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14 VERIFICATION PROGRAMS

This chapter describes the U.S. Nuclear Regulatory Commission (NRC) staff evaluation of the combined license (COL) applicant's verification programs, including the initial plant test program (ITP), and inspections, tests, analyses, and acceptance criteria (ITAAC).

14.1 Specific Information to be Addressed for the Initial Plant Test Program

Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Final Safety Analysis Report (FSAR) Section 14.1 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Section 14.1, "Specific Information to be Addressed for the Initial Plant Test Program."

The staff reviewed the combined license application and checked the referenced U.S. EPR FSAR section to ensure that no issues relating to this section remained for review. The staff's review confirmed that there are no outstanding issues related to this section.

The staff reviewed the combined license (COL) application information in the U.S. EPR FSAR Tier 2, Section 14.1 on Docket No. 52-020. The results of the staff's technical evaluation of the information related to the specific information to be addressed for the initial plant test program incorporated by reference in the COL FSAR have been documented in the staff Safety Evaluation Report (SER) on the design certification application for the U.S. EPR. The staff's SER on the U.S. EPR FSAR is not yet complete. The staff will update Section 14.1 of this report to reflect the final disposition of the U.S. design certification application. **Request for additional information (RAI) 222, Question 01-5 is being tracked as an open item**

14.2 Initial Plant Test Program

14.2.1 Introduction

The COL FSAR initial plant test program is intended to verify that the as-built facility configuration and operation complies with the approved plant design and applicable regulations. The initial plant test program consists of preoperational and initial startup testing. Major phases of testing include:

- Preoperational Tests - The preoperational tests are conducted following the completion of construction but before fuel loading.
- Initial Fuel Loading - Initial fuel loading starts after completion of the preoperational testing.
- Initial Criticality and Low-Power Tests - The initial criticality phase of the startup test program confirms that criticality is achieved in a safe and controlled manner. Following initial criticality, a series of low-power physics tests (LPPT) are performed to verify selected core design parameters.
- Power-Ascension Tests - A series of power ascension tests is conducted to bring the reactor to full power.

The scope of the initial test program, as well as its general plans for accomplishing the test program is described to demonstrate that due consideration has been given to matters that normally require advance planning.

The technical aspects of the initial test program are described to show that (1) the test program adequately verifies the functional requirements of plant structures, systems, and components (SSCs); and (2) the sequence of testing is such that the safety of the plant does not depend on untested SSCs. In addition, the measures are described to ensure that (1) the initial test program is accomplished with adequate numbers of qualified personnel; (2) adequate administrative controls will be established to govern the initial test program; (3) the test program is 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 is verified, to the extent practicable, during the period of the initial test program. In addition, this section provides information on the COL information items that have been addressed by the COL applicant.

14.2.2 Summary of Application

COL FSAR Section 14.2 incorporates by reference U.S. EPR FSAR Tier 2, Section 14.2, "Initial Plant Test Program."

In addition, in COL FSAR Section 14.2, the COL applicant provided the following:

COL Information Items

COL Information Item 14.2-1

The COL applicant provided additional information in COL FSAR Section 14.2.2, "Organization and Staffing," to address COL Information Item 14.2-1 from U.S. EPR FSAR Tier 2, Table 1.8-2, "U.S. EPR Combined License Information Items," as follows:

A COL applicant that references the U.S. EPR certified design will provide site-specific information that describes the organizational units that manage, supervise, or execute any phase of the test program.

The COL applicant provided details on the corporate startup organization, COL FSAR site-specific startup organization, and the Project Delivery Consortium that combines the roles of the nuclear steam supply system (NSSS) designer/supplier and the architect engineer and is supplemented by the turbine generator supplier.

COL Information Item 14.2-2

The COL applicant provided additional information in COL FSAR Section 14.2.11, "Test Program Schedule," to address COL Information Item 14.2-2 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

A COL applicant that references the U.S. EPR certified design will develop a test program that considers the following guidance components:

1. The applicant should allow at least nine months to conduct preoperational testing.

2. The applicant should allow at least three months to conduct startup testing, including fuel loading, low power tests, and power ascension tests.
3. Plant safety will not be dependent on the performance of untested SSC during any phase of the startup test program.
4. Surveillance test requirements will be completed in accordance with plant Technical Specification requirements for SSC operability before changing plant modes.
5. Overlapping test program schedules (for multi-unit sites) should not result in significant divisions of responsibilities or dilutions of the staff provided to implement the test program.
6. The sequential schedule for individual startup tests should establish, insofar as practicable, that test requirements should be completed prior to exceeding 25 percent power for SSCs that are relied upon to prevent, limit, or mitigate the consequences of postulated accidents.
7. Approved test procedures should be in a form suitable for review by regulatory inspectors at least 60 days prior to their intended use or at least 60 days prior to fuel loading for fuel loading and startup test procedures.
8. Identity and cross reference each test (or portion thereof) required to be completed before initial fuel loading and that is designed to satisfy the requirements for completing ITAAC.

The COL applicant stated that a site-specific test program shall be developed that considers the components specified above and shall provide copies of test procedures to the NRC at least 60 days prior to their scheduled performance date.

COL Information Item 14.2-3

The COL applicant provided additional information in COL FSAR Section 14.2.3, "Test Procedures," to address COL Information Item 14.2-3 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

A COL applicant that references the U.S. EPR design certification will provide site-specific information for review and approval of test procedures.

The COL applicant provided information on test procedure preparation and execution, special test procedures, sign-off provisions, acceptance criteria, procedure adherence policy, and maintenance and modification procedures.

COL Information Item 14.2-4

The COL applicant provided additional information in COL FSAR Section 14.2.5, "Review, Evaluation, and Approval of Test Results," to address COL Information Item 14.2-4 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

A COL applicant that references the U.S. EPR design certification will address the site-specific administrative procedures for review and approval of test results.

The COL applicant described the measures to be implemented for procedure review and evaluation, composition and duties of the test review team (TRT), and test expectations.

COL Information Item 14.2-5

The COL applicant provided additional information in COL FSAR Section 14.2.12, "Individual Test Descriptions," to address COL Information Item 14.2-5 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

A COL applicant that references the U.S. EPR design certification will provide site-specific test information for the circulating water supply system.

In COL FSAR Section 14.2.12, the COL applicant referred to COL FSAR Section 14.2.14, "COL Applicant Site-Specific Tests," for this item. COL FSAR Section 14.2.14.7, "Circulating Water Supply System," describes the objectives, prerequisites, test methods, data required, and acceptance criteria for tests on the circulating water supply system.

COL Information Item 14.2-7

The COL applicant provided additional information in COL FSAR Section 14.2.12 to address COL Information Item 14.2-7 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

A COL applicant that references the U.S. EPR design certification will provide site-specific test information for the cooling tower.

In COL FSAR Section 14.2.12, the COL applicant referred to COL FSAR Section 14.2.14, for this item. COL FSAR Section 14.2.14.10, "Cooling Tower Acceptance," described the objectives, prerequisites, test methods, data required, and acceptance criteria for tests on the cooling tower.

COL Information Item 14.2-8

The COL applicant provided additional information in COL FSAR Section 14.2.12 to address COL Information Item 14.2-8 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

A COL applicant that references the U.S. EPR design certification will provide site-specific test information for the raw water supply system (RWSS).

In COL FSAR Section 14.2.12, the COL applicant referred to COL FSAR Section 14.2.14, for this item. COL FSAR Section 14.2.14.1, "Raw Water Supply System," described the objectives, prerequisites, test methods, data required, and acceptance criteria for tests on the raw water supply system.

COL Information Item 14.2-9

The COL applicant provided additional information in COL FSAR Section 14.2.12 to address COL Information Item 14.2-9 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

A COL applicant that references the U.S. EPR design certification will provide site-specific test information for personnel radiation monitors.

In COL FSAR Section 14.2.12, the COL applicant referred to COL FSAR Section 14.2.14, for this item. COL FSAR Section 14.2.14.11, "Plant Laboratory Equipment," described the objectives, prerequisites, test methods, data required, and acceptance criteria for tests on the personnel radiation monitors and radiation survey instruments.

COL Information Item 14.2-10

The COL applicant provided additional information in COL FSAR Section 14.2.4, "Conduct of Test Program," to address COL Information Item 14.2-10 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

A COL applicant that references the U.S. EPR design certification will plan, and subsequently conduct, the plant startup test program.

The COL applicant addressed this item by committing to plan and conduct the initial test program and by committing to control the initial test program.

COL Information Item 14.2-11

The COL applicant provided additional information in COL FSAR Section 14.2.9, "Trial Use of Plant Operating and Emergency Procedures," to address COL Information Item 14.2-11 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

A COL applicant that references the U.S. EPR design certification will identify the specific operator training to be conducted as part of the low-power testing program related to the resolution of TMI Action Plan Item I.G.1, as described in:

1. NUREG-0660 - NRC Action Plans Developed as a Result of the TMI-2 Accident, Revision 1, August 1980.
2. NUREG-0694 - TMI-Related Requirements for New Operating Licenses, June 1980.
3. NUREG-0737 - Clarification of TMI Action Plan Requirements.

The COL applicant stated specific operator training and participation, as described in the U.S. EPR FSAR Tier 2, Section 14.2.9, "Trial Use of Plant Operating and Emergency Procedures" will be conducted to satisfy this COL information item.

Supplemental Information

The COL applicant provided the following supplemental information:

Site-specific startup tests were described for the following COL FSAR items:

- Section 14.2.14.1, "Raw Water Supply System"
- Section 14.2.14.2, "Ultimate Heat Sink (UHS) Makeup Water System"
- Section 14.2.14.3, "Essential Service Water Blowdown System"
- Section 14.2.14.4, "Essential Service Water Chemical Treatment System"

- Section 14.2.14.5, “Waste Water Treatment Plant”
- Section 14.2.14.6, “Fire Water Supply”
- Section 14.2.14.7, “Circulating Water Supply System”
- Section 14.2.14.8, “UHS Makeup Water Intake Structure Ventilation Systems”
- Section 14.2.14.9, “Cooling Tower Acceptance”
- Section 14.2.14.10, “Plant Laboratory Equipment”
- Section 14.2.14.11, “Personnel Monitors and Radiation Survey Instruments”
- Section 14.2.14.12, “UHS Makeup Water Intake Structure Communications System”
- Section 14.2.14.13, “Turbine Island Ventilation Systems”

14.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed within the final safety evaluation report (FSER) related to the U.S. EPR FSAR.

In addition, the relevant requirements of NRC regulations for the initial plant test program, and the associated acceptance criteria, are specified in NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition,” (hereafter referred to as NUREG-0800 or the SRP), Section 14.2, “Initial Plant Test Program - Design Certification and New License Applicants.”

The applicable regulatory requirements for the initial plant test program are as follows:

1. Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities,” Section 34(b)(6)(iii), “Contents of applications; technical information,” as it relates to the requirement that the COL applicant provide plans for preoperational testing and initial operations.
2. 10 CFR 30.53(c), “Tests,” as it relates to testing radiation detection and monitoring instruments.
3. 10 CFR Part 50, Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” Section XI, “Test Control,” as it relates to test programs established to assure that SSCs will perform satisfactorily in service.
4. 10 CFR Part 50, Appendix J, “Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors,” Section III.A.4, as it relates to the preoperational leakage rate testing of the primary reactor containment and related systems and components penetrating the primary containment pressure boundary.
5. 10 CFR 52.79(a)(28), “Contents of applications; technical information,” as it relates to the requirement that COL applicants provide plans for preoperational testing and initial operations.

6. 10 CFR 52.80(a), "Contents of applications; additional technical information," as it relates to the requirement that a COL application 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 the acceptance criteria met, the facility has been constructed and will operate in conformity with the combined license, the provisions of the Atomic Energy Act of 1954, and NRC regulations.

14.2.4 Technical Evaluation

The staff reviewed COL FSAR Section 14.2 and checked the referenced design certification FSAR to ensure that the combination of the information in the U.S. EPR FSAR and the information in the COL FSAR represents the complete scope of required information relating to this review topic. The review confirmed that the information contained in the COL application and incorporated by reference addresses the required information relating to this section. U.S. EPR FSAR Tier 2, Section 14.2 has been reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the information incorporated by reference related to the initial plant test program has been documented in the staff safety evaluation report on the design certification application for the U.S. EPR.

The staff's review of the information contained in the COL FSAR is discussed as follows:

The staff's review confirmed there is no outstanding information, outside of the U.S. EPR FSAR, related to the following COL FSAR sections:

- Section 14.2.6, "Test Records"
- Section 14.2.10, "Initial Fuel Load and Initial Criticality"
- Section 14.2.13, "References"

The staff's technical evaluation of the information incorporated by reference for these sections is discussed in the related section of the FSER related to the U.S. EPR FSAR.

The staff's SER, documenting the review of COL FSAR Section 14.2, is limited to the following COL FSAR sections and the COL information items and supplemental information contained therein:

- Section 14.2.1, "Summary of test program and objectives"
- Section 14.2.2, "Organization and staffing"
- Section 14.2.3, "Test procedures"
- Section 14.2.4, "Conduct of the test program"
- Section 14.2.5, "Review, evaluation, and approval of test results"
- Section 14.2.7, "Conformance of test program with regulatory guides"

- Section 14.2.8, “Utilization of reactor operating and testing experiences in development of initial test program”
- Section 14.2.9, “Trial use of plant operating and emergency procedures”
- Section 14.2.11, “Test program schedule”
- Section 14.2.12, “Individual test descriptions”
- Section 14.2.14, “COL applicant site-specific tests”

14.2.4.1 *Summary of Test Program and Objectives*

The staff reviewed conformance of COL FSAR Section 14.2.1 to the guidance in Regulatory Guide (RG) 1.206, “Combined License Applications for Nuclear Power Plants (LWR Edition),” Section C.III.1, Chapter 14, C.I.14.2.1, “Summary of Test Program and Objectives,” and to the guidance and applicable regulatory positions of RG 1.68. The staff notes that the COL applicant appropriately incorporates by reference U.S. EPR FSAR Tier 2, Section 14.2.1, “Summary of Test Program and Objectives.”

In addition, the COL applicant provided the following supplemental information.

In COL FSAR Section 14.2.1.1.4, “Phase III - Initial Criticality and Low Power Physics Testing,” the COL applicant added the following supplemental information for Item 6, following “The initial criticality and low-power physics tests (LPPT) as a minimum consist of the following:”

Verification that the Technical Specification SR 3.1.2.1 requirement of 1000 pcm is met. At this point the Site Commissioning Integration Supervisor or designee should verify that initial criticality activities have been completed and transition to those activities supporting low power physics testing.

Upon review of the information incorporated by reference and the supplemental information, the staff identified the following areas where additional information was needed. A description of the specific issues identified by the staff is as follows:

In RAI 21, Question 14.02-7, the staff requested that the COL applicant provide additional information on the site-specific procedures that will govern construction activities of the ITP. In a November 21, 2008, response to RAI 21, Question 14.02-7, the COL applicant proposed to revise COL FSAR Section 14.2.1 to include the development of site-specific administrative procedures that control the turnover of systems or portions of systems from the construction organization to the startup organization. The staff reviewed the COL applicant’s response, and concluded that the proposed change adequately describes the development of procedures that will govern the construction activities of the ITP. The COL applicant’s response also conforms to the guidance contained in RG 1.68 and RG 1.206. Therefore, the staff finds this proposed change acceptable. The staff confirmed that COL FSAR Revision 8, dated March 27, 2012, was revised as committed in the response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 21, Question 14.02-7 resolved.

The COL applicant’s FSAR lists the COL information items in COL FSAR Table 1.8-2, “FSAR Sections that Address COL information items.” In RAI 56, Question 14.02-32, the staff requested that the COL applicant revise COL FSAR Table 1.8-2 and COL FSAR Section 14.2 to

address all COL information items assigned to the COL applicant in U.S. EPR FSAR Tier 2, Section 14.2.

In a March 9, 2009, response to RAI 56, Question 14.02-32, the COL applicant proposed to revise COL FSAR Table 1.8-2 to include the additional COL information items assigned to the COL applicant in U.S. EPR FSAR Tier 2, Section 14.2 and to revise COL FSAR Section 14.2 to be consistent with the language of the COL information items given in U.S. EPR FSAR Tier 2, Table 1.8-2. The staff reviewed the COL applicant's response, and concluded that the proposed changes conform to the guidance contained in RG 1.68 and RG 1.206. Therefore, the staff finds these proposed changes acceptable. The staff confirmed that COL FSAR Revision 5, dated June 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant has adequately addressed this issue and, therefore, considers RAI 56, Question 14.02-32 resolved.

14.2.4.2 *Organization and Staffing*

The staff reviewed the conformance of COL FSAR Section 14.2.2 to the guidance in RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.2, "Organization and Staffing," and to the guidance and applicable regulatory positions of RG 1.68. The staff notes that the COL applicant appropriately incorporates by reference U.S. EPR FSAR Tier 2, Section 14.2.2, "Organization and Staffing."

In COL FSAR Section 14.2.2, the COL applicant provided information to supplement the existing information in the U.S. EPR FSAR Tier 2, Section 14.2.2 with a description of the organization, staffing, and responsibilities related to the initial test program. This information was provided to address COL Information Item 14.2-1 in the U.S. EPR FSAR. COL Information Item 14.2-1 states:

A COL applicant that references the U.S. EPR certified design will provide site-specific information that describes the organizational units that manage, supervise, or execute any phase of the test program. This description should address the organizational authorities and responsibilities, the degree of participation of each identified organizational unit, and the principal participants. The COL applicant should also describe how, and to what extent, the plant's operating and technical staff participates in each major test phase. This description should include information pertaining to the experience and qualification of supervisory personnel and other principal participants who are responsible for managing, developing, or conducting each test phase. In addition, the COL applicant is responsible for developing a training program for each fundamental group in the organization.

The staff reviewed the resolution of COL Information Item 14.2-1 related to the organization and staffing for the initial test program included in COL FSAR Section 14.2.2.

To resolve COL Information Item 14.2-1, the COL applicant provided the following information relating to organization, staffing, and responsibilities:

In COL FSAR Section 14.2.2, the COL applicant stated that UniStar Nuclear Engineering (UNE) will have both a corporate startup organization and a site-specific organization at CCNPP Unit 3. COL FSAR Figures 13.1-2, "Organizational Structure for Items and Issues Related to Nuclear Safety, Security and Reliability, Pursuant to the Negation Action Plan," 13.1-3, "Project Delivery Organization," and 13.1-4, "UNE Corporate Organization," show the relationships between the corporate and onsite startup organizations.

The President and Chief Executive Officer of UNE have overall responsibility for functions involving design, construction, testing, and operation of CCNPP Unit 3. The Senior Vice President of Services reports to the UNE President and CEO, and is responsible for managing the siting, construction, and preoperational testing during these phases of project delivery.

The Vice President – Startup, Testing, and Commissioning reports to the Senior Vice President of Services and is responsible for the development (in conjunction with the Project Delivery Consortium) and management of the CCNPP Unit 3 startup, testing, and commissioning program, which provides oversight and confirmation of system, structure, and component testing. This group also provides direct support to UniStar Nuclear Operating Services, LLC for system turnover and plant testing to ensure requirements are met. The startup, testing, and commissioning program consists of three functional groups: the commissioning program development group, the planning and scheduling group, and the commission integration group.

The commissioning program development personnel work closely with the Project Delivery Consortium to develop procedures describing organizational responsibilities and interfaces between the Consortium, UNE testing personnel, and the UniStar Nuclear Operating Services, LLC operational staff who will be accepting system turnover, maintaining configuration control, manipulating controls during testing, and reviewing test results.

Planning and scheduling personnel will ensure testing schedules are aligned with construction and turnover schedules and that the proper organizational resources are available when needed. Detailed monitoring of testing performance is conducted to ensure problems are quickly identified and corrected and to ensure that proper and timely notification of ITAAC performance is made to parties, including the NRC.

Oversight and coordination of actual startup, testing, and commissioning activities is performed by startup, testing, and commissioning personnel located at the site under the direction of the Site Commissioning Manager.

The COL applicant stated that the roles of nuclear steam supply system designer/supplier and architect engineer are combined in a Project Delivery Consortium formed by the collaboration of AREVA NP (AREVA) and Bechtel Power Corporation (Bechtel). The Consortium is complemented by the turbine-generator supplier, Alstom.

Within the Consortium, the CCNPP Unit 3 project is controlled by a Project Director (PD). The PD serves as the single point of contact for the Calvert Cliffs 3 Nuclear Project, LLC, and UNE to ensure efficient integration of engineering, procurement, and construction throughout the project delivery lifecycle. The Consortium will develop the startup testing and commissioning program with support and oversight of UNE engineering and startup and testing groups for implementation plans and procedures. Consortium personnel will provide technical support during startup of the facility and transition into the operational phase. Oversight of Consortium activities are performed by UNE personnel with relevant expertise in accordance with UNE-Consortium agreements and contracts.

The Project Delivery Consortium is responsible for developing the initial plant test program, procedures, and directing the tests at the CCNPP Unit 3. The Project Delivery Consortium will coordinate the construction schedules with startup test program requirements and provide manpower support as needed to meet the schedule, correct deficiencies, or make repairs. The organization provides technical advice and consultation on matters relating to the design, construction, operation, and testing of systems and equipment. The Project Delivery Consortium directs and controls startup program technical and functional test activities,

including prerequisite work and testing Phases I through IV. In addition, the Project Delivery Consortium directs the startup tests, subject to UNE oversight.

The Project Delivery Consortium and other contract or vendor staff will meet the education and experience guidance contained in American National Standards Institute/American Nuclear Society (ANSI/ANS)-3.1-1993, "Selection, Qualification, and Training of Personnel for Nuclear Power Plants," Section 3.2, for contractor and temporary positions.

UniStar Nuclear Operating Services, LLC will commission, operate, and maintain CCNPP Unit 3. They will provide trained manpower for the startup, testing, commissioning, and operation of the plants and use "lessons learned" from all operating U.S. EPRs to drive continuous improvement and maintain standard processes. UniStar Nuclear Operating Services, LLC will provide operational and maintenance input to design, and planning for construction, system turnover, and system testing and commissioning. In the construction phase, UniStar Nuclear Operating Services, LLC will provide trained and qualified station staff for operational support of system maintenance and configuration control, and component and system turnover and testing. During CCNPP Unit 3 startup and testing, UniStar Nuclear Operating Services, LLC will provide additional operations, maintenance, and support staff for oversight and execution of the startup testing and commissioning program and in review and evaluation of test results in support of the UNE Startup, Testing, and Commissioning organization.

