staff concludes that the applicant has satisfactorily addressed the interface requirement and site-specific ITAAC for this building.

2.4.19 ITAAC for the Control Rods

In COL Part 10, Section 2.4.19, the applicant has identified interface requirements and site-specific ITAAC for the North Anna 3 Control Rods which is based on the interface requirements incorporated in Table 2.4.19-1 in Part 10 of the North Anna 3 COL Revision 8. As discussed in the staff's SER for Section 4.2, the staff has found that the proposed ITAAC will ensure that the control rods to be loaded into the core of Unit 3 will be capable of withstanding design seismic and dynamic loadings. The staff concludes that the applicant has satisfactorily addressed the interface requirement and site-specific ITAAC for this component.

2.4.20 ITAAC for Seismic Category I Buried Piping, Conduits and Tunnels Design Description

In COL Part 10, Section 2.4.20, the applicant has identified interface requirements and site-specific ITAAC for the North Anna 3 Buried Piping, Conduits and Tunnels which is based on the interface requirements incorporated in Table 2.4.20-1 in Part 10 of the North Anna 3 COL Revision 8. As discussed in the staff's SER for Section 3.7.3, the staff has found that the proposed ITAAC will ensure that the buried piping, conduits and tunnels of Unit 3 will be capable of withstanding design seismic and dynamic loadings. The staff concludes that the applicant has satisfactorily addressed the interface requirement and site-specific ITAAC for these items.

2.4.21 ITAAC for Access Tunnel

In COL Part 10, Section 2.4.21, the applicant has identified interface requirements and site-specific ITAAC for the North Anna 3 Access Tunnel which is based on the interface requirements incorporated in Table 2.4.21-1 in Part 10 of the North Anna 3 COL Revision 8. As discussed in the staff's SER for Section 3.7.3, the staff has found that the proposed ITAAC will ensure that the Access Tunnel of Unit 3 will be capable of withstanding design seismic and

dynamic loadings. The staff concludes that the applicant has satisfactorily addressed the interface requirement and site-specific ITAAC for the Access Tunnel.

2.4.22 ITAAC for Radwaste Tunnel

In COL Part 10, Section 2.4.22, the applicant has identified interface requirements and site-specific ITAAC for the North Anna 3 Radwaste Tunnel which is based on the interface requirements incorporated in Table 2.4.22-1 in Part 10 of the North Anna 3 COL Revision 8. As discussed in the staff's SER for Section 3.7.3, the staff has found that the proposed ITAAC will ensure that the Radwaste Tunnel of Unit 3 will be capable of withstanding design seismic and dynamic loadings. The staff concludes that the applicant has satisfactorily addressed the interface requirement and site-specific ITAAC for the Radwaste Tunnel.

14.3.5 Post-Combined License Activities

As discussed above, the staff finds the following applicant proposed post COL activities acceptable:

- Dominion shall submit to the NRC, no later than 1 year after issuance of the combined license or at the start of construction as defined in 10 CFR 50.10(a), whichever is later, its implementation schedules for completion of the following ITAAC. Dominion shall submit updates to the ITAAC schedules every 6 months thereafter and, within 1 year of its scheduled date for initial loading of fuel, shall submit updates to the ITAAC schedules every 30 days until the final notification is provided to the NRC under paragraph (c)(1) of 10 CFR 52.99.

- For piping DAC ITAAC, (1) the as-designed Pipe Break Analysis Report will be completed per DCD ITAAC Table 3.1-1 and (2) the ASME Code design reports for safety-related piping packages will be completed for DAC ITAAC Tables 2.1.2-3 (2b1), 2.2.2-7 (2b1), 2.2.4-6 (10b1), 2.4.1-3 (2b1), 2.4.2-3 (2b1), 2.6.1-1 (8b1), 2.6.2-2 (2b1), 2.11.1-1 (9a), 2.15.1-2 (2a3), and 2.15.4-2 (2b1) for the applicable systems in order to support the closure of the DAC ITAAC. Information will be made available for NRC review, inspection, and audit on a system basis. Information will be made available to the NRC to facilitate reviews, inspections, and audits throughout the process.

- For human factors engineering DAC, HFE Design Acceptance Criteria ITAAC consists of a series of results summary reports which verify that the specific associated Design Commitment is met. The summary reports will be made available at each stage for NRC review, inspection, and audit on an element by element basis. Information (procedures and test programs) will be made available to the NRC to facilitate reviews, inspections, and audits throughout the process.

- For instrumentation and controls, the set of ESBWR digital instrumentation and control DAC ITAAC establishes a phased closure process. Procedures and test programs necessary to demonstrate that the DAC ITAAC requirements are met will be used at each phase to certify to the NRC that the design is in compliance with the certified design. Information will be made available for NRC review, inspection, and audit on a system basis. Information will be made available to the NRC to facilitate

reviews, inspections, and audits throughout the process.

14.3.6 Conclusion

The NRC staff's finding related to information incorporated by reference is in NUREG–1966 and NUREG–1966, Supplement 1. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to this section that were incorporated by reference are resolved.

In addition, the staff compared the information in the application to the relevant NRC regulations, the guidance in Section 14.3 of NUREG–0800, and other NRC regulatory guides. The staff's review concludes that the design features and performance characteristics of the SSCs described in the COL FSAR can be verified adequately by the proposed ITAAC. Therefore, the North Anna 3 ITAAC are acceptable and meet the requirements of 10 CFR 52.79(d)(2), 10 CFR 52.80, and 10 CFR 52.99(a); and the guidance in RG 1.206, Regulatory Positions C.II.1 and C.III.5.