During the startup period, the Site Commissioning Manager, who reports to the Manager of Commissioning Integration (UNE), is also a matrixed report to the CCNPP Unit 3 Site Vice President.

The Site Commissioning Manager is responsible for oversight and proper implementation of the preoperational and startup test program, including providing technical advice to people conducting the tests, briefing personnel responsible for operation of the plant during the tests, ensuring that the tests are performed in accordance with the applicable procedures, and reviewing test results and analyses. The Site Commissioning Manager executes these responsibilities through supervisors and technical personnel for mechanical, electrical, and instrumentation and control (I&C) commissioning, as well as overall integration of commissioning testing and test analysis and documentation. The supervisors in these areas functionally report to the Operations Manager to ensure efficient integration of commissioning staff with the plant operational staff for the testing and commissioning phase.

During startup and commissioning, the Site Commissioning Integration, Test Analysis & Documentation, Mechanical Commissioning, Electrical Commissioning, and I&C Commissioning Supervisors (who report to the UNE Site Commissioning Manager) also report to and coordinate with the Operations Manager to ensure startup and commissioning activities are conducted safely and in accordance with station expectations and procedures.

The UniStar Nuclear Operating Services, LLC plant operating, maintenance, and engineering personnel are utilized to the extent practicable during the Startup Test Program. The plant staff operates permanently installed and powered equipment for Phases I through IV and subsequent system tests. The Site Commissioning Manager will coordinate the use of the staff with the Site Vice President and the Project Delivery Organization.

The staff reviewed the resolution of COL Information Item 14.2-1 and identified the following areas where additional information was needed. A description of the specific issues identified by the staff is as follows:

In RAI 28, Question 14.02-16, the staff requested that the COL applicant revise COL FSAR Section 14.2.2 to provide implementing measures to ensure that personnel that are formulating and conducting test activities are not the same personnel who designed or are responsible for satisfactory performance of the system(s) or design features(s) being tested.

In a December 22, 2008, response to RAI 28, Question 14.02-16 (ML083650127), the COL applicant proposed to revise COL FSAR Section 14.2.2 to state:

Personnel formulating and conducting test activities are not the same personnel who designed or are responsible for satisfactory performance of the system(s) or design features(s) being tested.

The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206 and, therefore, considers this proposed change acceptable. The staff notes this item was incorporated into the COL applicant's COL FSAR Revision 5; however, the above language was not incorporated into the COL applicant's COL FSAR Revision 6. Therefore, in follow-up RAI 162, Question 14.02-49, the staff requested that the COL applicant reinstate in COL FSAR Section 14.2.2, the language included in response to RAI 28, Question 14.02-16 and in COL FSAR Revision 5.

In a November 20, 2009, response to RAI 162, Question 14.02-49, the COL applicant proposed to revise COL FSAR Section 14.2.2 to add a statement in the description of the Project Delivery Consortium that personnel formulating and conducting test activities are not the same personnel who designed or are responsible for satisfactory performance of the system(s) or design features(s) being tested. The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and is therefore acceptable. The staff confirmed that COL FSAR Revision 8, dated March 27, 2012, was revised as committed to in the response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 162, Question 14.02-49 resolved.

In RAI 22, Question 14.02-8, the staff requested that the COL applicant supplement COL FSAR Section 14.2.2 to include further details on the responsibilities, interfaces, and authorities of the principal participants in the ITP and of the plant staff as they relate to the ITP. In a November 21, 2008, response to RAI 22, Question 14.02-8, the COL applicant stated that the plant staff is not responsible for managing or executing the initial test program. The use of plant staff employees during Phases I through IV of the ITP is intended to be within their normal site-specific activities and qualifications during plant operation and not in a startup engineer role. If the plant staff employees were used in a startup engineer role, they would be required to meet those stated qualifications. The staff reviewed the COL applicant's response, and determined that the COL applicant's response is inconsistent with staff guidance and, therefore, in follow-up RAI 98, Question 14.02-38, the staff requested that the COL applicant address the staff's concerns.

In follow-up RAI 98, Question 14.02-38, , the staff requested that the COL applicant provide further details on the responsibilities, interfaces, and authorities of the principal participants in the ITP and of the plant staff as they relate to the ITP. Specifically, the staff requested that the COL applicant address the following points:

- Each manager that provides personnel to complete the ITP should have a statement in their position description that they will provide personnel to complete the ITP.

- It should be stated that during the performance of preoperational or startup test, whether the preoperational/start-up engineers will be responsible for running the test with plant personnel acting in a support role, or if a different chain of command will be established.
- During the execution of the ITP, it should be stated whether the start-up group or operations has the ultimate authority over the ITP.
- The description of the engineering manager's responsibilities should include that the engineering manager is part of the test review team (TRT).
- Specify which organization has responsibility for fuel loading during the ITP.
- Identify who will manage the workload of plant staff performing ITP with other duties.
- Identify and describe the controls that will be in place to manage the workload of plant staff performing ITP with other duties.

In a July 30, 2009, response to RAI 98, Question 14.02-38, the COL applicant stated that they updated COL FSAR Section 13.1 and included the proposed markup of COL FSAR Section 13.1. In addition, the COL applicant updated COL FSAR Section 14.2. The COL applicant's response addressed the bullets described above.

The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR, Revision 6, dated September 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 98, Question 14.02-38 resolved.

In RAI 51, Question 14.02-29, the staff requested that the COL applicant confirm that sufficient managerial oversight and staffing is provided to complete the initial test program. If any additional managerial oversight is necessary to complete the initial test program, the staff requested that the COL applicant revise COL FSAR Section 14.2.2 to provide an organization description of any additional management positions; a description of the responsibilities, interfaces, and authorities of any additional management positions; and a description of the education, training, and experience requirements of any additional management positions. RAI 51, Question 14.02-29 was based on COL FSAR Revision 3. The COL applicant provided a revised startup organization in COL FSAR Revision 6. Therefore, the staff notes that this RAI is no longer applicable, and considers RAI 51, Question 14.02-29 resolved.

In RAI 28, Question 14.02-14, and in follow-up RAI 102, Question 14.02-39, the staff requested that the COL applicant revise COL FSAR Section 14.2.2 to describe the education, training, qualification, and experience requirements for organizations responsible for the conduct of preoperational and startup tests, and for organizations that will develop testing, operating, and emergency procedures; and include a general description regarding the development of a training program for each functional group of employees in the organization relative to the schedule for preoperational testing and initial startup testing to ensure that the necessary plant staff is ready to begin the test program.

In a December 22, 2008, response to RAI 28, Question 14.02-14, and in a May 18, 2009, response to follow-up RAI 102, Question 14.02-39, the COL applicant stated that COL FSAR Table 13.1-1, "Generic Position/Site Specific Position Cross Reference," will be revised to identify the Startup Manager as equivalent to the ANS-3.1-1993, Section 4.2.4 Technical

Manager to establish the specific education, training, qualification, and experience requirements for the position of Startup Manager.

In addition, the COL applicant stated in a November 20, 2009, response to follow-up RAI 162, Question 14.02-44, that test procedures are prepared by the Project Delivery Consortium. In a December 22, 2008, response to RAI 28, Question 14.02-14, the COL applicant stated that testing is conducted by the startup/preoperational test engineers.

In a December 22, 2008, response to RAI 28, Question 14.02-14, and in a May 18, 2009, response to follow-up RAI 102, Question 14.02-39, the COL applicant stated that COL FSAR Table 13.1-1 establishes the startup and preoperational test engineer education, training, qualification, and experience requirements as those specified in ANSI/ANS-3.1-1993, Sections 4.4.11 and 4.4.12, respectively. The education and experience of AREVA personnel and other contract or vendor staff will meet the education, training, qualification, and experience guidance provided in ANSI/ANS-3.1-1993, Section 3.2, for contractor and temporary positions.

Furthermore, the COL applicant proposed a supplement to COL FSAR Section 14.2.2, "Qualifications and Training," to discuss the training requirements applicable to the personnel responsible for conduct of preoperational and startup tests. In addition to stating the education and qualification requirements for the Startup Manager, Startup Engineer, Preoperational Test Engineer, and other contract or vendor staff, COL FSAR Section 14.2.2 states that training of personnel that will be responsible for the conduct of preoperational and startup tests, and for organizations that will develop the preoperational and startup tests is based on site-specific training and qualification of engineering personnel. Specific topics that will be addressed include the following:

- Administrative controls for modifying procedures
- Verbatim procedure compliance and independent verification requirements
- Administrative controls for documenting condition reports
- Test sequence and program administration
- Documentation requirements, including acceptance criteria reviews
- Policies regarding operations control of equipment manipulations (valves, breakers, switches, etc.)
- Preoperational Test/Startup Engineer interface with Test Review Team
- Requirements regarding identifying (tagging) components within the released for test boundary
- Requirements for components within tag out boundaries
- Component specific training by major vendors (turbine, reactor coolant pumps, etc.), as applicable

The staff reviewed the COL applicant's response, and concluded that the proposed revision conforms to the guidance contained in RG 1.68 and RG 1.206 and, therefore, considers this proposed change acceptable. The staff confirmed that COL FSAR Revision 5 dated June 30,

2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 28, Question 14.02-14, RAI 162, Question 14.02-4, and RAI 102, Question 14.02-39 resolved.

Based on the COL applicant's COL FSAR Revision 3, in RAI 16, Question 14.02-5, and in follow-up RAI 98, Question 14.02-37, the staff requested that the COL applicant either confirm that the System Engineer and Preoperational Test Engineer are the same position and fix the discrepancy in the title of the position in COL FSAR Section 14.2.2 and COL FSAR Table 13.1-1, or add the System Engineer and associated education, training, and experience requirements in COL FSAR Table 13.1-1, and add the Preoperational Test Engineer and associated roles and responsibilities to COL FSAR Section 14.2.2.

In a July 30, 2009, response to RAI 98, Question 14.02-37, the COL applicant stated that they performed an update of COL FSAR Section 13.1 and included the proposed markup of COL FSAR Section 13.1. In addition, the COL applicant updated COL FSAR Section 14.2. COL FSAR Section 13.1.1.1, "Design, Construction and Operating Responsibilities," included the description of the Project Delivery Consortium which will be responsible for managing and executing each phase of the test program.

The Preoperational Test Engineers and the Startup Engineers position titles have been replaced with the Site Commissioning Integration Supervisor, Test Analysis & Documentation Supervisor, Electrical Commissioning Supervisor, and DCS Commissioning Supervisor. Each will be qualified to fulfill both the Preoperational Test Engineer and the Startup Testing Engineer qualifications in ANSI/ANS-3.1-1993.

The staff confirmed that COL FSAR Revision 6, dated September 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 98, Question 14.02-37 resolved. Since the subject of the staff's original request is no longer applicable, the staff also considers RAI 16, Question 14.02-5 resolved.

In its July 21, 2009, responses to RAI 98, Questions 14.02-37 and 14.02-38, the COL applicant stated that they performed an update of COL FSAR Section 13.1 and included the proposed markup of COL FSAR Section 13.1. In addition, the COL applicant proposed a revision to COL FSAR Section 14.2. These changes were included in the COL applicant's COL FSAR Revision 6, as described above. The staff reviewed the COL applicant's revisions to COL FSAR Sections 13.1 and 14.2, and identified the following issues.

In RAI 162, Question 14.02-44, the staff requested that UniStar revise the remainder of COL FSAR Section 14.2 to reflect the new organizational structure described in the proposed revision to COL FSAR Section 14.2.2 in response to RAI 98, Questions 14.02-37 and 14.02-38, which was incorporated into the COL applicant's COL FSAR, Revision 6.

In a November 20, 2009, response to RAI 162, Question 14.02-44, the COL applicant submitted a proposed revision to the remainder of COL FSAR Section 14.2 to address the new organizational structure. The staff finds the COL applicant's proposed revision acceptable with one exception. Therefore, in follow-up RAI 202, Question 14.02-56, the staff requested that the COL applicant address their concerns that are discussed below.

In follow-up RAI 202, Question 14.02-56, the staff noted that in the first paragraph of the proposed revision to COL FSAR Section 14.2.5.1, "Procedure Review and Evaluation," the COL applicant replaced the "Startup/Preoperational Test Engineer" with "test engineer." The test

engineer is not described in COL FSAR Section 14.2.2 or in COL FSAR Chapter 13, "Conduct of Operations." The staff requested that the COL applicant clarify whether the test engineer is equivalent to a Commissioning Supervisor, or if it is a new position. The staff requested that the COL applicant revise COL FSAR Section 14.2.5.1 to state "Commissioning Supervisor" instead of "test engineer" if the test engineer is a Commissioning supervisor, or that the COL applicant revise COL FSAR Section 14.2.2 to include a description of the test engineer if the test engineer is a new position.

In a March 3, 2010, response to RAI 202, Question 14.02-56, the COL applicant replaced "test engineer" with "responsible Commissioning Supervisor, or designee test engineer." The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and is therefore acceptable. The staff confirmed that COL FSAR Revision 8, dated March 27, 2012 was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 202, Question 14.02-56 resolved.

In RAI 162, Question 14.02-45, the staff requested that the COL applicant revise COL FSAR Section 14.2.2 to reinstate the provision that the NSSS vendor, architect-engineer, and other major contractors, as appropriate, should provide the test objectives and acceptance criteria used in developing detailed test procedures.

In a November 20, 2009, response to RAI 162, Question 14.02-45, the COL applicant proposed adding the following responsibility to the bulleted list of responsibilities of the Project Delivery Consortium specified in COL FSAR Section 14.2.2:

Providing the objectives and acceptance criteria used in developing detailed test procedures

The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 8, dated March 27, 2012, was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 162, Question 14.02-45 resolved.

In RAI 162, Question 14.02-46, the staff noted that COL FSAR, Revision 5, Section 14.2 described the roles and responsibilities of the Startup Manager, Startup Engineering Support Supervisors, System Engineers, Startup and Preoperational Engineers, Architect Engineering Personnel, and the AREVA Site Startup Organization. Specifically, these positions had, in part, the following responsibilities:

- Approving startup administrative procedures
- Approving startup technical procedures
- Approving startup test schedule
- Approving work and procedures that are prerequisites for ITP
- Developing and implementing administrative controls to address system and equipment configuration control
- Managing the development and approval of procedures to support the ITP

- Responsibility for specific systems/subsystems for the ITP
- Providing technical guidance and assistance in testing and the preparation of test procedures
- Recommending changes in plant design and/or construction to facilitate testing, operation, and maintenance
- Assuring that assigned test procedures are written and testing is conducted in accordance with the site specific administrative procedures
- Supervising testing and reporting current status of ITP
- Coordinating activities among involved groups
- Providing the objectives and acceptance criteria used in developing detailed test procedures
- Providing a designated member of the test review team
- Evaluating test results
- Providing technical support and liaison with the startup organization to coordinate problem resolution
- Provide the objectives and acceptance criteria used in developing detailed test procedures
- Provide initial procedure drafts of startup test procedures and review proposed changes
- Provide technical advice and consultation to the plant staff during the conduct of the test program

In RAI 162, Question 14.02-46, the staff also requested that the COL applicant identify which positions in the revised startup organization will perform each of these tasks and requested that the COL applicant revise COL FSAR Section 14.2, accordingly.

In a November 20, 2009, response to RAI 162, Question 14.02-46, the COL applicant stated that the Site Commissioning Manager – Startup, Testing and Commissioning will approve startup administrative procedures, startup technical procedures, the startup test schedule, and work and procedures that are prerequisites for the ITP.

The Project Delivery Consortium will develop and implement administrative controls to address system and equipment configuration control. The Consortium will assure that assigned test procedures are written and testing is conducted in accordance with the site-specific administrative procedures. In addition, the Consortium will supervise testing and report the current status of ITP, coordinate activities among involved groups, provide the objectives and acceptance criteria used in developing detailed test procedures, provide a designated member of the test review team. The consortium will evaluate test results, provide technical support and liaison with the startup organization to coordinate problem resolution, and provide the objectives and acceptance criteria used in developing detailed test procedures. Lastly, the Consortium will also provide initial procedure drafts of startup test procedures and review proposed changes,

and provide technical advice and consultation to the plant staff during the conduct of the test program.

The Manager of Commissioning Program Development is responsible for managing the development and approval of procedures supporting the ITP.

The Systems Engineers, which are matrixed from the engineering department, have responsibility for specific systems/subsystems during the conduct of the ITP, provide technical guidance and assistance in testing and the preparation of test procedures, and recommend changes in plant design and/or construction to facilitate testing, operation, and maintenance.

The COL applicant also provided markup pages of COL FSAR Section 14.2 that incorporate the proposed changes. The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and is therefore acceptable. The staff confirmed that COL FSAR Revision 8, dated March 27, 2012, was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 162, Question 14.02-46 resolved.

In RAI 162, Question 14.02-47, the staff requested that UniStar clarify whether the five supervisors that report to the Site Commissioning Manager, and include the Site Commissioning Integration Supervisor, Test Analysis & Documentation Supervisor, Mechanical Commissioning Supervisor, Electrical Commissioning Supervisor, and I&C Commissioning Supervisor, will be performing the tests in the initial test program in the role of preoperational and startup engineers or whether they will be supervising staff performing these functions. In addition, the staff requested that the COL applicant revise COL FSAR Section 14.2 to clearly reflect the role of these supervisors in the conduct of the initial test program.

In a November 20, 2009, response to RAI 162, Question 14.02-47, the COL applicant stated that the five supervisors that report to the Site Commissioning Manager will not be performing any test during the initial test program. This is described in COL FSAR Section 14.2.2. The role of the Site Commissioning Manager, which is executed by the five supervisors, is for oversight and proper implementation of the preoperational and startup test program. COL FSAR Section 14.2.2 (under Project Delivery Consortium) states that the Project Delivery Consortium is responsible for developing the initial plant test program, procedures, and directing the tests at the CNPP Unit 3. In addition, the COL applicant provided markup pages that include the responsibilities of the supervisors and incorporates the above changes. The staff reviewed the COL applicant's response, and finds that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 8, dated March 27, 2012, was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 162, Question 14.02-47 resolved.

In RAI 162, Question 14.02-48, the staff noted that the proposed revision to COL FSAR Section 14.2.2 states, in part, that the commissioning and startup program include construction inspections and tests to verify that structures, systems, and components have been installed to conform to design specifications, drawings, and other design documents. This group ensures system turnover and testing procedures and boundaries are complete, accurate, and sufficiently clear to allow for the safe and efficient turnover of systems to UniStar Nuclear Operating Services, LLC. This group also provides direct support to UniStar Nuclear Operating Services, LLC for system turnover and plant testing to ensure requirements are met.

The staff notes that the above description appears to describe construction acceptance testing and the turnover process after construction inspection. Therefore, in RAI 162, Question 14.0-48, the staff also requested that the COL applicant clarify how the above description relates to the initial test program and revise COL FSAR Section 14.2.2, accordingly.

In a November 20, 2009, response to RAI 162, Question 14.02-48, the COL applicant proposed the removal of the paragraphs described the construction acceptance testing and the turnover process after construction inspection from the description of the Startup Organization in COL FSAR Section 14.2.2 and limited the discussion to the organizational units associated with each phase of the Startup Test Program.

These activities are described in the proposed revision to COL FSAR Section 13.1.1.1.1.5, "UniStar Nuclear Operating Services, LLC," that was submitted with the COL applicant's July 21, 2009, response to RAI 98, Questions 14.02-37 and 14.02-38. In addition, the COL applicant proposed to add COL FSAR Section 14.2.1.1.1, "Construction Activities," to describe the turnover process and the site-specific administrative procedures that describe it. The staff notes that with the exception of the section numbering and the change of positions to conform to the newly proposed organization, this change is identical to the one proposed in response to RAI 21, Question 14.02-7.

The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and is therefore acceptable. The staff confirmed that COL FSAR Revision 8, dated March 27, 2012, was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 162, Question 14.02-48 resolved.

14.2.4.3 *Test Procedures*

The staff reviewed conformance of COL FSAR Section 14.2.3 to the guidance in RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.3, "Test Procedures," and to the guidance and applicable regulatory positions of RG 1.68. The staff concluded that the COL applicant appropriately incorporates by reference U.S. EPR FSAR Tier 2, Section 14.2.3, "Test Procedures." The staff review of this COL application is limited to COL Information Item 14.2-3, which states:

A COL applicant that references the U.S. EPR design certification will provide site-specific information for review and approval of test procedures.

To address COL Information Item 14.2-3, the COL applicant provided information on test procedure preparation and execution, special test procedures, sign-off provisions, acceptance criteria, procedure adherence policy, and maintenance/modification procedures.

The staff reviewed the COL applicant's information provided in COL Information Item 14.2-3 related to test procedures included under COL FSAR Sections 14.2.3.1, "Test Procedure Preparation and Execution," through 14.2.3.6, "Maintenance/Modification Procedures." The staff reviewed the information provided to address COL Information Item 14.2-3 related to test procedures, and identified the following area where additional information was needed. A description of the specific issue identified by the staff is as follows:

In RAI 20, Question 14.02-6, the staff requested that the COL applicant indicate how test acceptance criteria will account for measurement errors and uncertainties used in the transient and accident analyses in COL FSAR Section 14.2.3.4, "Acceptance Criteria."

In a November 21, 2008, response to RAI 20, Question 14.02-6, the COL applicant stated that additional details have been included in U.S. EPR FSAR Tier 2, Section 14.2.3 in a September 24, 2008, response to U.S. EPR RAI 68, Question 14.02-27, to address RG 1.68, Regulatory Position C.4. The staff reviewed the COL applicant's response, and concluded that applicant's response conforms to the guidance contained in RG 1.68 and RG 1.206 and, therefore, finds the response acceptable. The staff confirmed that Revision 1 of the U.S. EPR FSAR, dated May 29, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant has adequately addressed this issue and, therefore, the staff considers RAI 20, Question 14.02-6 resolved.

14.2.4.4 *Conduct of Test Program*

The staff reviewed conformance of COL FSAR Section 14.2.4 to the guidance in RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.4, "Conduct of Test Program," and to the guidance and applicable regulatory positions of RG 1.68. The staff concluded that the COL applicant appropriately incorporates by reference U.S. EPR FSAR Tier 2, Section 14.2.4, "Conduct of Test Program." The staff's evaluation is limited to the information provided to address COL Information Item 14.2-10 relating to administrative controls for adhering to approved test procedures during conduct of the test program, which states:

A COL applicant that references the U.S. EPR design certification will plan, and subsequently conduct, the plant startup test program.

The COL applicant addressed this COL information item by stating that the initial test program will be planned and conducted by the startup test group and will be controlled by administrative procedures and requirements. The format and content of the startup procedures is addressed in the COL FSAR Section 14.2.3.

COL FSAR Section 14.2.5 addresses the review and approval process for both initial issue and subsequent revisions of test procedures. In addition, it addresses the review and approval process for test results, as well as for the failure to meet acceptance criteria or other operational problems or design deficiencies. COL FSAR Section 14.2.5 also describes the phases of the initial test program and establishes the requirements for progressing from one phase to the next, as well as the requirements for moving beyond selected hold points or milestones within a given phase.

The controls used to verify that the as-tested status of each system is known and those modifications, including retest requirements deemed necessary for systems undergoing or already having completed testing, are tracked and addressed in COL FSAR Section 14.2.3.6.

Lastly, the qualifications and responsibilities of the positions within the startup test group are addressed in COL FSAR Section 14.2.2.

The staff reviewed the resolution to the COL information item related to administrative control for adhering to approved test procedures included under COL FSAR Sections 14.2.2, 14.2.3, 14.2.4, and 14.2.5. The staff identified the following area where additional information was needed. A description of the specific issue identified by the staff is as follows:

In RAI 51, Question 14.02-30, the staff requested that the COL applicant revise COL FSAR Sections 14.2.3, 14.2.4, and 14.2.5 to include descriptions of administrative procedures and requirements for processes such as the distribution and control of procedures as they relate to

version control, and to provide further details on the processes related to test corrections, test interruptions, procedure modifications, and procedure revisions.

In a February 27, 2009, response to RAI 51, Question 14.02-30, the COL applicant stated that the COL FSAR Section 13.5.1.1 states, "Procedures shall be reviewed, approved, and controlled according to the requirements of the UniStar Nuclear QAPD." COL FSAR Section 13.5.1.1.7, "Temporary Procedures," provides additional detail regarding temporary procedures which might be used to provide guidance for testing and/or unusual situations not within the scope of normal procedures. COL FSAR Section 13.5.2.1.5, "Operating Procedure Program," describes an operating procedures program used to develop the procedures to control plant operations. The COL applicant stated that this information is generically applicable to the use and control of procedures at COL FSAR and as such is directly applicable to COL FSAR Sections 14.2.3 and 14.2.4.

Additionally, with regard to test interruptions and test corrections, the COL applicant stated that the decision to interrupt the performance of a test is the responsibility of the Startup/Preoperational Test Engineer/Senior Operator, but in cases of personnel or equipment safety issues, any of the personnel involved with the test can interrupt a test in progress. When a test has been interrupted the Startup/Preoperational Test Engineer and Senior Operator will determine if the test can be safely resumed at the point it was interrupted or whether the test must be restarted at the beginning of the test.

In addition, the COL applicant proposed to supplement COL FSAR Section 14.2.3.1 with the following statement: "The control of procedures as it relates to distribution, version control, modifications, and revisions meets the administrative control requirements as described in Section 13.5."

Furthermore, the COL applicant proposed to revise COL FSAR Section 14.2.3.5, "Procedure Adherence Policy," as shown below:

The startup organization employs a verbatim procedure adherence program and document violations to the program in the Corrective Action Program. When a procedure step is discovered that cannot be performed as written the plant shall be placed in a safe condition in accordance with the restoration guidance in the procedure or as determined by the {Senior Reactor Operator, responsible Commissioning Supervisor, or designee} and all related testing activities placed on hold by the {responsible Commissioning Supervisor or designee} until the procedure is revised.

The decision to interrupt the performance of a test is the responsibility of the {responsible Commissioning Supervisor or designee, or a Senior Reactor Operator} but in cases of personnel or equipment safety issues, any of the personnel involved with the test can interrupt a test in progress. When a test has been interrupted, the {responsible Commissioning Supervisor or designee} will determine if the test can be safely resumed at the point it was interrupted or whether the test must be restarted at the beginning of the test.

The staff reviewed the COL applicant's response, and concluded that the revision conforms to the guidance contained in RG 1.68 and RG 1.206 and, therefore, finds this proposed change acceptable. The staff confirmed that COL FSAR Revision 5, dated June 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 51, Question 14.02-30 resolved.

14.2.4.5 *Review, Evaluation, and Approval of Test Results*

The staff reviewed conformance of COL FSAR Section 14.2.5 to the guidance in RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.5, "Review, Evaluation, and Approval of Test Results," and to the guidance and applicable regulatory positions of RG 1.68. The staff concluded that the COL applicant appropriately incorporates by reference U.S. EPR FSAR Tier 2, Section 14.2.5, "Review, Evaluation, and Approval of Test Results." The staff's review is limited to the information provided to address COL Information Item 14.2-4, which states:

A COL Applicant that references the U.S. EPR design certification will address the site-specific administrative procedures for review and approval of test results.

To address this COL information item, the COL applicant provided information on procedure review and evaluation, the roles and responsibilities of the test review team, and the expectations of the test program, which included the requirements for moving between phases of the test program.

The staff reviewed the resolution to the COL information item related to site-specific procedures for review and evaluation of test results, approval of individual test results, approval of milestones, and hold points within each test phase included under COL FSAR Section 14.2.5. The staff identified the following areas where additional information was needed. A description of the specific issues identified by the staff is as follows:

In RAI 24, Question 14.02-10, the staff requested that the COL applicant revise COL FSAR Section 14.2.5 to include the provisions for the development of procedures to control the review, evaluation, and approval of test results for each phase of the test program, and for the development of procedures to ensure notification of responsible organizations, such as design organizations, when test acceptance criteria are not met and to ensure that specific controls have been established to resolve such problems.

In a December 19, 2008, response to RAI 24, Question 14.02-10, the COL applicant stated that the preoperational and startup test review team is used to review the startup tests before the tests are performed and to review the completed test results and any revisions after the test is completed.

The COL applicant proposed to revise COL FSAR Section 14.2.5.2, "Test Review Team," to add the following statement to the functional description of the TRT:

Verify that the test results that do not meet acceptance criteria are entered into the corrective action program and the affected and responsible organizations are notified and have assumed responsibility for resolving the acceptance criteria deficiency. Implementation of corrective actions and retests are performed as required prior to proceeding to the next phase.

The staff reviewed the COL applicant's December 19, 2008, response to RAI 24, Question 14.02-10, and concluded that the revision conforms to the guidance contained in RG 1.68 and RG 1.206 and, therefore, finds this proposed change acceptable. The staff confirmed that COL FSAR Revision 5, dated June 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 24, Question 14.02-10 resolved.

In RAI 24, Question 14.02-11, dated October 17, 2008, the staff requested that the COL applicant revise COL FSAR Section 14.2.5 to include the methods and schedules for approval of test data for each major phase, and the methods used for initial review of individual parts of multiple tests.

In a December 19, 2008, response to RAI 24, Question 14.02-11, the COL applicant stated that TRT is used to review the startup test procedures before the tests are performed and to review the completed test results and any revisions after the test is completed. As stated in COL FSAR Section 14.2.5.3, "Test Expectations," test results for each phase of the test program are reviewed and verified to be complete (as required) and satisfactory before "the next phase of testing is started." The COL applicant proposed to revise COL FSAR Section 14.2.5.3 to state:

Results of tests and individual parts of multiple tests conducted at a plateau are evaluated prior to proceeding to the next level.

The staff reviewed the COL applicant's response, and concluded that the revision conforms to the guidance contained in RG 1.68 and RG 1.206 and, therefore, finds this proposed change acceptable. The staff confirmed that COL FSAR Revision 5, dated June 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 24, Question 14.02-11 resolved.

In RAI 24, Question 14.02-12, the staff requested that the COL applicant clarify which provisions in the COL application ensure the involvement of design organizations in the resolution of design-related problems that result in, or contribute to, a failure to meet test acceptance criteria, and revise COL FSAR Section 14.2.5.1 accordingly.

In a December 19, 2008, response to RAI 24, Question 14.02-12, the COL applicant stated that the engineering (design) organization is a member of the TRT as stated in COL FSAR Section 14.2.5.2. The intent of the TRT reviews is to ensure that the design bases are adequately verified prior to beginning downstream testing. The functions of the TRT are stated in COL FSAR Section 14.2.5.2. These functions require that affected and responsible organizations (including design) are notified when test acceptance criteria are not met. The revision made to satisfy RAI 24, Question 14.02-10 applied to the COL applicant's response to RAI 24, Question 14.02-12 as well.

The staff reviewed the COL applicant's response, and concluded that the revision conforms to the guidance contained in RG 1.68 and RG 1.206 and, therefore, finds this proposed change acceptable. The staff confirmed that COL FSAR Revision 5, dated June 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 24, Question 14.02-12 resolved.

In RAI 28, Question 14.02-17, the staff requested that the COL applicant establish appropriate hold points at selected milestones throughout the power-ascension test phase to ensure that relevant test results are evaluated and approved by the designated personnel or groups before proceeding with the power-ascension test phase.

In a December 22, 2008, response to RAI 28, Question 14.02-17, the COL applicant proposed a revision to COL FSAR Section 14.2.5.3 to identify the hold points for power ascension tests and the requirements for moving beyond selected hold points. In the proposed revision, the COL applicant stated:

The TRT membership is increased prior to beginning the low power physics testing phase by adding the Plant Manager, Engineering Manager, Operations Manager, and Maintenance Manager to the TRT. Power ascension tests are scheduled and conducted at pre-determined power levels. The power ascension plateaus are as follows:

- 5 %
- 25 %
- 50 %
- 75 %
- ≥ 98 %

The TRT shall review the tests performed in the plateau and determine if it is acceptable to proceed to the next plateau. If core anomalies or plant stability issues are present, the TRT shall assign a responsible organization to develop bases for proceeding to a higher power level that is reviewed, approved, and entered into the plant records by the TRT prior to increasing reactor power.

The staff reviewed the COL applicant's response, and concluded that the revision conforms to the guidance contained in RG 1.68 and RG 1.206 and, therefore, finds this proposed change acceptable. The staff confirmed that Revision 5 of the COL FSAR Revision 5, dated June 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 28, Question 14.02-17 resolved.

In RAI 214, Question 14.02-57, the staff noted that COL FSAR Section 14.2.5.3 identifies considerations that would be used to determine whether tests could proceed to the next power ascension plateau. For example, the considerations identify plant transients, core anomalies, or plant stability issues that would be reviewed, along with test results, by the TRT to determine whether to proceed to the next power level. There is a second tier of plant conditions that were not included in the descriptions, associated with radiation safety requirements under 10 CFR Part 20, "Standards for Protection Against Radiation," Appendix B, "Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage," and 10 CFR 50.36a, "Technical Specifications on Effluents from Nuclear Power Reactors," to control and monitor liquid and gaseous effluents under 10 CFR Part 50, Appendix I, "Numerical Guidelines for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low As Is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents." Accordingly, the staff requested that the COL applicant revise the scope of plant conditions to include test outcomes that would be reviewed by the TRT and identify actions to be taken to avoid violations of NRC radiation protection regulations and license conditions to control doses to plant workers and members of the public.

In a March 24, 2010, response to RAI 214, Question 14.02-57, the COL applicant proposed a revision to COL FSAR Section 14.2.5.3 that would expand the scope of plant parameters that will be reviewed by the TRT and evaluated against limits before allowing the test to proceed to the next step. The additional test limits identified in the proposed revision include 10 CFR Part 20 and 10 CFR 50.36a. Under 10 CFR Part 20, a COL holder is required to monitor and conduct radiological surveys and evaluations to confirm that plant operations, including the conduct of tests, do not result in doses to workers in excess of 10 CFR Part 20, Subpart C, "Occupational Dose Limits," in excess of 10 CFR Part 20, Subpart D, "Radiation

Dose Limits for Individual Members of the Public,” for members of the public, and that all radiation exposures and resulting doses are as low as is reasonably achievable (ALARA) as mandated by 10 CFR Part 20, Subpart B. Under 10 CFR 50.36a, a COL holder is required to operate and maintain the plant such that operations comply with the design objectives of 10 CFR Part 50, Appendix I, Sections II.A, II.B, and II.C in ensuring that offsite individual doses resulting from liquid and gaseous effluent releases are ALARA and will not exceed numerical guides and design objectives and comply with 10 CFR 50.36a and 10 CFR 50.34a, “Design Objectives for Equipment to Control Releases of Radioactive Material in Effluents – Nuclear Power Reactors.” Given the above, the staff finds the COL applicant’s response and inclusion of additional information in COL FSAR Section 14.2.5.3 acceptable. The staff confirmed that COL FSAR Revision 8, dated March 27, 2012, was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 214, Question 14.02-57 resolved.

14.2.4.6 *Conformance of Test Programs with Regulatory Guides*

The staff reviewed conformance of COL FSAR Section 14.2.7 to the guidance in RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.7, “Conformance of Test Programs with Regulatory Guides,” and to the guidance and applicable regulatory positions of RG 1.68. The staff concluded that the COL applicant appropriately incorporates by reference U.S. EPR FSAR Tier 2, Section 14.2.7, “Conformance of Test Program with Regulatory Guidance.” However, the staff identified the following area where additional information was needed. A description of the specific issue identified by the staff is as follows:

COL FSAR Section 14.2.7 incorporates by reference U.S. EPR FSAR Tier 2, Section 14.2.7. The list provided in the U.S. EPR FSAR does not include RG 1.136, “Design Limits, Loading Combinations, Materials, Construction, and Testing of Concrete Containments,” which is included in RG 1.206, Section C.I.14.2.7. Therefore, in RAI 50, Question 14.02-27, the staff requested that the COL applicant provide clarifying information related to the applicability of RG 1.136 or the justification for taking exception to RG 1.136.

In an April 30, 2009, response to RAI 50, Question 14.02-27, the COL applicant stated that COL FSAR Section 14.2.7 incorporates U.S. EPR FSAR, Tier 2, Section 14.2.7 with no departures or supplements. In Revision 1 of the U.S. EPR FSAR, the list of applicable regulatory guides in U.S. EPR FSAR Tier 2, Section 14.2.7 was updated to include RG 1.136. Therefore, RG 1.136 is incorporated by reference into the COL FSAR. The staff reviewed the COL applicant’s response, and concluded that the response conforms to the guidance contained in RG 1.68 and RG 1.206 and, therefore, finds the response acceptable. Therefore, the staff considers RAI 50, Question 14.02-27 resolved.

14.2.4.7 *Utilization of Reactor Operating and Testing Experience in Test Program Development*

The staff reviewed conformance of COL FSAR Section 14.2.8 to the guidance in RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.8, “Utilization of Reactor Operating and Testing Experiences in Test Program Development,” and to the guidance and applicable regulatory positions of RG 1.68. The staff concluded that the COL applicant appropriately incorporates by reference U.S. EPR FSAR Tier 2, Section 14.2.8, “Utilization of Reactor Operating and Testing Experience in Development of Initial test Program.” However, the staff identified the following area where additional information was needed. A description of the specific issue identified by the staff is as follows:

U.S. EPR FSAR Tier 2, Section 14.2.8 describes its program for reviewing available information related to reactor operating and testing experiences and discusses how this information is used to develop the initial test program. This description includes the sources and types of information reviewed, the conclusions or findings, and the effect of the review on the initial test program. However, U.S. EPR FSAR Tier 2, Section 14.2.8 does not state that the summary or review will contain recognized categories of reportable, repeatedly experienced occurrences and other operating experiences that could potentially impact the performance of the test program.

Therefore, in RAI 23, Question 14.02-9, the staff requested that the COL applicant supplement the summary of operating experience and its effects on the test program in COL FSAR Section 14.2.8 to provide more details with respect to testing experiences at other reactor facilities and categories of reportable, repeatedly experienced occurrences and other operating experiences that could potentially impact the performance of the test program. The staff notes that this RAI is no longer applicable, because Revision 1 of U.S. EPR FSAR Tier 2, Section 14.2.8 now contains this information. Therefore, the staff considers RAI 23, Question 14.02-9 resolved.

The staff review of COL FSAR Section 14.2.8 is limited to the information which addressed COL Information Item 14.2-6, which stated:

The first COL applicant that references the U.S. EPR certified design will commit to review results from European predecessors concerning the new, unique, or novel EPR features (such as reactor internals (vibration measurement), natural circulation of the reactor coolant system, reactor coolant pump stand-still seal, pressurizer surge line (thermal stratification)) and propose supplemental testing if necessary.

The COL applicant initially addressed this COL information item by committing to review results from European predecessors concerning the new, unique, or novel U.S. EPR features such as those previously noted in U.S. EPR FSAR Tier 2, Section 14.2.8.1, to propose supplemental testing if necessary, and to share that information with subsequent COL applicants.

The staff reviewed the COL applicant's response to the COL information item related to consideration of previously performed testing for unique or plant-specific design. The staff identified the following area where additional information was needed. A description of the specific issue identified by the staff is as follows:

The U.S. EPR is an evolutionary design and does not contain new, unique, or first-of-a-kind design features that would require prototype testing on the first plant only, or first three plants. The following design features were identified in the U.S. EPR FSAR as possibly being novel in the United States:

- Reactor internals (vibration measurement)
- Natural circulation of the reactor coolant system
- Reactor coolant pump stand-still seal
- Pressurizer surge line (thermal stratification)

The staff determined that these design features do not meet the definition of first-of-a-kind design features and, therefore, these features will be tested on each plant referencing the U.S. EPR design certification. Therefore, the statement to commit the first COL applicant to review the operating and testing experience is redundant as this action item is already contained in the commitment in U.S. EPR FSAR Tier 2, Section 14.2.8, which states, "...the plant operations staff reviews reactor operating and testing experiences at other facilities that are similar in design and capacity prior to the Unit starting up."

In U.S. EPR FSAR Tier 2, Revision 1, Section 14.2.8.1, "First-of-a-Kind Testing," the design certification applicant (AREVA) removed the paragraph stating, "...the first COL applicant that references the U.S. EPR certified design will commit to review results from European predecessors concerning the new, unique, or novel U.S. EPR features such as those previously noted and propose supplemental testing if necessary," and removed the associated COL information item from U.S. EPR FSAR Tier 2, Table 1.8-2.

In RAI 92, Question 14.02-35, the staff requested that the COL applicant remove the supplemental information that was in COL FSAR Section 14.2.8.1 and the associated COL information item, and revise COL FSAR Table 1.8-2 to be consistent with U.S. EPR FSAR Tier 2, Revision 1, Section 14.2.8.1.

In an April 29, 2009, response to RAI 92, Question 14.02-35, the COL applicant agreed to remove the COL information item committing the first COL applicant to review results from European predecessors. The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 6, dated September 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 92, Question 14.02-35 resolved.

14.2.4.8 *Trial Use of Plant Operating and Emergency Procedures*

The staff reviewed conformance of COL FSAR Section 14.2.9 to the guidance in RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.9, "Trial use of Plant Operating and Emergency Procedures," and to the guidance and applicable regulatory positions of RG 1.68. The staff concluded that the COL applicant appropriately incorporates by reference U.S. EPR FSAR Tier 2, Section 14.2.9. The staff's review of COL FSAR Section 14.2.9 is limited to the information provided to address COL Information Item 14.2-11 which states:

A COL applicant that references the U.S. EPR design certification will identify the specific operator training to be conducted as part of the low-power testing program related to the resolution of TMI Action Plan Item I.G.1, as described in (1) NUREG-0660-NRC Action Plans Developed as a Result of the TMI-2 Accident, Revision 1, August 1980, (2) NUREG-0694 - TMI-Related Requirements for New Operating Licenses, June 1980, and (3) NUREG- 0737 - Clarification of TMI Action Plan requirements.

The COL applicant addresses this COL information item by committing to conduct specific operator training and participation, as described in the U.S. EPR FSAR Tier 2, Section 14.2.9.

The staff reviewed the resolution to the COL information item related to specific operator training included under COL FSAR Section 14.2.9. The staff identified the following area where

additional information was needed. A description of the specific issue identified by the staff is as follows:

In RAI 49, Question 14.02-25, the staff requested that the COL applicant revise COL FSAR Section 14.2.9 to include specific operator training and participation, based on the performance and evaluation of the test results of certain initial tests that will be conducted as part of the use-testing of the plant operating, surveillance, and emergency procedures during the initial test program.

In a February 27, 2009, response to RAI 49, Question 14.02-25, the COL applicant stated that COL FSAR Section 13.2 incorporates by reference Nuclear Energy Institute (NEI) 06-13A, "Template for an Industry Training Program Description," which states that, "the results of reviews of operating experience are incorporated into training and retraining programs in accordance with the provisions of TMI Action Item I.C.5, Appendix 1A. Training programs encompass all phases of plant operation including preoperational testing and low power operation in accordance with the provisions of TMI Action Item I.G.1. Before initial fuel loading, sufficient plant staff will be trained to provide for safe plant operations." In addition, the COL applicant stated that U.S. EPR FSAR Tier 2, Revision 1, Section 14.2 added additional operator training. The COL applicant proposed to revise COL FSAR Section 14.2.9 to state, "Specific operator training and participation, as described in the U.S. EPR FSAR Tier 2, Section 14.2.9 will be conducted." The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 5, dated June 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant has adequately addressed this issue and, therefore, considers RAI 49, Question 14.02-25 resolved.

14.2.4.9 *Test Program Schedule*

The staff reviewed conformance of COL FSAR Section 14.2.11 to the guidance in RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.11, "Test Program Schedule," and to the guidance and applicable regulatory positions of RG 1.68. The staff concluded that the COL applicant appropriately incorporates by reference U.S. EPR FSAR Tier 2, Section 14.2.11, "Test Program Schedule." The staff review of this application is limited to the following:

- COL information item relating to test program schedule
- COL FSAR Table 13.4-1, "Operational Programs Required by NRC Regulations and Program Implementation"
- Proposed License Condition Number 3 addressing the implementation milestones for operational programs
- Proposed License Condition Number 6 addressing a schedule that supports planning for and conducting of NRC inspections of operational programs
- Proposed License Condition Number 7 addressing the process for making changes to the initial startup test program described in COL FSAR Chapter 14

Test Program Schedule

COL Information Item 14.2-2 states:

A COL applicant that references the U.S. EPR certified design will develop a test program that considers the following eight guidance components:

- The applicant should allow at least nine months to conduct preoperational testing.
- The applicant should allow at least three months to conduct startup testing, including fuel loading, low power tests, and power-ascension tests.
- Plant safety will not be dependent on the performance of untested SSC during any phase of the startup test program.
- Surveillance test requirements will be completed in accordance with plant Technical Specification requirements for SSC operability before changing plant modes.
- Overlapping test program schedules (for multi-unit sites) should not result in significant divisions of responsibilities or dilutions of the staff provided to implement the test program.
- The sequential schedule for individual startup tests should establish, insofar as practicable, that test requirements should be completed prior to exceeding 25 percent power for SSC that are relied on to prevent, limit, or mitigate the consequences of postulated accidents.

Approved test procedures should be in a form suitable for review by regulatory inspectors at least 60 days prior to their intended use or at least 60 days prior to fuel loading for fuel loading and startup test procedures.

Identify and cross reference each test (or portion thereof) required to be completed before initial fuel loading and that is designed to satisfy the requirements for completing ITAAC.

The COL applicant addressed COL Information Item 14.2-2 in COL FSAR Section 14.2.11 by committing to develop a site-specific test program that considers the components specified above and to provide copies of approved test procedures to the NRC at least 60 days prior to their scheduled performance date.

The staff reviewed the resolution to the COL information item related to test program schedule included under COL FSAR Section 14.2.11. The staff identified the following areas where additional information was needed. A description of the specific issues identified by the staff is as follows:

In U.S. EPR FSAR Tier 2, Revision 1, Section 14.2.11, the design certification applicant updated COL Information Item 14.2-2 to include all of the eight guidance criteria discussed above. In RAI 92, Question 14.02-36, and RAI 50, Question 14.02-28, the staff requested that the COL applicant revise COL FSAR Section 14.2.11 to include the additional guidance components for developing the site-specific test program. In addition, the staff requested that the COL applicant revise the associated COL information item, COL Information Item 14.2-2, in COL FSAR Table 1.8-2.

In an April 29, 2009, response to RAI 92, Question 14.02-36, and an April 30, 2009, response to RAI 50, Question 14.02-28, the COL applicant proposed to revise the application as described above. The staff reviewed the COL applicant's response, and concluded that the proposed changes conform to the guidance contained in RG 1.68 and RG 1.206, and therefore are acceptable. The staff confirmed that COL FSAR Revision 6, dated September 30, 2009, contains the changes committed to in the RAI responses. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, ff considers RAI 92, Question 14.02-36 and RAI 50, Question 14.02-28 resolved.

Operational Program Information

In COL FSAR Table 13.4-1, the COL applicant provided information to address the implementation of operational programs. The table lists the ITP as an operational program, provides the applicable COL FSAR section where the ITP is fully described, and lists the regulatory requirements and the implementation milestone commitments applicable to the ITP. The COL applicant stated that the ITP will be implemented prior to conduct of the activities described in the Initial Test Program. The staff notes that the implementation milestone the COL applicant proposed is consistent with the description of the ITP in U.S. EPR FSAR Tier 2, Section 14.2.

Proposed License Condition No. 2

In the COL application, Part 10 ITAAC and ITAAC Closure," Proposed License Condition Number 2, "COL Items," the COL applicant proposed a license condition that, in part, addresses the COL information item in COL FSAR Section 14.2.11. The COL applicant stated that the licensee shall develop a test program that considers the components identified in COL FSAR Section 14.2.11 and shall provide copies of approved test procedures to the NRC at least 60 days prior to their scheduled performance date.

Proposed License Condition No. 3

In the COL application, Part 10, Proposed License Condition No. 3, "Operational Program Implementation," the COL applicant proposed a license condition for operational programs. The COL applicant stated that the licensee shall implement the programs or portions of programs identified in COL FSAR Table 13.4-1 on or before the associated milestones in COL FSAR Table 13.4-1.

Proposed License Condition No. 6

In the COL application, Part 10, Proposed License Condition No. 6, "Operational Program Readiness," the COL applicant discussed the availability of a schedule that will support the planning and conduct of NRC inspections of operational programs. The COL applicant stated that this schedule shall be submitted to the appropriate Director of the NRC no later than 12 months after issuance of the COL FSAR to support planning for and conduct of NRC inspections of operational programs given in the operational program COL FSAR Table 13.4-1. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the operational programs in the COL FSAR table have been fully implemented or the plant has been placed in commercial service, whichever comes first.

Proposed License Condition No. 7

In the COL application, Part 10, Proposed License Condition Number 7, "Startup Testing," the COL applicant discussed the process for making changes to the ITP described in COL FSAR Chapter 14. The COL applicant stated that any changes to the initial startup test program made in accordance with the provisions of 10 CFR 50.59, "Changes, tests and experiments," or 10 CFR Part 52, Appendix(TBD), Section VIII shall be reported in accordance with 10 CFR 50.59(d) within one month of such change.

The staff concluded that the proposed license conditions adequately describe the implementation of each major phase of the initial test program, and conform to the guidance contained in RG 1.68, RG 1.206, and NUREG-0800, Section 14.2. In addition, since test activities will not start until a facility is built; the staff finds that it is appropriate and acceptable for the COL holder to submit a schedule that will contain implementation details of operational programs, during the post-COL phase, as discussed in Section 14.2.5 of this report.

14.2.4.10 *Individual Test Descriptions*

The staff reviewed conformance of COL FSAR Section 14.2.12 to the guidance in RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.12, "Individual Test Descriptions," and to the guidance and applicable regulatory positions of RG 1.68. The staff concluded that the COL applicant appropriately incorporates by reference U.S. EPR FSAR Tier 2, Section 14.2.12, "Individual Test Descriptions." The staff review of this COL application is limited to the information addressing COL Information Items 14.02-5, 14.02-7, 14.02-8, and 14.02-9, which state respectively:

1. A COL applicant that references the U.S. EPR design certification will provide site-specific test abstract information for the circulating water supply system.
2. A COL applicant that references the U.S. EPR design certification will provide site-specific test abstract information for the cooling tower.
3. A COL applicant that references the U.S. EPR design certification will provide site-specific test abstract information for the raw water supply system.
4. A COL applicant that references the U.S. EPR design certification will provide site-specific test abstract information for personnel radiation monitors.

The staff notes these four COL information items are addressed in COL FSAR Section 14.2.14.

The staff's review of the resolution to the COL information items related to test descriptions for site-specific tests included under COL FSAR Section 14.2.12 is included in Section 14.2.4.11 of this report.

14.2.4.11 *COL Applicant Site-Specific Tests*

The staff reviewed conformance of COL FSAR Section 14.2.14 to the guidance in RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.12, and to the guidance and applicable regulatory positions of RG 1.68. The staff review of this application is limited to the supplemental information provided to address the testing of site-specific SSCs and design features not included in U.S. EPR FSAR Tier 2, Section 14.2.12 that satisfy the eight criteria specified in RG 1.68,

Regulatory Position C1 and to the information provided to resolve COL Information Items 14.02-5 and 14.02-7.

COL FSAR Section 14.2.14 includes the following site-specific tests:

- 14.2.14.1, “Raw Water Supply System”
- 14.2.14.2, “Ultimate Heat Sink Makeup Water System”
- 14.2.14.3, “Essential Service Water Blowdown System”
- 14.2.14.4, “Essential Service Water Chemical Treatment System”
- 14.2.14.5, “Waste Water Treatment Plant”
- 14.2.14.6, “Fire Water Supply”
- 14.2.14.7, “Circulating Water Supply System”
- 14.2.14.8, “UHS Makeup Water Intake Structure Ventilation System”
- 14.2.14.9, “UHS Electrical Building Ventilation System”
- 14.2.14.10, “Cooling Tower Acceptance”
- 14.2.14.11, “Plant Laboratory Equipment”
- 14.2.14.12, “Portable Personnel Monitors and Radiation Survey Instruments”
- 14.2.14.13, “UHS Makeup Water Intake Structure and UHS Electrical Building Communications System”

COL Information Items 14.02-5, 14.02-7, 14.02-8, and 14.02-9, respectively state:

- A COL applicant that references the U.S. EPR design certification will provide site-specific test abstract information for the circulating water supply system.
- A COL applicant that references the U.S. EPR design certification will provide site-specific test abstract information for the cooling tower.
- A COL applicant that references the U.S. EPR design certification will provide site-specific test abstract information for the raw water supply system.
- A COL applicant that references the U.S. EPR design certification will provide site-specific test abstract information for personnel radiation monitors.

COL Information Item 14.02-5 is addressed in COL FSAR Section 14.2.14.7. COL Information Item 14.02-7 is addressed in COL FSAR Section 14.2.14.10. COL Information Item 14.02-8 is addressed in COL FSAR Section 14.2.14.1. COL Information Item 14.02-9 is addressed in COL FSAR Section 14.2.14.11.

The staff reviewed the COL applicant's proposed resolution of COL Information Items 14.02-5, 14.02-7, 14.02-8, and 14.02-9 as described in COL FSAR Section 14.2.14. In addition, the staff reviewed the additional COL applicant site-specific testing included in COL FSAR Section 14.2.14. The staff identified the following areas where additional information was needed. A description of the specific issues identified by the staff is as follows:

In RAI 28, Question 14.02-15, the staff requested that the COL applicant confirm that there are no additional site-specific structures, systems, and/or design features that meet the criteria of RG 1.68, Regulatory Position C.1 and that require testing to be addressed in COL FSAR Section 14.2.14. In a December 22, 2008, response to RAI 28, Question 14.02-15, the COL applicant stated that a review of RG 1.68, Section C.1 and COL FSAR Section 14.2.14 indicated that no additional site-specific structures, systems, and/or design features that meet the criteria of RG 1.68, Regulatory Position C.1 that need to be addressed. The staff reviewed the COL applicant's response, and concluded that the COL applicant's response conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. Therefore, the staff considers RAI 28, Question 14.02-15 resolved.

In RAI 28, Question 14.02-24, the staff requested that the COL applicant revise the test abstracts under COL FSAR Section 14.2.14 to identify in which phase each test will be performed. In a December 22, 2008, response to RAI 28, Question 14.02-24, the COL applicant proposed to revise the tests described in COL FSAR Section 14.2.14 to indicate the applicable phase(s) in which testing will occur. While the staff concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and would be acceptable, the COL applicant did not revise all of the test abstracts in COL FSAR, Revision 5. Therefore, the staff in follow-up RAI 162, Question 14.02-43, the staff requested that the COL applicant revise COL FSAR Sections 14.2.14.11 and 14.2.14.12 to identify in which phase each test will be performed.

In a November 20, 2009, response to RAI 162, Question 14.02-43, the COL applicant proposed a revision to COL FSAR Sections 14.2.14.11, 14.2.14.12, and 14.2.14.13 to identify in which phase each test will be performed. The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. **RAI 162, Question 14.02-43 is being tracked as a confirmatory item**, until the COL FSAR is revised accordingly.

In RAI 15, Question 14.02-3, the staff requested that the COL applicant review all of the test abstracts in COL FSAR Section 14.2.14 to ensure that test method and acceptance criteria information are included in the appropriate sections and revise the test abstracts, as appropriate. In addition, the staff requested that the COL applicant revise the acceptance criteria section of the test abstracts to include sufficient detail to establish the functional adequacy of the SSCs. In a December 19, 2008, response to RAI 15, Question 14.02-3, the COL applicant stated that it had reviewed all the test abstracts in COL FSAR Section 14.2.14 to ensure that test method and acceptance criteria information are included in the appropriate sections. In addition, the COL applicant proposed to revise the acceptance criteria for each of the test abstracts and provided proposed mark-up pages of the COL FSAR that incorporated their response. The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 8, dated March 28, 2012, was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 15, Question 14.02-3 resolved.

In RAI 50, Question 14.02-26, the staff requested that the COL applicant revise the test abstracts in COL FSAR Section 14.2.14 to specify the prerequisites and major plant operating conditions necessary for each test (such as power level and mode of operation of major control systems), to contain sufficient information to justify the specified test method if such method does not subject the SSC under test to representative design operating conditions, and to identify pertinent precautions for individual tests, as necessary (e.g., minimum flow requirements or reactor power level that must be maintained).

In an April 30, 2009, response to RAI 50, Question 14.02-26, the COL applicant stated that major plant operating conditions necessary for each test and pertinent precautions for individual tests are identified in the RAI responses to RAI 15, Question 14.02-3, RAI 28, Questions 14.02-18, 14.02-21, 14.02-22, and 14.02-24, and RAI 50, Question 14.02-26. The COL applicant stated that test methods specified in those responses subject SSCs to representative operating design conditions and will verify major components of a particular system function properly and that the overall system functions as described in their respective sections of the COL FSAR. In addition, the COL applicant proposed to revise COL FSAR Section 14.2.14.10 to indicate the specific power level prerequisite for performing cooling tower acceptance testing.

The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 6, dated September 30, 2009, contains the changes committed to in the RAI responses. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 50, Question 14.02-26 resolved.

In RAI 15, Question 14.02-4, the staff requested that the COL applicant revise the applicable test abstracts under COL FSAR Section 14.2.14 to include verification of redundancy and electrical independence of affected SSCs, as appropriate. In a December 19, 2008, response to RAI 15, Question 14.02-4, the COL applicant stated that the Integrated Engineered Safety Features/Loss of Power (Test No. 153) provided in the U.S. EPR FSAR has been incorporated by reference and includes acceptance criteria that state that electrical redundancy, independence, and load group assignments are as designed. The COL applicant stated that tests will ensure the electrical redundancy, independence, and load group assignments of the SSCs covered within the scope of the U.S. EPR and COL FSAR site-specific SSCs including the UHS makeup system, essential service water blowdown, essential service water chemical treatment system, UHS Makeup Water Intake Structure Ventilation System, and UHS Electrical Building Ventilation System. The raw water supply system, waste water treatment plant, fire water supply, and the circulating water supply system are not safety related and, therefore, are not included in the redundancy and electrical independence verifications. The staff reviewed the COL applicant's response, and determined this response inconsistent with agency guidance and the approach taken in the U.S. EPR FSAR. Therefore, for consistency with the U.S. EPR approach, in follow-up RAI 52, Question 14.02-31, the staff requested that the COL applicant revise the applicable COL FSAR sections to include provisions in the objectives, test methods, and acceptance criteria for the verification of redundancy and electrical independence of affected SSCs including the ultimate heat sink makeup system, essential service water blowdown system, essential service water chemical treatment system, UHS Makeup Water Intake Structure Ventilation System, and UHS Electrical Building Ventilation System.

In a March 6, 2009, response to RAI 52, Question 14.02-31, the COL applicant stated that the essential service water blowdown system and essential service water chemical treatment system are not safety-related systems. The motor-operated valves (MOVs) that isolate the

safety-related essential service water system from the non-safety-related essential service water blowdown system are considered part of the ESWS not the blowdown system, and testing of these MOVs is addressed in the U.S. EPR FSAR Tier 2, Section 14.2.12.5.7, "Essential Service Water System (Test No. 048)." The COL applicant will not revise COL FSAR Section 14.2.14.3. The COL applicant stated that not incorporating the recommended changes to COL FSAR Section 14.2.14.3, "Essential Service Water Blowdown System," does not result in any inconsistency between the COL FSAR and the U.S. EPR FSAR. In addition, the COL applicant stated that there are no components (including MOVs, solenoid-operated valves (SOVs), air-operated valves (AOVs)) of the blowdown system that can be operated from the control panel or remote shutdown panel; and therefore proposed to delete Test Method Steps 3a, 3b, 3e, and 3f; Data Required Item 4c; and Acceptance Criteria Items 5a, 5b, 5e, and 5f from COL FSAR Section 14.2.14.3.

Furthermore, the COL applicant stated that the MOVs that isolate the non-safety-related essential service water chemical treatment system from the non-safety-related essential service water normal makeup system are also non-safety-related. The essential service water chemical treatment system is not subject to electrical independence and redundancy testing requirements; therefore, the COL applicant will not revise COL FSAR Section 14.2.14. The COL applicant stated that not incorporating the recommended changes to COL FSAR Section 14.2.14.4 does not result in any inconsistency between the COL FSAR and U.S. EPR FSAR.

The COL applicant stated that because there are no safety-related MOVs, SOVs, and AOVs in the essential service water chemical treatment system, Test Method Step 3b, Data Required Item 4c, and Acceptance Criteria Item 5b will be deleted from COL FSAR Section 14.2.14.4. Acceptance Criteria Items 5d, 5e, and 5g, are appropriate steps to be taken for initial MOV/SOV/AOV testing, regardless of their safety classification. The COL applicant stated that these steps will remain.

In addition, the COL applicant proposed the following revisions to COL FSAR Section 14.2.14:

- Section 14.2.14.2, "Ultimate Heat Sink (UHS) Makeup Water System," will be revised to delete "safety-related blowdown" and add "ESW system" in Item 2b.
- Sections 14.2.14.2, 14.2.14.8, and 14.2.14.9 will be revised to include the following statement in the test objectives: "Verify electrical independence and redundancy of safety-related power supplies."
- Sections 14.2.14.2, 14.2.14.8, and 14.2.14.9 will be revised to include the following statement in the test method: "Verify electrical independence and redundancy of power supplies for safety-related functions."
- Sections 14.2.14.2, 14.2.14.8, and 14.2.14.9 will be revised to include the following statement in the acceptance criteria: "Safety-related components meet electrical independence and redundancy requirements."
- Test Method Steps 3a, 3b, 3e, and 3f, Data Required Item 4c, and Acceptance Criteria Items 5a, 5b, 5e, and 5f will be deleted from COL FSAR Section 14.2.14.3.

The staff reviewed the COL applicant's March 6, 2009, response to RAI 52, Question 14.02-31, and concluded that at the time of the response the proposed change conformed to the guidance contained in RG 1.68 and RG 1.206 and would, therefore, have been acceptable. However,

after the staff reviewed COL FSAR Revision 8, Section 14.2.14.3, "Essential Service Water Blowdown Systems," Acceptance Criteria Items 5a, 5b, 5e, and 5f remained in the COL application, even though the COL applicant's March 6, 2009, response to RAI 52, Question 14.02-31 indicated that Acceptance Criteria items 5a, 5b, 5e, and 5f are to be deleted since there are no parts of the blowdown system that can be operated from the control panel or remote shutdown panel. In addition, U.S. EPR FSAR Tier 1, Table 2.7.11-2, "Essential Service Water System Equipment I&C and Electrical Design," was revised since the COL applicant submitted its response and indicates that the blowdown MOV's are controlled from the main control room. Therefore, in RAI 373, Question 14.02-59 the staff requested that the COL applicant revise its March 6, 2009, response to RAI 52, Question 14.02-31 to be consistent with the revised design of the Essential Service Water System. **RAI 373, Question 14.02-59 is being tracked as an open item.**

In RAI 173, Question 14.02-51, the staff requested that the COL applicant revise COL FSAR Section 14.2.14.2, Step 3.b to include the verification of the response of all safety-related automatic valves in the UHS makeup water system to their appropriate open/close signal sources. In addition, the staff noted that COL FSAR Section 14.2.14.2, Step 3.f states, "Verify flow through the SAQ room cooler in each room of both the UHS Makeup Water Intake Structure and UHS Electrical Building." Essential Service Water Pump Building Ventilation System room cooler flow is not described in COL FSAR Section 9.2.5, "Ultimate Heat Sink," or shown on COL FSAR Figure 9.2-3, "Normal Makeup, Emergency Makeup, Blowdown & Chemical Treatment." Therefore, in RAI 173, Question 14.02-51 the staff also requested that the COL applicant identify the COL FSAR section that addresses the SAQ. Lastly, the staff requested that the COL applicant include testing of the following items in COL FSAR Section 14.2.14.2:

- Testing of screen water system and pumps, traveling screens, and strainers
- Verification of minimum Technical Specification flow rates for the system
- Testing of water hammer design features, such as time delays on valves
- Testing of normal or accident Essential Service Water basin makeup controls

In a December 8, 2009, response to RAI 173, Question 14.02-51, the COL applicant stated that COL FSAR Section 14.2.14.2, Step 3.b will be revised to include verification of UHS Makeup Water System safety-related automatic valve response to applicable open/close signal sources.

The UHS Makeup Water Intake Structure and UHS Electrical Building cooling systems (SAF) are addressed in COL FSAR Section 9.4.15, "UHS Makeup Water Intake Structure Ventilation System," and COL FSAR Figure 9.4-1, "Turbine Building Ventilation System." Symbol SAQ is applicable to the Essential Service Water (ESW) Pump Building Ventilation System. Therefore, SAQ will be deleted from COL FSAR Section 14.2.14.2. U.S. EPR FSAR Tier 2, Section 9.4.11, "Essential Service Water Pump Building Ventilation System," discusses the ESW Pump Building Ventilation System (SAQ) and is incorporated by reference into the COL FSAR.

COL FSAR Section 14.2.14.2, Step 3.e addresses strainer testing. COL FSAR Section 14.2.14.2 will be revised to include valve time delay testing relied upon to prevent water hammer, testing of the screen wash system and traveling screens, and verification of the minimum Technical Specification flow rate.

Testing of the ESW Cooling Tower basin level instrumentation and controls is addressed in U.S. EPR FSAR Tier 2, Section 14.2.12.5.8, "Ultimate Heat Sink (Test No. 049)," Test Method Step 3.5 and Acceptance Criteria Item 5.1.5. UHS Makeup Water System initiation and operation from the main control room and the remote shutdown panel is tested and verified as described in COL FSAR Section 14.2.14.2, Items 3.a and 5.a.

The staff reviewed the COL applicant's December 9, 2009, response to RAI 173, Question 14.02-51, and identified the issues discussed below. Therefore, in follow-up RAI 337, Question 14.02-58, the staff requested that the COL applicant revise the test abstract to address the following additional areas:

- Net positive suction head (NPSH) available should be verified against NPSH required ($NPSH_a > NPSH_r$) for the UHS safety-related makeup water pumps.
- Testing of NS-AQ (non-safety supplemental grade) such as the travelling screens and screen wash pumps, and related motor operated valves to verify proper operations, utilizing normal and Institute of Electrical and Electronics Engineers (IEEE) Standard (Std) 308, "IEEE Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations," defines Class 1E as, "The safety classification of the electric equipment and systems that are essential to emergency reactor shutdown containment isolation, reactor core cooling, and containment and reactor heat removal, or are otherwise essential in preventing significant release of radioactive material to the environment."
- Manual fill and automatic fill sequence of the UHS Makeup Water System. Verify there is no evidence of water hammer during the filling process.
- It is unclear to the staff if the travelling screen and screen wash pumps are operated from the main control room (MCR) or a local panel in the UHS makeup water intake structure. The staff requests that the COL applicant clarify this and add to COL FSAR Section 14.2.14.2.
- Verify that the minimum flow valve opens in the event the pump discharge valve fails to open.
- Verify that the heat tracing (and alarms) associated at the UHS Makeup Water Intake Structure operates correctly.
- As requested in RAI 279, Question 09.02.05-17, Item 9, strainer "debris removal" line should be changed to "blowdown" line.

In addition, the staff requested that the COL applicant address the following two comments:

- In COL FSAR Section 14.2.14.3, "Essential Service Water Blowdown System," "Altermate" blowdown should be changed to "emergency" blowdown.
- The test in COL FSAR Section 14.2.14.4, "Essential Service Water Chemical Treatment System," should be revised to reflect the change in COL FSAR Section 9.02.05 in which the COL applicant removed the chemical treatment subsystem for the UHS Makeup Water System since the system is normally in dry layup. The chemical addition for UHS Makeup Water System is done only during full flow testing, utilizing portable chemical skids and totes.

Follow-up RAI 337, Question 14.02-58 is being tracked as an open item.

In RAI 173, Question 14.02-52, the staff requested that the COL applicant revise COL FSAR Section 14.2.14.2 or 14.2.14.3 to include the testing of instrumentation and controls (either automatic or manual) that control the Essential Service Water basin level in normal makeup or safety-related UHS makeup modes.

In a December 8, 2009, response to RAI 173, Question 14.02-52, the COL applicant stated that the testing of the ESW basin level instrumentation and controls is in U.S. EPR FSAR Tier 2, Section 14.2.12.5.8, Test Method Step 3.5 and Acceptance Criteria Item 5.1.5. In addition, the COL applicant stated that testing of the ESW Blowdown System is in COL FSAR Section 14.2.14.3. The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 6, dated September 30, 2009, contains the changes committed to in the RAI responses. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 173, Question 14.02-52 resolved.

In RAI 26, Question 14.02-13, the staff requested that the COL applicant amend COL FSAR Section 14.2.14 to include the testing of personnel monitors and radiation survey equipment. In a December 19, 2008, response to RAI 26, Question 14.02-13, the COL applicant proposed to add a test abstract for portable personnel monitors and radiations survey equipment in COL FSAR Section 14.2.14.12. With the exception of two points, the staff concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. To address those two points, in follow-up RAI 137, Question 14.02-41, the staff requested that the COL applicant revise the proposed section to address the following issues:

1. The use of the word "portable" in front of "personnel monitors" is confusing, since this test includes Radiologically Controlled Area (RCA) and security building exit contamination monitors, which are usually installed in the facility in some way. Please delete this word to minimize potential confusion.
2. Additionally, RCA egress personnel contamination monitors should have a backup power capability to ensure functionality of the monitors during loss of power events. Provide an additional step to verify back up power function, or justify why such a step is not required.

In a September 14, 2009, response to RAI 137, Question 14.02-41, the COL applicant stated that occurrences of the word "portable" will be deleted from COL FSAR Section 14.2.14.12, and in the event of a loss of power to the radiologically controlled area, egress personnel radiation monitors, battery-powered portable radiation survey instruments will be used to assess personnel contamination and control the movement of radioactive material until power can be restored. In addition, the COL applicant submitted a markup of the revised test abstract.

The staff reviewed the COL applicant's response and identified the following issues and in follow-up RAI 220, Question 14.02-55, the staff requested that the COL applicant revise the test abstract as follows:

- Add an additional prerequisite that states that the "Personnel Monitors and Radiation Survey Instruments are calibrated in accordance with industry standards."

- Test Method Step 3.c states that the COL holder will “verify that alarms and displays are capable of detecting activity levels that are above the acceptance levels.” Since the alarms and displays do not detect activity (the radiation detector does) please clarify this statement. For example, revise the wording to state, “Verify that personnel monitors and radiation survey instruments are capable of detecting and activating alarms and displays to alert workers to activity levels that are above acceptance levels.”
- Add the following item under Section 5, Acceptance Criteria, “Personnel monitors and radiation survey instruments function as described in COL FSAR Section 12.5.”

In a March 3, 2010, response to RAI 220, Question 14.02-55, the COL applicant proposed to revise COL FSAR Section 14.2.14.12, as requested. The staff reviewed the COL applicant’s response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 8, dated March 27, 2012, was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 220, Question 14.02-55 resolved.

In RAI 86, Question 14.02-33, the staff requested that the COL applicant amend COL FSAR Section 14.2.14 to include testing of laboratory equipment used to analyze or measure radiation levels and radioactivity concentrations, as this equipment is used to ensure that the specified design conditions of the facility are not exceeded during any condition of normal operation. In a May 7, 2009, response to RAI 86, Question 14.02-33, the COL applicant proposed adding a test abstract for plant laboratory equipment.

With the exception of two points, the staff concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. To address those two points, in follow-up RAI 175, Question 14.02-53, the staff requested that the COL applicant revise COL FSAR Section 14.2.14.11 Item 4.c to read, “Completed vendor specified laboratory equipment startup and calibration procedures.” In an October 27, 2009, response to follow-up RAI 175, Question 14.02-53, the COL applicant revised the test abstract as requested. The staff reviewed the COL applicant’s response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 8, dated March 27, 2009, was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 175, Question 14.02-53 resolved.

In RAI 14, Question 14.02-2, the staff requested that the COL applicant identify the test abstract for the raw water supply system, which is identified as a COL test in U.S. EPR FSAR Tier 2, Table 14.2-1, “List of Initial Tests for the U.S. EPR.” In an October 31, 2008, response to RAI 14, Question 14.02-2, the COL applicant stated that “[t]he intent of CCNPP Unit 3 FSAR Section 14.2.14.1, Desalination Plant, is to specify all testing requirements of the CCNPP Unit 3 FSAR Raw Water Supply System as described in CCNPP Unit 3 FSAR Section 9.2.9. The title of CCNPP Unit 3 FSAR Section 14.2.14.1 will be revised to be Raw Water Supply System and the testing described in this section will cover the raw water piping, desalination plant, desalinated water storage tank, desalinated water transfer pumps, and desalinated water distribution piping and valves.” In a December 19, 2008, supplemental response to RAI 14, Question 14.02-2, the COL applicant provided markup pages to the COL FSAR that incorporated their response, which were incorporated into COL FSAR Revision 5. With the exception of two points, the staff concluded that the proposed change conforms to the guidance

contained in RG 1.68 and RG 1.206, and therefore is acceptable. To address those two points, in follow-up RAI 165, Question 14.02-50, the staff requested that the COL applicant revise COL FSAR Section 14.2.14.1 to include verification of the auto start feature on the RWSS pumps upon low pressure or a trip of the running pump consistent with COL FSAR Section 9.2.9, "Raw Water Supply System."

In a November 23, 2009, response to RAI 165, Question 14.02-50, the COL applicant stated that there are no separate raw water supply pumps for the RWSS. The supply of water to the RWSS is from the Chesapeake Bay via the Circulating Water Makeup pumps, as stated in Revision 6 of COL FSAR Section 9.2.9.2, "System Description." The initial test program for the Circulating Water Makeup pumps is described in the COL FSAR Section 14.2.14.7. In COL FSAR Section 14.2.14.1, the RWSS description refers to the desalinated water transfer pumps. For these pumps, the pump that is designated as the "running pump" will be manually started, and the standby pump will automatically start on low discharge pressure in the RWSS. The standby pump will also start on trip of the running pump. Since COL FSAR Section 14.2.14.1 (i.e., Steps 3.c & 3.f) addresses verification of the manual start of the running transfer pump and verification of the auto-start of the standby transfer pump, the COL applicant stated that no additional testing entries are being added.

The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 6, dated September 30, 2009, contains the changes committed to in the RAI responses. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 165, Question 14.02-50 resolved.

In RAI 28, Question 14.02-18, the staff noted that the COL FSAR Section 9.2.9.5, "Inspection and Testing Requirements for the Desalination Plant," states that pressure testing and functional testing are conducted during post-construction, pre-commissioning and startup, as necessary to confirm system integrity and proper operation of individual components and the total system. In addition, portions of the system are demonstrated with inservice leak testing where such method does not jeopardize other systems/equipment and is sufficient to demonstrate proper operation. COL FSAR Section 14.2.14.1 does not identify the need for pressure testing and leak testing in the test method section. Therefore, the staff also requested that the COL applicant address this discrepancy. Additionally, COL FSAR Section 14.2.14.1, Item 5.a states that the desalination plant is described in COL FSAR Section 9.2.11. The staff notes that there is no Section 9.2.11 in the COL Unit 3 FSAR. The Desalination Plant is described in COL FSAR Section 9.2.9. The staff requested that the COL applicant revise COL FSAR Section 14.2.14.1, Item 5.a, accordingly.

In a December 22, 2008, response to RAI 28, Question 14.02-18, the COL applicant stated that the raw water supply system, which includes the desalination plant, is a non-safety-related system which would undergo pressure and functional testing prior to startup. Functional testing of the raw water supply system and components is covered in COL FSAR Section 14.2.14.1. The COL applicant proposed to revise COL FSAR Section 9.2.9.5 to remove the phrase "in-service" from the referenced statement. The raw water supply system should undergo pressure testing during the post-construction period to ensure system integrity, as stated in COL FSAR Section 9.2.9.5. The COL applicant also proposed to revise COL FSAR Section 14.2.14.1, Item 5.a to remove the reference to COL FSAR Section 9.2.11 for the desalination plant. The staff reviewed the COL applicant's response, and determined that the COL applicant's response did not sufficiently address the staff's request. Therefore, in follow-up

RAI 102, Question 14.02-40, the staff noted that the COL applicant's December 22, 2008, response to RAI 28, Question 14.02-18 stated that the raw water supply system should undergo pressure testing during the post-construction period to ensure system integrity, as stated in COL FSAR Section 9.2.9.5, but did not include this change in the proposed COL FSAR markup. Therefore, in follow-up RAI 102, Question 14.02-40, the staff requested that the COL applicant revise COL FSAR Section 14.2.14.1 to include pressure testing and leak testing of the raw water supply system.

In a May 18, 2009, response to follow-up RAI 102, Question 14.02-40, the COL applicant proposed to revise COL FSAR Section 14.2.14.1 to indicate that inspection and testing requirements will be completed as described in COL FSAR Section 9.2.9.5. The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 6, dated September 30, 2009, contains the changes committed to in the RAI responses. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 28, Question 14.02-18 and RAI 102, Question 14.02-40 resolved.

In RAI 28, Question 14.02-19, the staff noted that COL FSAR Section 14.2.14.3 describes the ESW blowdown systems. COL FSAR Section 14.2.14.3, Item 5.a states that the ESW blowdown systems operate per design and as described in COL FSAR Section 9.2.1. The ESW blowdown systems are described in COL FSAR Section 9.2.5. The staff requested that the COL applicant correct this discrepancy. In a December 22, 2008, response to RAI 28, Question 14.02-19, the COL applicant proposed to correct this discrepancy in the next revision of the COL FSAR. The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 5, dated June 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 28, Question 14.02-19 resolved.

In RAI 28, Question 14.02-20, the staff noted that COL FSAR Section 14.2.14.4, "Essential Service Water Chemical Treatment System," describes the ESW chemical treatment system. COL FSAR Section 14.2.14.4, Item 5.a states that the ESW chemical treatment system operates per design and as described in COL FSAR Section 9.2.1. The ESW chemical treatment systems are described in COL FSAR Section 9.2.5. The staff requested that the COL applicant correct this discrepancy. In a December 22, 2008, response to RAI 28, Question 14.02-20, the COL applicant corrected this discrepancy. The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 5, dated June 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 28, Question 14.02-20 resolved.

In RAI 28, Question 14.02-23, the staff noted that COL FSAR Section 14.2.14.6.5, "Fire Water Supply," Acceptance Criteria states that the fire water supply system operates per design requirements and as described in COL FSAR Section 9.5.1. COL FSAR Section 9.5.1.4 states that all fire protection features and systems will be surveilled, inspected, tested, and maintained in accordance with applicable codes and standards of the National Fire Protection Association (NFPA) including start-up and acceptance tests. The staff requested that the COL applicant explain how the acceptance criteria for the NFPA start-up and acceptance tests will be met.

In a December 22, 2008, response to RAI 28, Question 14.02-23, the COL applicant proposed to revise COL FSAR Section 14.2.14.6 to include references to requisite acceptance criteria. The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 5, dated June 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 28, Question 14.02-23 resolved.

In RAI 14, Question 14.02-1, the staff requested that the COL applicant specify the timing (preoperational vs. power ascension) of the circulating water supply test provided to satisfy COL Information Items 14.2-5 and 14.2-7. In addition, the staff requested that the COL applicant explain how the objectives of the two tests in the U.S. EPR design certification are being met, and verify that both COL Information Items 14.2-5 and 14.2-7 are being satisfied through this test abstract. In an October 31, 2008, response to RAI 14, Question 14.02-1, the COL applicant stated the testing requirements will be divided into two tests consistent with the U.S. EPR FSAR, taking into account the site-specific design. In a December 19, 2008, supplemental response to RAI 14, Question 14.02-1, the COL applicant provided COL FSAR markups of the test abstracts. The circulating water supply system test abstract was provided in COL FSAR Section 14.2.14.7, and the cooling tower test abstract was provided in COL FSAR Section 14.2.4.10. Each test specified the phase in which the test would be performed. The staff reviewed the COL applicant's response, and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 5, dated June 30, 2009, contains the changes committed to in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 14, Question 14.02-1 resolved.

In RAI 90, Question 14.02-34, the staff requested that the COL applicant to revise COL FSAR Section 14.2.14 to include testing to demonstrate the operability of heat tracing and freeze protection systems. In a May 20, 2009, response to RAI 90, Question 14.02-34, the COL applicant proposed a revision to COL FSAR Section 8.3.1 to include the general requirements for electrical heat tracing and freeze protection and proposed a revision to COL FSAR Section 14.2.14 to include testing to demonstrate the operability of heat tracing and freeze protection systems for applicable safety-related systems. The staff reviewed the COL applicant's response, and determined that this issue should be addressed generically in the U.S. EPR FSAR and issued U.S. EPR RAI 260, Question 14.02-122. In a September 4, 2009, response to U.S. EPR RAI 260, Question 14.02-122, AREVA proposed changes to U.S. EPR FSAR Tier 2, Section 8.3 that were analogous to those proposed by UniStar in response to COL RAI 90, Question 14.02-34. In addition, AREVA proposed to add Test No. 114 for heat tracing. The staff reviewed the COL applicant's response, and concluded that the proposed U.S. EPR FSAR change conforms to the guidance contained in RG 1.68 and RG 1.206 and, therefore, finds the proposed U.S. EPR FSAR change acceptable. The staff notes that U.S. EPR RAI 260, Question 14.02-122 was incorporated into Revision 3 of the U.S. EPR FSAR. Therefore, the staff considers COL RAI 90, Question 14.02-34 resolved.

In RAI 42, Question 9.5.02-1, the staff requested that the COL applicant demonstrate that the portable wireless communication system used in the UHS Makeup Water Intake Structure and the UHS Electrical Building is not susceptible to an excess noise level, electromagnetic interference (EMI), and radio frequency interference (RFI).

In a January 14, 2009, response to RAI 42, Question 9.5.02-1, the COL applicant proposed to revise COL FSAR Section 14.2.14 to include test method and acceptance criteria for the UHS

Makeup Water Intake Structure and the UHS Electrical Building communication system. The proposed revisions to COL FSAR Section 14.2.14 will include additional acceptance criteria to demonstrate that the communications equipment in the UHS Makeup Water Intake Structure and UHS Electrical Building is capable of operating under maximum noise conditions. The staff reviewed the COL applicant's response, and determined that the proposed revision does not completely meet the requirements of RG 1.68 and, therefore, in follow-up RAI 187, Question 14.02-54, the staff requested that the COL applicant add the following objectives, test methods, and acceptance criteria to the test of the UHS Makeup Water Structure and UHS Electrical Building Communication Systems in COL FSAR Section 14.02.14.12:

OBJECTIVES

- To demonstrate that the communications system functions as designed to malfunctions or failures
- To demonstrate that the UHS makeup water structure and UHS electrical building communication systems meet design requirements
- To demonstrate electrical independence and redundancy of safety-related power supplies

TEST METHOD

- Verify that the communication system responds as designed to actual or simulated limiting malfunctions or failures.
- Verify redundancy and electrical independence of the communication system.
- Verify electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.

ACCEPTANCE CRITERIA

- The portable wireless communication system provides radio coverage throughout the plant, except in areas restricted due to potential EMI/RFI considerations.
- The portable wireless communication system provides an interconnection to the public switched telephone network (PSTN) to allow offsite communications.
- The digital telephone system provides plant-wide intercom capability.
- The digital telephone system provides an interconnection to the public switched telephone network to allow offsite communications.
- The public address and alarm system operates as described in the design specification.

- The sound powered system operates as described in the design specification.
- The security communication system operates as described in the design specification.
- Safety-related I&C equipment is not adversely impacted by the portable phones and radios of the communication system.
- Safety-related components meet electrical independence and redundancy requirements.

In a November 11, 2009, response to RAI 187, Question 14.02-54, the COL applicant stated that U.S. EPR FSAR Tier 2, Revision 1, Section 14.2.12.11.7, provides testing to verify the adequacy of intra-plant and offsite communication systems. In a May 14, 2009, response to U.S. EPR RAI 144, Question 14.02-72a, AREVA committed to provide clarification of objectives, test methods, and acceptance criteria associated with Communication System Test No. 130. Following incorporation of the proposed clarifications into the U.S. EPR FSAR, the startup test for the UHS Makeup Water Intake Structure and UHS Electrical Building Communication Systems, currently located in COL FSAR Section 14.2.14.13, will be revised to be consistent with the revised Communication System Test No. 130 objectives, test method, and acceptance criteria. The COL applicant provided a markup of the test abstract that incorporated the discussed changes. The staff reviewed the COL applicant's response and concluded that the proposed change conforms to the guidance contained in RG 1.68 and RG 1.206, and therefore is acceptable. The staff confirmed that COL FSAR Revision 8, dated March 27, 2012, was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 187, Question 14.02-54 resolved.

14.2.5 Post Combined License Activities

U.S. EPR FSAR Tier 2, Table 1.8-2 contains COL information items that the COL applicant is required to address. The following COL information items in Table 14.2-1 of this report include the proposed combined license activities which the staff evaluated in this report, but which will be completed following issuance of the license as discussed in the section given below.

Table 14.2-1 Post Combined License Activities

Item No.	Description	COL FSAR Section	COL SER Section
14.2-2	A COL applicant that references the U.S. EPR certified design will develop a test program that considers the following guidance components: 1. The applicant should allow at least nine months to conduct preoperational testing. 2. The applicant should allow at least three months to conduct startup testing, including fuel loading, low power tests, and power ascension tests. 3. Plant safety will not be dependent on the performance of untested SSC during any phase of the startup test program. 4. Surveillance test requirements	14.2.11	14.2.4.9

Item No.	Description	COL FSAR Section	COL SER Section
	<p>will be completed in accordance with plant Technical Specification requirements for SSC operability before changing plant modes. 5. Overlapping test program schedules (for multi-unit sites) should not result in significant divisions of responsibilities or dilutions of the staff provided to implement the test program. 6. The sequential schedule for individual startup tests should establish, insofar as practicable, that test requirements should be completed prior to exceeding 25% power for SSC that are relied upon to prevent, limit, or mitigate the consequences of postulated accidents.</p> <p>7. Approved test procedures should be in a form suitable for review by regulatory inspectors at least 60 days prior to their intended use or at least 60 days prior to fuel loading for fuel loading and startup test procedures. 8. Identify and cross reference each test (or portion thereof) required to be completed before initial fuel loading and that is designed to satisfy the requirements for completing ITAAC.</p>		
14.2-10	A COL applicant that references the U.S. EPR design certification will plan, and subsequently conduct, the plant startup test program.	14.2.4	14.2.4.4
14.2-11	A COL applicant that references the U.S. EPR design certification will identify the specific operator training to be conducted as part of the low-power testing program related to the resolution of TMI Action Plan Item I.G.1, as described in (1) NUREG-0660 - NRC Action Plans Developed as a Result of the TMI-2 Accident, Revision 1, August 1980, (2) NUREG-0694 - TMI-Related Requirements for New Operating Licenses, June 1980, and (3) NUREG-0737 - Clarification of TMI Action Plan requirements.	14.2.9	14.2.4.8
Proposed License Condition (PLC)-3	Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC shall implement the programs or portions of programs identified in FSAR Table 13.4-1 on or before the associated milestones in FSAR Table 13.4-1.	14.2.11	14.2.4.9
PLC-6	Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC shall submit to the appropriate Director of the NRC, a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of NRC inspections of operational programs listed in the operational program FSAR Table 13.4-1. The schedule shall be updated every 6 months until 12 months before	14.2.11	14.2.4.9

Item No.	Description	COL FSAR Section	COL SER Section
	scheduled fuel loading, and every month thereafter until either the operational programs in the FSAR table have been fully implemented or the plant has been placed in commercial service, whichever comes first.		
PLC-7	Any changes to the Initial Startup Test Program described in Chapter 14 of the FSAR made in accordance with the provisions of 10 CFR 50.59 or Section [] of Appendix [] to 10 CFR Part 52 shall be reported in accordance with 50.59(d) within one month of such change.	14.2.11	14.2.4.9

The staff finds the sections of PLC related to COL Information Item 14.2-11 in COL FSAR Section 14.2.9 and COL Item 14.2-6 in Section 14.2.12 acceptable. However, the staff determined that portions of PLC-2, PLC-3, PLC-6, and PLC-7 are not acceptable and need revision, consistent with the standard license conditions issued to other applicants as addressed in **RAI 374, Question 14.02-60, which is being tracked as an open item.**

14.2.6 Conclusions

The staff reviewed the COL application and checked the referenced U.S. EPR FSAR. The staff's review confirmed that the COL applicant addressed the required information relating to initial plant test program, and there is no outstanding information expected to be addressed in the COL FSAR related to this section.

The staff reviewed the information in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to the initial plant test program incorporated by reference in the COL FSAR have been documented in the staff's Safety Evaluation Report (SER) on the design certification application for the U.S. EPR. The staff's SER on the U.S. EPR is not yet complete. The staff will update Section 14.2 of this report to reflect the final disposition of the U.S. EPR design certification application.

However, the staff is unable to finalize its conclusions on the initial test program in accordance with NRC regulations.

Based on the information in the COL FSAR Section 14.2, the information incorporated by reference from U.S. EPR FSAR Tier 2, Section 14.2, and the information proposed by the COL applicant, the staff determined that the COL applicant:

- Provided sufficient information related to the objectives of the initial test program
- Provided sufficient information related to organization, staffing, and responsibilities to establish the adequacy of the COL applicant's plans for personnel participation during the implementation of the initial test program
- Described an acceptable method for activities related to test specifications and test procedures, conduct of the initial test program, and review, evaluation, and approval of test results

- Described an acceptable method for the consideration of reactor operating and testing experience
- Described an acceptable method for the trial use of plant operating, emergency, and surveillance procedures
- Described an acceptable method for the development of the initial test program schedule
- Provided test abstracts for site specific SSCs that conform to the guidance and applicable regulatory positions of RG 1.26, and RG 1.68

The staff concluded that, except for the confirmatory items and open item identified in the Technical Evaluation section, the relevant information presented within the COL FSAR meets the acceptance criteria in NUREG-0800, Section 14.2, RG 1.26, and RG 1.68 and describes an acceptable ITP that, when successfully completed, will demonstrate the functional adequacy of plant SSCs, and will meet the requirements of 10 CFR 52.79(a)(28) and 10 CFR Part 50, Appendix B, Criterion XI.

14.3 Inspections, Tests, Analyses, and Acceptance Criteria

14.3.1 Selection Criteria and Methodology for FSAR Tier 1

14.3.1.1 Introduction

This section evaluates the ITAAC for the COL application under 10 CFR Part 52. The overall review approach ensures that the complete facility is verified and that the ITAAC are necessary and sufficient to verify conformance with the applicable regulations (10 CFR 52.97(b)).

The type of information and the level of detail included in an ITAAC are based on a graded approach commensurate with the safety significance of the structures, systems, and components (SSCs) for the design. The top-level information selected should include the principal performance characteristics and safety functions of the SSCs and should be verified appropriately by ITAAC. Design-specific and unique features of the facility should be considered carefully for inclusion in an ITAAC.

14.3.1.2 Summary of Application

Section 14.3 of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 FSAR incorporates by reference Section 14.3 of the U.S. EPR FSAR, Revision 0.

In addition, in COL FSAR Section 14.3, the COL applicant provided the following:

COL Information Items

The COL applicant provided additional information in Section 14.3 to address COL Information Item 14.3-1 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

A COL applicant that references the U.S. EPR design certification will provide ITAAC for emergency planning, physical security, and site specific portions of the facility that are not included in the Tier 1 ITAAC associated with the certified design.

The COL applicant also provided ITAAC for emergency planning, physical security, and site-specific portions of the facility in Part 10 of the COL application.

The COL applicant provided additional information in COL FSAR Section 14.3 to address COL Information Item 14.3-2 from U.S. EPR FSAR Tier 2, Table 1.8-2 as follows:

A COL applicant that references the U.S. EPR design certification will describe the selection methodology for site-specific SSCs to be included in ITAAC, if the selection methodology is different from the methodology described within the FSAR, and will also provide the selection methodology associated with emergency planning and physical security hardware.

The COL applicant addressed COL Information Item 14.3.2 in COL FSAR Section 14.3.2. The COL applicant referred to the selection criteria and methodology defined in the U.S. EPR FSAR Tier 2, Section 14.3.2 for the site-specific ITAAC.

Part 10 of the COL application, Appendix B, incorporates by reference U.S. EPR FSAR Tier 1. The ITAAC for the COL application are as follows:

- Design Certification ITAAC are contained in the U.S. EPR FSAR Tier 1, which is incorporated by reference.
- The Physical Security ITAAC are contained in the U.S. EPR FSAR Tier 1, which is incorporated by reference, the site-specific ITAAC are contained in Part 10 of the COL application, Appendix B, Table 2.2-1.
- Emergency Planning ITAAC are contained in Part 10 of the COL application, Appendix B, Table 2.3-1.
- Site-specific ITAAC are contained in Part 10 of the COL application, Appendix B, Table 2.4-1 through Table 2.4-35.

14.3.1.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference and the supplemental information presented in this application is addressed within the FSER related to the U.S. EPR FSAR.

14.3.1.4 *Technical Evaluation*

The staff reviewed COL FSAR Section 14.3 of the and reviewed the referenced design certification FSAR to ensure that the combination of the information in the design certification FSAR and the information in the COL FSAR represent the complete scope of information relating to this review topic. The staff's review confirmed that the information contained in the COL application and incorporated by reference addresses the required information relating to this section. Section 14.3 of the U.S.EPR FSAR is being reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the information incorporated by reference related to ITACC will be documented in the staff safety evaluation report on the design certification application for the U.S. EPR.

The staff reviewed the information contained in the COL FSAR.

The staff reviewed the site-specific ITAAC for the CCNPP Unit 3 application to determine if the three components of each site-specific ITAAC were on the same subject matter, in agreement, complimentary, and parallel with each other. In addition, for each site-specific ITAAC, the inspections, tests, and analyses (ITA) should be the appropriate actions, and the acceptance criteria should be an appropriate standard to evaluate whether the design commitment for that site-specific ITAAC was met. This review did not evaluate the technical or safety aspects of those ITAAC or determine if they met regulatory requirements or industry standards or if the safety functions of the SSCs associated with them could be performed.

The staff reviewed the site-specific ITAAC for the CCNPP Unit 3 application, and in RAI 96, Question 14.03-1, the staff noted the following items:

1. ITAAC Item 1a in COL ITAAC Table 2.4-11: The last word in CW -“Nuclear” should be “Nuclear Island.”
2. ITAAC Item 6b in COL ITAAC Table 2.4-21: In the Acceptance Criteria, a space is missing between “and ducting.”
3. ITAAC Item 8 in COL ITAAC Table 2.4-21: In the Acceptance Criteria, a space is missing between the words “upon receipt.”
4. ITAAC Item 6a in COL ITAAC Table 2.4-22 - In the Acceptance Criteria, the word “in” after “Seismic I: should be deleted.
5. ITAAC Item 7 in COL ITAAC Table 2.4-24 - In the Acceptance Criteria, the ending of the last sentence now reads “...are installed as built.” It should read “...are installed as designed.” See Item 6 in the Acceptance Criteria, which states, “are installed as designed.”
6. ITAAC Item 2b in COL ITAAC Table 2.4-1 - In the Acceptance Criteria, the angle of “internal friction is greater and equal to 35 degrees: whereas, the Commitment Wording states “equal to 35 degrees.”
7. ITAAC Item 2c in COL ITAAC Table 2.4-1 - In the Acceptance Criteria, for Item 2c., now states, “the coefficient of friction is greater and equal to .7”; whereas, the Commitment Wording states, “equal to .7.”
8. ITAAC Item 4 in Table 2.4-1 - In the Acceptance Criteria for Item 4, now states, “the backfill shear wave velocity is \geq 1,000 ft per second”; whereas, the Commitment Wording states, it is “1,000 ft per second.”

In a May 28, 2009, response to RAI 96, Question 14.03-1, the COL applicant committed to make the changes to Part 10 of the COL application, Appendix B, ITAAC as requested by the staff. The staff confirmed that Part 10 of the COL application, Appendix B, Revision 8 to the COL application, dated March 27, 2012, were revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 96, Question 14.03-1 resolved.

The staff reviewed the ITAAC in Part 10 of the COL application to have the correct Inspections, Tests or Analyses for performance of the stated design commitment, and have an Acceptance Criteria (AC) that clearly indicates that the design commitment was met. It is also important for the Commitment Wording, ITA and AC to be consistent with one another so that their intent can

be readily understood. This ITAAC review is referred to by the staff as the “inspectability” review. The staff had “inspectability” questions concerning the COL ITAAC that are contained in **RAI 360, Questions 14.03-15 to 14.03-27 and RAI 361, Questions 14.03-28 to 14.03-45 are being tracked as open items.**

14.3.1.5 *Post Combined License Activities*

There are no post COL activities related to this section.

14.3.1.6 *Conclusions*

The staff reviewed the COL application and reviewed the referenced U.S. EPR FSAR. The staff's review confirmed that the COL applicant addressed the required information relating to ITACC. The staff is reviewing the information in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to ITACC incorporated by reference in the COL application will be documented in the staff safety evaluation report on the design certification application for the U.S. EPR. The SER on the U.S. EPR is not yet complete. The staff will update this report to reflect the final disposition of the design certification application.

14.3.2 Structural and Systems Engineering Inspections, Tests, Analyses, and Acceptance Criteria

14.3.2.1 *Introduction*

SRP Section 14.3.2 addresses the review of ITAAC for Structural and Systems Engineering. The staff reviews the proposed ITAAC to determine whether, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in accordance with the COL and NRC regulations. The staff also verifies that the ITAAC contained in the certified design apply to those portions of the facility design that are approved in the design certification.

The scope of Structural and Systems Engineering ITAAC covers the major structural systems described in the final safety analysis report of the COL application, including the reactor vessel, American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 piping systems, and major building structures (primary containment, Nuclear Island structures, Turbine Building, component cooling water heat exchanger structures, diesel fuel storage structures, and the Radwaste Building).

In this report, the staff reviews the structural-related portions of SRP Section 14.3.2.

14.3.2.2 *Summary of Application*

COL FSAR Section 14.3.2 incorporates by reference U.S. EPR FSAR Tier 2, Section 14.3.2. In addition, in COL FSAR Section 14.3.2, the COL applicant provided the following:

COL Information Items

The COL applicant provided additional information in COL FSAR Section 14.3 to address COL Information Item 14.3-1 as follows:

A COL applicant that references the U.S. EPR design certification will provide ITAAC for emergency planning, physical security, and site specific portions of the facility that are not included in the Tier 1 ITAAC associated with the certified design (10 CFR 52.80(a)).

The COL applicant provided ITAAC for emergency planning, physical security, and site-specific portions in Part 10 of the COL application, Appendix B.

The COL applicant provided additional information in COL FSAR Section 14.3 to address COL Information Item 14.3-2 as follows:

A COL applicant that references the U.S. EPR design certification will describe the selection methodology for site-specific SSCs to be included in ITAAC, if the selection methodology is different from the methodology described within the FSAR, and will also provide the selection methodology associated with emergency planning and physical security hardware.

The COL applicant addressed COL Information Item 14.3-2 in COL FSAR Section 14.3.2. The COL applicant referred to the selection criteria and methodology defined in the U.S. EPR FSAR Tier 2, Section 14.3.2 for the site-specific ITAAC.

Supplemental Information

COL FSAR Section 14.3.2 provides supplemental information for ITAAC, including the following:

- Site-specific analyses that were reviewed to identify safety-significant features (COL FSAR Table 14.3-1).
- Site-specific structures, systems, and components (SSCs) that were considered to be addressed by ITAAC (COL FSAR Table 14.3-2)
- The interface requirements that were contained in U.S. EPR FSAR Tier 1, Section 4, along with the method for addressing them (COL FSAR Table 14.3-3)
- Selection Criteria for ITAAC
- Site-Specific ITAAC

License Conditions

The COL applicant provided the Proposed License Conditions for ITAAC in Part 10, Appendix A, of the COL application.

ITAAC

The COL applicant originally provided ITAAC for structural-related portions of this review in Part 10, Appendix B, Revision 3, COL ITAAC Tables 2.4-1 through 2.4-20, 2.4-26, and 2.4-28 of the COL application. Between Revision 3 and Revision 7 to Part 10, Appendix B, some ITAAC tables were removed (e.g., ITAAC tables for Ultimate Heat Sink Electrical Building and the New and Spent Fuel Storage Racks), and some ITAAC tables were added (e.g., ITAAC tables for the Forebay Structure and the Access Building, etc.); therefore, ITAAC tables were renumbered. Based on Revision 7 to Part 10, Appendix B, of the COL application, the structural-related

portions of the ITAAC tables now include COL ITAAC Tables 2.4-1 through 2.4-19, COL ITAAC Table 2.4-24, and COL ITAAC Tables 2.4-30 through 2.4-34.

14.3.2.3 *Regulatory Basis*

The regulatory bases are the relevant requirements of the following NRC regulations:

1. 10 CFR 52.47(b)(1), as it relates to the requirement that a design certification application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act of 1954, and NRC regulations.
2. 10 CFR 52.80(a), as it relates to the requirements that a COL application 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 the acceptance criteria met, the facility has been constructed and will operate in conformity with the combined license, the provisions of the Atomic Energy Act of 1954, and NRC regulations.

14.3.2.4 *Technical Evaluation*

The staff reviewed Part 10 of the COL application and considered the referenced design certification FSAR. The staff confirmed that the information contained in the COL application and incorporated by reference addresses the relevant information related to this section.

The staff reviewed the structural-related portions of the information contained in the COL FSAR as discussed below.

COL Information Items

The staff conducted a preliminary assessment of COL FSAR Section 14.3.2, using the acceptance criteria and guidance provided in SRP Section 14.3.2 and RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," Section C.II.1.2.2, "ITAAC for Structures and Systems." The staff also reviewed U.S. EPR FSAR Tier 2, Section 14.3.2. Based on its preliminary assessment, the staff determined that additional information and clarification would be needed before a conclusion can be made whether COL FSAR Section 14.3.2 sufficiently meets the expectations of SRP Section 14.3.2 and RG 1.206 C.II.1.2.2. Therefore, in RAI 118, Question 14.03.02-2-A, the staff requested that the COL applicant provide additional information and clarifications for COL FSAR Section 14.3.2.

In a March 31, 2010, response to RAI 118, Question 14.03.02-2-A, the COL applicant stated that several of the interface requirements listed in COL FSAR Table 14.3-3 are associated with the design criteria for an SSC. The COL applicant also stated that the COLA contains the specific design criteria that have adequate information for the staff to establish the acceptability of the site-specific design to meet those interface requirements; therefore, no ITAAC were provided for those items. The specific interface requirements listed in COL FSAR Table 14.3-3 are as follows:

- The COL applicant will provide the design of the Fire Protection Storage Tanks and Building.
- The COL applicant will provide the design of the Switchgear Building.
- The COL applicant will provide the design of the Turbine Building.
- The COL applicant will provide the design of the Access Building.

For the Fire Protection Storage Tanks and Building, COL FSAR Table 14.3-3 references COL FSAR Section 3.7.2.3.3 and COL FSAR Section 3.7.2.8 for design information. For the Switchgear Building, Turbine Building, and Access Building, COL FSAR Table 14.3.2 references COL FSAR Table 3.2-1 for design information.

The staff reviewed the COL FSAR tables and sections referenced above, and determined that the referenced sections and table for the Fire Protection Storage Tanks and Building, Switchgear Building, Turbine Building, and Access Building contain only structural seismic classifications and references to design codes for the design of these structures. The staff considers that there is insufficient design information provided in the referenced sections or table to satisfy the interface requirements for these structures. Specifically, the design information should consist of a summary of the analysis and design approach (including acceptable codes and standards, load and load combinations, analysis procedures, acceptance criteria and materials) and design results for some representative structural members. Therefore, in follow-up RAI 275, Question 14.03.02-13, the staff requested that the COL applicant clarify where the design information to satisfy the interface requirements for these structures is included in the COL FSAR. For any of the design information that is identical to other Seismic Category 1 structures, a reference to the appropriate subsections in the COL FSAR would be adequate.

In a September 1, 2011, response to RAI 275, Question 14.03.02-13, the COL applicant stated that UniStar Nuclear Energy (UNE) is in the process of reclassifying the Fire Protection Storage Tanks and Building to Conventional Seismic. The COL applicant also stated that, for the Seismic Category II Turbine Building, Switchgear Building, and Access Building, the analysis and design will be performed during the detailed design engineering phase, therefore, the design results are not available at this time; however, a summary of design information is provided in the RAI response, and the analysis and conceptual design of the structures will be provided in the response to RAI 315, Question 03.07.02-63. In addition, the COL FSAR will be updated to include the stability evaluation results for the structures, as well as the design codes and standards.

The staff reviewed the COL applicant's September 1, 2011, response to RAI 275, Question 14.03.02-13, and determined that (1) the acceptability of design classification will be discussed in the COL FSAR Section 3.2 review; (2) the summary of design information provided, which include acceptable codes and standards, loads and load combinations, analysis procedures, materials and acceptance criteria, is comparable to those in the COL FSAR for Seismic Category I structures, therefore, is acceptable; (3) it is acceptable not to provide design results for these structures at this time, because (a) ITAAC related to the above Seismic Category II structures state that the design of CCNPP Unit 3 Seismic Category II structures is to the same requirements as a Seismic Category I structure; (b) this is consistent with the U.S. EPR design certification review position, according to the U.S. EPR SER and U.S. EPR FSAR, Revision 3, for Seismic Category II structures, such as the Nuclear Auxiliary Building

(NAB), no detailed design information is required at this time, but the results of seismic interaction analyses with Seismic Category I structures and stability evaluation will be provided in the design certification application.

The staff determined that the COL applicant's September 1, 2011, response to RAI 275, Question 14.03.02-13, addressed most of the staff's concerns. However, as requested in the RAI, for all Seismic Category II structures, in appropriate section(s) of the COL FSAR the COL applicant should include the entire summary of the design information provided in the September 1, 2011, response to RAI 275, Question 14.03.02-13, and that provided in the response to RAI 315, Question 03.07.02-63. Therefore in follow-up RAI 334, Question 14.03.02-19, the staff requested that the COL applicant address the above issue.

In an April 20, 2012, response to RAI 334, Question 14.03.02-19, the COL applicant stated that, for Seismic Category II structures, the COL FSAR Section 3.7.2.8 will be revised to include the design information consistent with the responses to RAI 275, Question 14.03.02-13 and RAI 315, Question 03.07.02-63.

The staff reviewed the proposed mark-ups for COL FSAR Section 3.7.2.8 and determined that the proposed mark-ups include a summary of the analysis and design approach for the Seismic Category II Turbine Building, Switchgear Building and Access Building, and that the summary is, in general, consistent with the response to RAI 275, Question 14.03.02-13, and is therefore acceptable. However, the staff also determined that the COL FSAR mark-ups do not include the design information consistent with the response to RAI 315, Question 03.07.02-63. The staff notes that the information may not be available at this time, but the COL applicant should confirm that the COL FSAR mark-ups with the information will be submitted for the staff's review on or before the response to RAI 315, Question 03.07.02-63. In addition, since the CWS MWIS is also a Seismic Category II structure, its design information comparable to that provided for other Seismic Category II structures should be included in the COL FSAR. Therefore, in follow-up RAI 367, Question 14.03.02-20, the staff requested that the COL applicant address the above issues. The staff needs the information to be able to conclude in the report that there is reasonable assurance that the specific COL interface requirements for the CCNPP Unit 3 Seismic Category II structures have been adequately implemented and addressed in the CCNPP Unit 3 COL application. **RAI 367, Question 14.03.02-20 is being tracked as an open item.**

In RAI 118, Question 14.03.02-2-B, the staff requested that the COL applicant provide information on the design and analyses for the new and spent fuel storage racks. In a March 31, 2010, response to RAI 118, Question 14.03.02-2-B, the COL applicant stated that the ITAAC for new and spent fuel storage racks were removed because the COL applicant intends to incorporate by reference those portions of the U.S. EPR FSAR related to the new and spent fuel storage racks in their entirety. The staff confirmed that the applicable changes to U.S. EPR Tier 1 and Tier 2 were submitted by the design certification applicant in a December 8, 2009, letter. Therefore, the staff concludes that RAI 118, Question 14.03.02-2-B, is no longer applicable and considers this RAI resolved.

Supplemental Information

The discussion of the staff's review of the supplemental information in COL FSAR Section 14.3.2 is included in the above section, "Combined License Information Items."

License Conditions

In a review of COL application, Appendix A, Section 3, "Operational Program Implementation," the staff examined the referenced COL FSAR Table 13.4-1, "Operational Programs Required by NRC Regulations and Program Implementation." As a result of its review, as discussed below, the staff identified the need for clarification and additional information related to (1) the omission of Containment inservice inspection (ISI) required by 10 CFR 50.55a, and (2) the COL applicant's implementation of the Maintenance Rule (10 CFR 50.65) in accordance with NEI 07-02 "Generic FSAR Template Guidance for Maintenance Rule Program Description for Plants Licensed Under 10 CFR Part 52," Revision 3, September 2007.

COL application, Part 10, Appendix A, ITAAC, Section 3 - "Operational Program Implementation" references COL FSAR Table 13.4-1. In COL FSAR Table 13.4-1, Item 12 addresses the Maintenance Rule (10 CFR 50.65), and references COL FSAR Section 17.6. COL FSAR Section 17.6 incorporates by reference NEI 07-02 Revision 3 (September 2007), "Generic FSAR Template for Maintenance Rule Program Description for Plants Licensed under 10 CFR Part 52." In RAI 118, Question 14.03.02-2-C the staff requested that the COL applicant discuss key elements of CCNPP's approach to address the Maintenance Rule (10 CFR 50.65) compliance issue and the appropriateness of incorporating NEI 07-02 Revision 3 by reference. The staff also requested that the COL applicant indicate any precedent for "incorporating by reference" the NEI 07-02 Revision 3 report in a COL application.

In a December 4, 2009, response to RAI 118, Question 14.03.02-2-C, the COL applicant stated that COL FSAR, Revision 6, Table 13.4-1, Item 17 references COL FSAR Section 17.7 and that COL FSAR Section 17.7 incorporates the NEI Maintenance Rule program template by reference (NEI 07-02A, "Generic FSAR Template Guidance for Maintenance Rule Program Description for Plants Licensed Under 10 CFR Part 52," Revision 0, March 2008). The COL applicant also stated that NEI 07-02 provides a complete generic program description for use in developing COL FSARs and that the document is consistent with RG 1.206. The COL applicant noted that a main objective of this program is NRC-approved, standardized COL FSAR content that expedites NRC review and issuance of the COL. Additionally, the COL applicant stated that the NEI 07-02A, Revision 0 template is incorporated by reference in Revision 1 of the Vogtle Electric Generating Plant, Units 3 and 4 COLA.

In addition to the above information the staff also noted that the staff's SER on NEI 07-02 also stated:

Further, based on the above evaluation, the staff finds that incorporation of NEI 07-02 by reference in a COL application will provide an acceptable method for (1) complying with the requirement in 10 CFR 52.79(a)(15) that FSARs contain a description of the program, and its implementation, for monitoring the effectiveness of maintenance to meet the requirements of Section 50.65 and (2) satisfying the acceptance criteria of SRP 17.6.

Based on the above discussion, the staff concluded that RAI 118, Question 14.03.02-2-C is resolved.

COL application, Part 10, Appendix A, Section 3 - "Operational Program Implementation" references COL FSAR Table 13.4-1. In COL FSAR Table 13.4-1, Item 1 addresses ISI Program (10 CFR 50.55a(g)), and references COL FSAR Sections 5.2.4 (ASME Code Class 1) and 6.6 (ASME Code Classes 2 and 3). The staff notes that 10 CFR 50.55a also requires ISI of the containment structure, in accordance with ASME Section XI, Subsections IWE and IWL, and

the special provisions for inaccessible areas defined in 10 CFR 50.55a. Therefore, in RAI 118, Question 14.03.02-2-D, the staff requested that the COL applicant explain why ISI of the containment structure is not included in COL FSAR Table 13.4-1. If the omission is an oversight, the staff requested that the COL applicant revise COL FSAR Table 13.4-1 accordingly.

In a December 4, 2009, response to RAI 118, Question 14.03.02-2-D, the COL applicant stated that U.S. EPR FSAR Tier 2, Section 3.8.1.7.2 addresses ISI of the Reactor Containment Building in accordance with 10 CFR 50.55(a) and that this section is incorporated by reference in COL FSAR Section 3.8.1.7.2 with no departures or supplements. The COL applicant further stated that for clarification, COL FSAR Table 13.4-1 will be revised to include a reference to COL FSAR Section 3.8.1.7.2 for Item 1, Inservice Inspection Program, and Item 4, Preservice Inspection Program. The COL applicant also stated that the ASME Code requirement references for these programs will be corrected. **RAI 118, Question 14.03.02-2-D, is being tracked as a confirmatory item** until the COL FSAR is revised accordingly.

ITAAC

The staff reviewed the structural-related portions of the ITAAC provided in COLA Part 10, Appendix B. There are significant portions of Part 10, Appendix B that will be reviewed by additional staff.

Design certification ITAAC is contained in U.S. EPR FSAR Tier 1, which is incorporated by reference. The staff notes there are no deviations reported in the COL application; therefore, no further review is required as part of the COL FSAR review. The completeness and accuracy of design certification ITAAC is being performed by others as part of the U.S. EPR FSAR review.

The site-specific ITAAC was provided in COLA Part 10, Appendix B, Revision 3, Tables 2.4-1 through 2.4-31 and is provided in COL application Part 10, Appendix B, Revision 7, Tables 2.4-1 through 2.4-35. The staff reviewed the structural related portions of Part 10 of the COL application, Appendix B, Revision 7, Tables 2.4-1 through 2.4-19, Part 10 of the COL application, Appendix B, Table 2.4-24, and Part 10 of the COL application, Appendix B, Tables 2.4-30 through 2.4-34. The review findings are discussed below.

The following is a status summary of the COL application Part 10, Appendix B ITAAC RAIs:

RAIs resolved

- RAI 118, Questions 14.03.02-2-E through 14.03.02-2-O

Follow-up RAIs resolved

- RAI 236, Questions 14.03.02-3 through 14.03.02-6
- RAI 256, Question 14.03.02-7
- RAI 269, Questions 14.03.02-9 through 14.03.02-10
- RAI 270, Question 14.03.02-11
- RAI 274, Question 14.03.02-12

- RAI 275, Questions 14.03.02-14 through 14.03.02-16
- RAI 309, Question 14.03.02-18

Follow-up RAI Confirmatory

- RAI 297, Question 14.03.02-17

The staff notes that currently there are no unresolved Appendix B ITAAC RAIs and Question 14.03.02-8 is not used.

In RAI 118, Questions 14.03.02-2-E, G, H, J, and O, the staff raised questions regarding ITAAC table format and consistencies with the U.S. EPR design certification ITAAC and requested that the COL applicant provide additional ITAAC information such as the description of the process used to ensure the inclusion of all commitments in the ITAAC tables, the description of the concrete specific parameters that must be met for structures included as part of the U.S. EPR design certification, and the requirement of an analysis for reconciling the as-built plant with all the structural design-basis loads and acceptance criteria for the UHS Electrical Building and New and Spent Fuel Storage Racks.

On December 4, 2009, March 31, 2010, June 18, 2010, and August 6, 2010, the COL applicant provided responses to five parts of RAI 118. The staff reviewed the COL applicant's responses to the five parts of RAI 118 and finds the responses to Questions 14.03.02-2-E and 14.03.02-2-H acceptable since they provide additional information that clarified the staff questions regarding ITAAC information related to the description of the process used to ensure the inclusion of all commitments in the ITAAC tables and ITAAC table consistencies with the U.S. EPR design certification ITAAC. The staff confirmed that the proposed changes to the COL ITAAC have been made in Revision 7 to the COL application. The staff also concluded that RAI 118, Question 14.03.02-2-O is no longer applicable because of the removal of ITAAC for New and Spent Fuel Storage Racks. During the staff review, the COL applicant confirmed that the information regarding the New and Spent Fuel Storage Tanks will be incorporated by reference in the U.S. EPR design certification application.

In addition, as a result of the staff's review of the RAI 118 responses discussed above, the staff issued follow-up RAIs to obtain additional information:

- RAI 275, Question 14.03.02-15 (follow-up to RAI 118, Question 14.03.02-2-G)
- RAI 236, Question 14.03.02-5 and RAI 270, Question 14.03.02-11 (follow-up to RAI 118, Question 14.03.02-2-J)

In February 18, 2011, June 30, 2010, and January 13, 2011, responses to the above follow-up questions, the COL applicant addressed the staff's concerns. The staff reviewed the responses and finds the response to RAI 275, Question 14.03.02-15 acceptable since the COL applicant addressed the staff's concern regarding the ITAAC information related to the description of the concrete specific parameters that must be met for structures included as part of the U.S. EPR design certification. Accordingly, the staff considers RAI 275, Question 14.03.02-15 resolved.

The staff also concluded that the questions in RAI 118, Question 14.03.02-2-J and its follow-up RAI 236, Question 14.03.02-5 and RAI 270, Question 14.03.02-11 regarding ITAAC for the UHS Electrical Building are no longer applicable because of the removal of the ITAAC for the UHS

Electrical Building and considers these questions resolved. The UHS Electrical Building has now been combined with the UHS Makeup Water Intake Structure.

Other Appendix B ITAAC RAIs are discussed below.

COL application, Part 10 ITAAC, Appendix B, Revision 3, Table 2.4-1 specified Structural Fill and Backfill under Seismic Category I and Seismic Category II-SSE Structures ITAAC. For this table, in RAI 118, Question 14.03.02-2-F, the staff requested that the COL applicant provide additional ITAAC information related to tests for structural fill and ITAAC information for Seismic Category II structures that utilize structural fill or backfill.

In a March 31, 2010, response to RAI 118, Question 14.03.02-2-F, the COL applicant addressed the staff's concerns. The staff finds the response to the original RAI regarding COL application ITAAC Table 2.4-1, Revision 3 addressed the staff concerns and was acceptable. However, as indicated in the response the table had been updated in COL application, Part 10, ITAAC Revision 6. The staff reviewed the updated table and determined that additional information was needed. Therefore, in RAI 275, Question 14.03.02-14, the staff requested that the COL applicant (1) provide an explanation regarding the removal of some structural fill commitment requirements from COL ITAAC Table 2.4-1, Revision 6, and (2) explain whether the shear wave velocity items in the markup to the table Revision 6 include all Seismic Category I and Seismic Category II SSE structures that utilize structural fill.

In an April 22, 2011, response to RAI 275, Question 14.03.02-14, the COL applicant indicated that the markup of COL application Part 10 ITAAC, Revision 6, Table 2.4-1 was based on the discussions from public meetings. The COL applicant's response included a summary of the May 8, 2009, public meeting and referenced other documents regarding the public meeting. According to the meeting summary and the related documents, (1) no additional ITAAC is needed for backfill parameters beyond shear wave velocity and compaction; other backfill characteristics will be described in the COL FSAR; however, in the case where the backfill source material is not known at the COL phase or the backfill is not fully characterized at the COL phase, additional ITAAC to confirm parameters other than shear wave velocity and compaction may be necessary; (2) no shear wave velocity ITAAC is necessary for Seismic Category I structures founded on native material (soil or rock) or on concrete fill, or on a shallow (less than or equal to 1.52 m (5 ft)) soil leveling course.

The COL applicant's April 22, 2011, response to RAI 275, Question 14.03.02-14, also indicated that, for CCNPP Unit 3, the source of structural fill has been identified, and the proposed structural fill has been tested and fully characterized as discussed in COL FSAR, Revision 7, Section 2.5.4, in which construction specifications serving as a quality control process are also discussed. In another section of this report, the staff will address the conclusion of their review of COL FSAR Section 2.5.4 regarding the adequacy of the backfill characteristics and the quality control process. Therefore, as stated above in the meeting conclusion (1), the staff concludes that the removal of the structural fill commitment requirements other than those for shear wave velocity and compaction from COL ITAAC Table 2.4-1 is acceptable.

In addition, the COL applicant's April 22, 2011, response to RAI 275, Question 14.03.02-14, indicated that the amount of fill beneath the Nuclear Island would exceed 1.52 m (5 ft) and that a new ITAAC would be created in COL ITAAC Table 2.4-1. The response confirmed that the only other Seismic Category I or II SSE structures not covered by COL ITAAC Table 2.4-1 are the Forebay and Ultimate Heat Sink Makeup Water Intake Structure, and they are founded on native material, concrete fill, or minimal leveling fill less than 1.52 m (5 ft). Therefore, as stated in the meeting conclusion (2), no shear wave velocity ITAAC was required for these structures.

The staff finds the COL applicant's April 22, 2011, response to RAI 275, Question 14.03.02-14, acceptable. The staff also has confirmed that COL application, Part 10 ITAAC, Appendix B, Revision 8, dated March, 2012, was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 118, Question 14.03.02-2-F, and the related follow-up RAI 275, Question 14.03.02-14, resolved.

The staff reviewed COL application, Part 10, Appendix B, Revision 3, Table 2.4-7 for the UHS Makeup Water Intake Structure and identified the need for additional information. Therefore, in RAI 118, Question 14.03.02-2-I, the staff requested that the COL applicant provide additional ITAAC information regarding the requirement of an analysis for reconciling the as-built plant with all the structural design-basis loads and acceptance criteria, as well as the loads on the structures.

The staff reviewed the COL applicant's December 4, 2009, response to RAI 118, Question 14.03.02-2-I, and determined that additional information was needed. SRP Section 14.3.2 specified that ITAAC require an analysis for reconciling the as-built plant with the structural design-basis loads. However, the COL applicant's response did not address consideration of as-built conditions for the analysis identified in related items in COL application, Part 10, ITAAC Table 2.4-7, Revision 3, and Table 2.4-33 proposed in the response. Therefore, in follow-up RAI 236, Question 14.03.02-6, the staff requested that the COL applicant revise COL ITAAC Tables 2.4-7 and 2.4-33 to state that the analysis being performed will consider the deviations from design resulting from as-built conditions. In addition, the staff requested that the COL applicant revise COL ITAAC Table 2.4-33 to indicate that the Forebay structure below grade concrete foundation and walls "contain a quantity of supplementary cementitious material appropriate for the exposure condition," for the consistency with other similar items in other ITAAC tables, or explain the reason for the omission. These issues were further addressed in follow-up RAI 274, Question 14.03.02-12.

In a January 13, 2011, response to RAI 274, Question 14.03.02-12, the COL applicant indicated that COL ITAAC Tables 2.4-7 and 2.4-30 (previously Table 2.4-33) were revised to state that deviations (due to as-built conditions) from the approved design will be analyzed for the design-basis loads and load combinations. In addition, the requirements regarding the quantity of supplementary cementitious material were removed from the corresponding ITAAC tables. The staff finds the removal of the quantity of the supplementary cementitious material from the ITAAC table acceptable, because COL FSAR Section 3.8.4.6.1 clearly states that about 20-25 percent of the total weight of the cementitious materials in all concrete mixtures will be replaced with fly as in conformance to American Society of Testing and Materials (ASTM) C618, which is referenced by American Concrete Institute 349-01. The staff finds the COL applicant's January 13, 2011, response to RAI 274, Question 14.03.02-12 acceptable. The staff also has confirmed that COL application Part 2 FSAR, Revision 8 and Part 10 ITAAC, Appendix B, Revision 8, both dated March, 2012, were revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and therefore, considers RAI 118, Question 14.03.02-2-I, and related follow-up RAI 236, Question 14.03.02-6, and RAI 274, Question 14.03.02-12, resolved.

The staff reviewed COL application, Part 10 – Appendix B ITAAC, Revision 3, Table 2.4-9 for Buried Duct Banks and Pipes and identified the need for the following additional information. Therefore, in RAI 118, Question 14.03.02-2-K, the staff requested that the COL applicant revise the ITAAC Table 2.4-9 to specifically address the requirement of an analysis for reconciling the as-built plant with all the structural design-basis loads and acceptance criteria. The staff also

requested that the COL applicant provide additional information regarding the criteria for the use of waterproof wrapping or coating for buried pipes. This issue was further addressed in follow-up RAI 275, Question 14.03.02-16.

In a February 18, 2011, response to RAI 275, Question 04.03.02-16, the COL applicant indicated that an analysis for reconciling the as-built plant with the structural design-basis loads will be performed and COL ITAAC Table 2.4-9 (now ITAAC Table 2.4-8) has been revised to indicate that an analysis for reconciling the as-built plant with the structural design-basis loads will be performed for buried duct banks and buried pipes. The staff confirmed that COL ITAAC Table 2.4-9 (now COL ITAAC Table 2.4-8) in Revision 7 to the COL application has been revised as stated. Therefore, the staff considers follow-up RAI 275, Question 14.03.02-16 resolved.

In an August 6, 2011, response to RAI 118, Question 14.03.02-2-K, Item 5, the COL applicant indicated that items with ITAAC information related to the waterproof membrane for buried duct banks or waterproof wrapping or coating for buried pipes have been deleted from COL ITAAC Table 2.4-9 (now COL ITAAC Table 2.4-8 in Revision 7 to the COL application) because the waterproofing system (membrane, wrapping or coating) does not serve a safety-related function. For buried duct banks and buried concrete pipes, the staff notes that it is acceptable not to include ITAAC information related to the waterproofing membrane in the ITAAC table, considering that the durability of below-grade concrete against aggressive groundwater will be achieved by using a low water/cementitious ratio and supplementary cementitious materials. However, for buried steel pipes/conduits, the waterproofing system (wrapping or coating) that is provided will be the only protection against the detrimental effects of aggressive groundwater. For such cases, since the waterproofing membrane serves a safety-related function, it should be confirmed by ITAAC that such wrappings or coatings have been properly installed for the buried steel pipes/conduits. Therefore, in follow-up RAI 309, Question 14.03.02-18, the staff requested that the COL applicant provide in COL application, Part 10 ITAAC, Appendix B, Revision 7, Table 2.4-8 ITAAC information related to the waterproofing wrapping or coating for buried steel pipes/conduits.

In a September 12, 2011, response to RAI 309, Question 14.03.02-18, the COL applicant stated that COL application, Part 10 ITAAC, Table 2.4-8, "Buried Conduit and Duct Banks, and Pipe and Pipe Ducts ITAAC," will be updated to include the ITAAC requirement for the protection wrappings and coatings for the Seismic Category I buried steel/iron pipes. The staff reviewed the RAI response and finds the response acceptable, since no Seismic Category I buried conduits exist for CCNPP Unit 3 according to COL FSAR Section 3.8.1.4.8. The staff also finds the proposed mark-up for ITAAC Table 2.4-8 acceptable, because it is consistent with the COL applicant's RAI response. The staff has confirmed that COL application, Part 2 COL FSAR, Revision 8, dated March, 2012, was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant has adequately addressed this issue and, therefore, considers RAI 118, Question 14.03.02-2-K, and the related follow-up RAI 309, Question 14.03.02-18, resolved.

The staff reviewed COL Application, Part 10 – ITAAC, Appendix B, Revision 3, Table 2.4-10, for the Fire Protection Building and noted that Item 2 does not require an analysis to reconcile the as-built plant with the structural design-basis loads and acceptance criteria, as well as the documentation of the analysis results in a structural analysis report. In RAI 118, Question 14.03.02-2-L, the staff requested that the COL applicant revise the ITAAC accordingly to address each issue or provide a technical explanation for not including this information in the

ITAAC. These issues were further addressed in follow-up RAI 236, Question 14.03.02-4. The response to RAI 236, Question 14.03.02-4 resulted in follow-up RAI 269, Question 14.03.02-10.

In a January 13, 2011, response to follow-up RAI 269, Question 14.03.02-10, the COL applicant indicated that COL ITAAC Table 2.4-9 (previously COL ITAAC Table 2.4.-10) had been revised to state that deviations (due to as-built conditions) from the approved design will be analyzed for design-basis loads and the results will be documented in a structural analysis report. In addition, similar revisions were made to COL ITAAC Tables 2.4-10, 2.4-11, 2.4-18, 2.4-22, 2.4-31, 2.4-32, and 2.4-33 (current numbering). The staff finds the COL applicant's response acceptable. The staff also has confirmed that COL application, Part 10, Appendix B, ITAAC, Revision 8, dated March, 2012, was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 118, Question 14.03.02-2-L, and related follow-up RAI 236, Question 14.03.02-4, and RAI 269, Question 14.03.02-10, resolved.

COL application, Part 10, Appendix B, ITAAC, Revision 3, Tables 2.4-11 through 2.4-20 are for non-Seismic Category I structures. Based on the COL application Part 10, Appendix B, Revision 7, those tables are re-numbered as Tables 2.4-10 through 2.4-19. The acceptance criteria state that a report exists and concludes that under seismic loads, the as-built structure will not impact the ability of any safety-related structure, system, or component to perform its safety function.

SRP Section 3.7.2 states that all non-Seismic Category I structures should be assessed to determine whether their failure under SSE conditions could impair the integrity of Seismic Category I SSCs, or result in incapacitating injury to control room occupants. Each non-Seismic Category I structure should meet at least one of the following criteria:

1. The collapse of the non-Seismic Category I structure will not cause the non-Seismic Category I structure to strike a Seismic Category I SSC.
2. The collapse of the non-Seismic Category I structure will not impair the integrity of Seismic Category I SSCs, nor result in incapacitating injury to control room occupants.
3. The non-Seismic Category I structure will be analyzed and designed to prevent its failure under SSE conditions, such that the margin of safety is equivalent to that of Seismic Category I structures.

In RAI 118, Question 14.03.02-2-M, the staff requested that, for each of the structures included in Revision 3 of the COL application, ITAAC Tables 2.4-11 through 2.4-20, the COL applicant clarify which of the above three criteria are being utilized to satisfy the requirements for design of non-Seismic Category I structures, and provide additional ITAAC information supporting the utilization of the criterion.

In a January 29, 2010, response to RAI 118, Question 14.03.02-2-M, the COL applicant provided adequate ITAAC information for most of the various non-Seismic Category I structures, except the Turbine Building, Switchgear Building, and Circulating Water System Makeup Water Intake Structure (CWS MWIS). Therefore, in follow-up RAI 256, Question 14.03.02-7, the staff requested that the COL applicant provide additional ITAAC information for the above three structures. Additionally, the staff requested that the COL applicant provide the ITAAC information requested in RAI 118, Question 14.03.02-2-M for all of the non-Seismic Category I structures not covered by COL application, Appendix B, Tables 2.4-11 through 2.4-20.

In an October 26, 2010, response to RAI 256, Question 14.03.02-7, the COL applicant provided additional ITAAC information for the Turbine Building, Switchgear Building, and the CWS MWIS, and added new ITAAC tables for the Waste Water Treatment Facility, Access Building, and Sheet Pile Wall. The staff reviewed the above response and concluded that the COL applicant addressed most of the staff's questions, with the exception that, for the CWS MWIS above ground structure and the Sheet Pile Wall, the SRP Section 3.7.2 Acceptance Criteria stated in the October 26, 2010, response were inconsistent with the COL FSAR Section 3.7.2.8. Therefore, in follow-up RAI 297, Question 14.03.02-17, the staff requested that the COL applicant explain the inconsistencies; revise ITAAC Tables 2.4-11 through 2.4-20, Revision 3 to include extreme event loads such as Tornado load and to be consistent with other ITAAC tables.

In a July 8, 2011, response to RAI 297, Question 14.03.02-17, the COL applicant indicated that, for the CWS MWIS above ground structure, the SRP Section 3.7.2 Acceptance Criteria to be utilized is changed and COL FSAR Section 3.7.2.8 will be revised to reflect consistency with the RAI response on SRP Section 3.7.2 Acceptance Criteria for the CWS MWIS above ground structure and the Sheet Pile Wall. In addition, the ITAAC tables for non-Seismic Category I structures will be revised to include extreme event loads such as Tornado load and to be consistent with other ITAAC tables. The staff finds the COL applicant's July 8, 2011, response to RAI 297, Question 14.03.02-17, acceptable. The staff also finds that COL application, Part 2 FSAR, Revision 8, and Part 10 ITAAC, Appendix B, Revision 8, both dated March, 2012, were revised as committed in the RAI responses, except that the ITAAC table for the Turbine Building was not revised as committed in the RAI response to RAI 297, Question 14.03.02-17. Therefore, the staff considers RAI 118, Question 14.03.02-2-M, and related RAI 256, Question 14.03.02-7, resolved. In addition, **follow-up RAI 297, Question 14.03.02-17 is being tracked as a confirmatory item**, pending inclusion of the stated ITAAC table update for the Turbine Building in the next revision of the COL application, Part 10 ITAAC.

The staff reviewed COL application Part 10, Appendix B, ITAAC, Revision 3, Table 2.4-26 for the Fire Water Distribution System and noted that Items 2, 3, and 5 do not require an analysis to reconcile the as-built plant with all the design-basis loads and acceptance criteria, as well as the documentation of the analysis results in an analysis report. In RAI 118, Question 14.03.02-2-N the staff requested that the COL applicant revise the ITAAC accordingly to address each issue or provide a technical explanation for not including this information in the ITAAC. These issues were further addressed in follow-up RAI 236, Question 14.03.02-3. The response to RAI 236, Question 14.03.02-3 resulted in follow-up RAI 269, Question 14.03.02-9.

In a January 13, 2011, response to RAI 269, Question 14.03.02-9, the COL applicant indicated that COL ITAAC Table 2.4-24 (previously COL ITAAC Table 2.4-26) had been revised to state that deviations (due to as-built conditions) from the approved design will be analyzed for design-basis loads and the results will be documented in a structural analysis report. The staff finds the COL applicant's January 13, 2011, response to RAI 269, Question 14.03.02-9 acceptable. The staff also has confirmed that COL application Part 10, Appendix B, ITAAC, Revision 8, dated March 2012, was revised as committed in the RAI response. Accordingly, the staff finds that the COL applicant adequately addressed this issue and, therefore, considers RAI 118, Question 14.03.02-2-N and related follow-up RAI 236, Question 14.03.02-3, and RAI 269, Question 14.03.02-9 resolved.

14.3.2.5 *Post Combined License Activities*

There are no post COL activities related to this section.

14.3.2.6 *Conclusions*

The staff reviewed the structural-related portions of the site-specific ITAAC. The staff concludes that, if all the open items and confirmatory items addressed above are resolved, the COL applicant will provide sufficient structural-related information to comply with 10 CFR 52.80(a), and the ITAAC will have provided reasonable assurance that, if the inspections, tests, and analysis are performed and the acceptance criteria met, the facility has been constructed and will be operated in conformance with the combined license, the provisions of the Atomic Energy Act of 1954, and NRC regulations.

The staff is also reviewing the ITAAC-related information provided in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to this section (to be incorporated by reference in the COL application) will be documented in the staff safety evaluation report on the design certification application for the U.S. EPR. The SER for the U.S. EPR is not yet complete. The staff will update this report to reflect the final disposition of the design certification application for the U.S. EPR.

14.3.3 Piping Systems and Components Inspections, Tests, Analyses, and Acceptance Criteria

14.3.3.1 *Introduction*

SRP Section 14.3.3, "Piping Systems and Components – Inspections, Tests, Analyses, and Acceptance Criteria," addresses the review of ITAAC for piping systems and components for CCNPP Unit 3. The staff reviews the proposed ITAAC to determine whether, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in accordance with the COL and NRC regulations. The staff also verifies that the ITAAC contained in the certified design apply to those portions of the facility design that are approved in the design certification.

The scope of review for Piping Systems and Components ITAAC includes:

- Piping design and the use of design acceptance criteria (DAC)
- Design, dynamic qualification, welding, and safety classification for components
- Issues regarding structural, mechanical, materials, and chemical engineering
- Treatment of motor-operated valves (MOVs), power-operated valves (POVs), and check valves

14.3.3.2 *Summary of Application*

Part 10 of the COL application, Appendix B, incorporates by reference U.S. EPR FSAR Tier 1. The site-specific ITAAC are contained in Part 10 of the COL application, Appendix B, Table 2.4-1 through Table 2.4-35.

14.3.3.3 *Regulatory Basis*

The regulatory bases are the relevant requirements of the following NRC regulations:

1. 10 CFR 52.47(b)(1), as it relates to the requirement that a design certification application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provision of the Atomic Energy Act of 1954, and NRC regulations.
2. 10 CFR 52.80(a), as it relates to the requirements that a COL application 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 criteria met, the facility has been constructed and will operate in conformance with the combined license, the provisions of the Atomic Energy Act of 1954, and NRC regulations.

14.3.3.4 *Technical Evaluation*

The staff reviewed COL site-specific ITAAC and reviewed the referenced design certification Tier 1 FSAR to ensure that the combination of the information in the U.S. EPR FSAR and the information in Part 10 of the COL application represents the complete scope of required information relating to this review topic. The review confirmed that the information contained in the COL application and incorporated by reference addresses the required information relating to this section. U.S. EPR FSAR Tier 1 has been reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the information incorporated by reference related to Piping Systems and Component ITAAC has been documented in the staff safety evaluation report on the design certification application for the U.S. EPR.

The staff's review of the information contained in the supplemental information provided in the COL application is discussed as follows:

The staff reviewed conformance of COL site-specific ITAAC for Piping Systems and Components to the guidance in SRP Section 14.3.3 and RG 1.206, Chapter 14, Section C.III.1, Subsection C.I.14.3, "Inspections, Tests, Analyses, and Acceptance Criteria." The staff finds that it appropriately incorporates by reference U.S. EPR FSAR Tier 1, Section 14.3.3. U.S. EPR FSAR Tier 1, Section 14.3.3 has been reviewed by staff under Docket No. 52-020. The staff's technical evaluation of the information incorporated by reference related to piping systems and components ITAAC has been documented in the staff SER on the design certification application for the U.S. EPR. The staff also reviewed Part 10, "ITAAC and Proposed License Condition," of the COL application.

14.3.3.4.1 Design, Fabrication/Installation and As-built Reconciliation ITAAC

10 CFR 52.80(a) requires that a COL application must 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 the acceptance criteria met, that facility has been constructed and will be operated in conformity with the COL, the provisions of the Atomic Energy Act, and the Commission's rules and regulations.

In the initial review of the ITAAC in Part 10 of the CCNPP COL application, the staff noted that the ITAAC proposed for the site-specific ultimate heat sink (UHS) makeup water system regarding American Society of Mechanical Engineers (ASME) Code components and piping systems were not sufficient. For clarity and inspectability, the staff determined that three distinct

ITAAC covering (1) design, (2) as-built reconciliation, and (3) fabrication and installation activities would encompass the complete scope to ensure the piping systems and components are properly designed and constructed in accordance with ASME Code Section III requirements.

1. ITAAC for design – To confirm that the piping systems or components identified as ASME Code Section III are designed in accordance with the ASME Code Section III requirements, an acceptable inspection, test and analysis is to indicate that an inspection of ASME Section III Code Design Reports (NCA-3550) and required documents will be performed. An acceptable acceptance criteria is that the ASME Code Design Report exists and concludes that the design of the piping systems or components identified as ASME Code Section III complies with the requirements of ASME Code Section III.
2. ITAAC for fabrication and installation – To confirm that the piping systems or components identified as ASME Code Section III are fabricated, installed and inspected in accordance with the ASME Code Section III requirements, an acceptable inspection, test and analysis is that an inspection of the piping systems or components will be performed. An acceptable acceptance criteria is that ASME Code Data Reports (certified when required by ASME Code) and inspection reports (including N-5 Data Reports where applicable) exist and conclude that the piping systems or components identified as ASME Section III are fabricated, installed and inspected in accordance with ASME Code Section III requirements.
3. ITAAC for as-built reconciliation – To confirm that the piping systems or components identified as ASME Code Section III are built in accordance with the ASME Code Section III requirements, an acceptable inspection, test and analysis is that a reconciliation analysis using the as-designed and as-built information and ASME Code Section III Design Reports (NCA-3550) will be performed. An acceptable acceptance criteria is that the ASME Code Design Report (NCA-3550)(certified when required by ASME Code) exists and concludes that the design reconciliation has been completed in accordance with the ASME Code for as-built reconciliation of the piping systems or components identified as ASME Code Section III. The report documents the results of the reconciliation analysis.

In RAI 70, Question 14.03.03-01, and RAI 161 Question 14.03.03-02, the staff identified these concerns to the COL applicant. The staff also noted that the above three ITAAC apply to both piping systems and components.

In its letters dated May 28, 2009, and December 15, 2009, respectively, UniStar Nuclear Energy responded to these RAIs. In reviewing the RAI responses, as well as the associated revision to the COL application, the staff identified the following additional concerns.

1. For component ITAAC, the COL applicant only included two ITAAC (8a, 8b) to address design, fabrication and installation, and as-built reconciliation. The applicant combined the fabrication and installation and as-built reconciliation into one ITAAC. It was noted in both RAI 70, Question 14.03.03-01, and RAI 161, Question 14.03.03-02, that three distinct ITAAC are necessary and sufficient to ensure that the components are properly designed and constructed in accordance with the ASME Code Section III requirements.
2. For the component design ITAAC (8a), the inspection, test, and analysis was not acceptable. Inspection to verify the existence of the ASME Code Section III Design

Report is not the objective of the ITAAC. Rather, an inspection of the ASME Code Design Reports and required documents should be performed.

3. For piping system reconciliation ITAAC (9b), the inspection, test, and analysis was not acceptable. The statement, "Piping, including supports, analyzed using time history methods will be reconciled to the as-built information" is misleading because it restricts the piping systems only to those analyzed using time history methods. The inspection, test, and analysis should be modified as, "Analyses to reconcile as-built deviations to the ASME Code Design Report (NCA-3550) will be performed. Piping, including supports, will be reconciled to the as-built information."

Therefore, RAI 70, Question 14.03.03-01, is considered closed and **RAI 161, Question 14.03.03-02, is being tracked as an Open Item.** The resolution of RAI 161, Question 14.03.03-02 is dependent on the resolution of similar issues identified to AREVA during the staff's review of the U.S. EPR DCD application. Once a resolution is reached with AREVA, the COL applicant will be able to revise the CCNPP COL application to resolve this issue.

14.3.3.4.2 Seismic Category I Equipment

In the initial review of the ITAAC in Part 10 of the CCNPP Unit 3 COL application, the staff identified that the ITAAC proposed for the site-specific UHS makeup water system Seismic Category I equipment was not appropriate. Specifically, the acceptance criteria stated that the as-installed UHS makeup water system equipment designated as Seismic Category I can withstand a design-basis seismic load without loss of safety function. It was not clear to the staff how the proposed acceptance criteria can be met based on the proposed the inspection, test and analysis.

In RAI 161, Question 14.03.03-03, the staff identified this concern to the COL applicant and indicated that an acceptable approach to address this ITAAC for Seismic Category I equipment should be constructed as follows:

Inspection, Test, Analysis

- a. Type tests, analyses, or a combination of type tests and analyses will be performed on the Seismic Category I equipment using analytical assumptions or under conditions that bound the Seismic Category I design requirements.
- b. Inspections will be performed of the as-installed Seismic Category I equipment to verify that the equipment, including anchorage, is seismically bounded by the tested or analyzed conditions.

Acceptance Criteria

- a. Test/analysis reports exist and conclude that the Seismic Category I equipment can withstand seismic design basis loads without loss of safety function.
- b. Inspection reports exist and conclude that the as-installed Seismic Category I equipment, including anchorage, are seismically bounded by the tested or analyzed conditions.

The staff requested that the COL applicant to address these issues and revise the ITAAC for Seismic Category I equipment. This question was also applicable to other systems that consist of Seismic Category I equipment.

In a March 31, 2010, response to RAI 161, Question 14.03.03-03, the COL applicant revised the ITAAC in Part 10 of the CCNPP Unit 3 COL application to address the areas of concern identified by the staff. Other applicable systems containing Seismic Category I equipments were also revised. The staff finds the response acceptable because the acceptance criteria adequately address the inspection, test and analysis for the ITAAC related to Seismic Category I equipments. Therefore, the staff considers RAI 161, Question 14.03.03-03 closed.

14.3.3.4.3 Seismic Category II Equipment

In the initial review of the ITAAC in Part 10 of the CCNPP Unit 3 COL application, the staff identified that the ITAAC proposed for the site-specific UHS makeup water system Seismic Category II equipment was not appropriate. Specifically, in the inspection, test and analysis, the staff found that an inspection alone cannot satisfy the commitment wording requirement. Verification of equipment capability to resist seismic load is typically established by tests, analyses, or both as it is usually not practical to verify the equipment capability by visual observation. In addition, the staff determined that it was not appropriate to have the commitment wording be more specific than the acceptance criteria. The acceptance criteria should more closely duplicate the commitment wording indicating that the Seismic Category II equipment and piping can withstand seismic design basis loads without impacting the capability of equipment designated as Seismic Category I from performing its safety function. Furthermore, it was not clear to the staff how the proposed AC can be concluded by the inspection, test and analysis. As discussed, an acceptable ITAAC is to include an analysis and the results to be documented in the analysis report(s). The staff expressed these concerns to the COL applicant in RAI 161, Question 14.03.03-04.

In a March 9, 2010, response to RAI 161, Question 14.03.03-04, the applicant revised the Seismic Category II related ITAAC for the UHS makeup water system in the CCNPP Unit 3 COL application. In addition, modifications were also made for the Fire Water Distribution System and Fire Suppression System, both of which contain Seismic Category II equipments and piping systems. The staff reviewed the response to RAI 161, Question 14.03.03-04, and the associated revision to the COL application, and finds the changes acceptable because type tests, analyses, or a combination of both, as well as inspection, are included in the inspection, test and analysis and acceptance criteria for Seismic Category II related ITAAC. Accordingly, the staff considers RAI 161, Question 14.03.03-04 closed. However, in reviewing the revision to the COL application, the staff identified that for the Fire Protection Building Ventilation System, an ITAAC to ensure that the Seismic Category II equipments and piping systems can withstand seismic design basis loads without impacting the capability of equipment designated as Seismic Category I from performing its safety function is missing. In RAI 375, Question 14.03.03-5, the staff requested that the COL applicant to address this concern or to justify why such ITAAC is not needed.

In a November 8, 2012, response to RAI 375, Question 14.03.03-05, the COL applicant added an ITAAC for the Fire Protection Building Ventilation System to address the staff's concern. However, instead of addressing Seismic Category II equipments and piping systems, the COL applicant used the term, "Conventional Seismic," and explained that RAI 253, Question 03.07.02-45 detailed the various equipments which consist of the Fire Protection Building Ventilation System. RAI 253, Question 03.07.02-45 is being resolved by the Structural

Engineering Branch in Chapter 3 of this report and no conclusion has been reached. **Therefore, RAI 375, Question 14.03.03-05 remains unresolved and is being tracked as an open item** until resolution of RAI 253, Question 03.07.02-45 is reached.

These issues are being tracked as an open item and confirmatory item until the COL applicant responds to the RAI and subsequently revises its COL application in accordance with the resolution of the RAI. In addition, since the review for the U.S. EPR FSAR has not been completed and may affect the contents in the CCNPP Unit 3 COL application, this section is being tracked as open pending review of any revisions to the section following approval of the FSAR Post Combined License Activities.

14.3.3.5 *Post Combined License Activities*

Piping Design Acceptance Criteria

In Part 2, Chapter 14, of the CCNPP Unit 3 application, the COL applicant indicated that the U.S. EPR FSAR includes a COL information item for piping design acceptance criteria (DAC). Specifically, the COL information item states: "A COL applicant that references the U.S. EPR design certification will identify a plan for implementing DAC. The plan will identify (1) the evaluations that will be performed for DAC, (2) the schedule for performing these evaluations, and (3) the associated design processes and information that will be available to the NRC for audit." In the CCNPP Unit 3 COL, the applicant addresses this COL item by stating the following: "The plan for implementing DAC will identify (1) the evaluations that will be performed for DAC, (2) the schedule for performing these evaluations, and (3) the associated design processes and information that will be available to the NRC for audit." The staff finds this acceptable because the COL applicant appropriately addressed U.S. EPR FSAR COL information item to ensure that a plan will be in place to implement DAC.

14.3.3.6 *Conclusions*

The staff reviewed the information in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to the Piping Systems and Components ITAAC incorporated by reference in the COL application have been documented in the staff's SER on the design certification application for the U.S. EPR. The staff's SER on the U.S. EPR is not yet complete. The staff will update Section 14.3.3 of this report to reflect the final disposition of the U.S. EPR design certification application.

The design certification applicant has proposed suitable ITAAC as required by 10 CFR 52.47(b)(1). The staff reviewed the piping systems and component portion of the site-specific ITAAC. The staff concludes that if all the open items and confirmatory items addressed above are resolved, the COL applicant will have provided sufficient piping systems and component-related information to comply with 10 CFR 52.80(a) and the ITAAC will provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria are met, the facility has been constructed and will be operated in conformance with the combined license, the provisions of the Atomic Energy Act of 1954, and NRC regulations.

14.3.4 Reactor Systems Inspections, Tests, Analyses, and Acceptance Criteria

The staff reviewed and concluded that the site-specific ITAAC contained in Part 10 of the COL application, Appendix B, Section 2.4, contains no issues related to reactor systems that require evaluation by the staff.

14.3.5 Instrumentation and Controls Inspections, Tests, Analyses, and Acceptance Criteria

The staff reviewed the site-specific ITAAC in Part 10 of the COL application, Appendix B, Section 2.4, and identified an issue related to instrumentation and controls (I&C). In RAI 325, Question 07-05-1, the staff requested details of the ultimate heat sink (UHS) including clarification of how the I&C functions (such as auto initiation signal, manual initiation signal, and display) are designed for the UHS Makeup Water System and the UHS Makeup Water Intake Structure Ventilation System. The additional information should be incorporated into Chapter 7 of the COL application and be sufficient to support the site-specific ITAAC for the UHS Makeup Water System located in Tables 2.4-20, 2.4-22, and 2.4-28 in Revision 7 of the CCNPP Unit 3 COL, Part 10, Inspections, Tests, Analyses Criteria (ITAAC) and ITAAC Closure. Resolution of this issue is addressed in Section 7.5 of this report.

14.3.6 Electrical Systems Inspections, Tests, Analyses, and Acceptance Criteria

14.3.6.1 Introduction

SRP Section 14.3.6, "Electrical Systems," addresses the review of ITAAC for electrical systems for CCNPP Unit 3. The staff reviewed COL FSAR, Revision 7, Part 10 which includes ITAAC information pertinent to site-specific SSCs for the electrical power system. The staff's review of the above ITAAC determines whether, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in accordance with the COL and NRC regulations. Also, the staff reviewed COL FSAR Section 14.3 to verify the site-specific ITAAC for the electrical SSCs that are approved and incorporated in the U.S. EPR design certification.

The scope of the electrical systems ITAAC review includes information on the entire station electrical system. This includes the Class 1E portions of the electrical system, environmental qualification (EQ), station blackout (SBO), portions of the electrical interface system, and the plant lightning protection, grounding, and lighting systems.

14.3.6.2 Summary of Application

COL FSAR, Revision 7, Section 14.3 incorporates by reference the same section of U.S. EPR FSAR Tier 1, and includes the following COL, supplemental, and license condition information:

COL Information Items

COL Information Item 14.3-1 states:

A COL applicant that references the U.S. EPR design certification will provide ITAAC for emergency planning, physical security, and site-specific portions of the

facility that are not included in the Tier 1 ITAAC associated with the certified design in accordance with 10 CFR 52.80(a).

The COL applicant performed site-specific analyses for safety-significant features and screened components pertinent to the electrical power system ITAAC in COL FSAR Section 14.3.

COL Information Item 14.3-2 states:

A COL applicant that references the U.S. EPR design certification will describe the selection methodology for site-specific SSCs to be included in ITAAC, if the selection methodology is different from the methodology described within the FSAR, and will also provide the selection methodology associated with emergency planning and physical security hardware.

The COL applicant stated that no departures or supplements were taken for the above ITAAC from the selection methodology used in U.S. EPR FSAR Tier 1, Section 4.

COL Information Item 14.3-3 states:

A COL applicant that references the U.S. EPR design certification will identify a plan for implementing DAC. The Plan will identify 1) the evaluations that will be performed for DAC, 2) the schedule for performing these evaluations, and 3) the associated design processes and information that will be available to the NRC for audit.

The COL applicant identified no design acceptance criteria (DAC) items for the electrical power systems.

Supplemental Information

COL FSAR Table 14.3-2, "Site-Specific SSC ITAAC Screening Summary," identified site-specific ITAAC for electrical power systems, and COL FSAR Table 14.3-3, "Interface Requirements Screening Summary," identified the interface ITAAC for switchyard equipment.

License Conditions

In COL application Part 10, Appendix A, "Proposed Combined License Conditions," the COL applicant identified two EQ- and one SBO-related COL items that cannot be resolved prior to issuance of the COL license. Thus, the COL applicant proposed them as license conditions in accordance with the guidance in RG 1.206, Section C.III.4.3. The identified EQ and SBO COL items are noted below.

COL Information Item 3.11-1:

CCNPP Unit 3 shall develop and maintain a list of electrical equipment meeting the criteria of 10 CFR 50.49 and record keeping requirement stated in 10 CFR 50.49(J).

COL Information Item 3.11-3:

CCNPP Unit 3 shall develop and submit the equipment testing program that includes milestones and completion data, prior to installation of the applicable equipment if the equipment qualification testing is incomplete.

COL Information Item 8.3-1:

CCNPP Unit 3 shall establish procedures to monitor and maintain emergency diesel generator reliability goal of .95 in accordance with RG 1.155.

14.3.6.3 *Regulatory Basis*

The relevant requirements of NRC regulations for this area of review, and the associated acceptance criteria are given in NUREG-0800, Section 14.3.6, "Electrical Systems – Inspections, Tests, Analyses, and Acceptance Criteria," and are noted below:

- 1 GDC 17, as it relates to providing for an onsite and offsite electric power system to permit functioning of SSCs important to safety. GDC 17 further requires that the onsite electric power system have independence and redundancy and the electric power supplied by the offsite system be supplied by two physically independent circuits. Also, GDC 17 requires that provisions be included to minimize the likelihood of losing all electric power as a result of or coincident with, loss of power generated by the nuclear power unit, from the transmission network, or the onsite electric power supplies.
- 2 10 CFR 50.49, as it relates to EQ of electrical equipment important to safety for nuclear power plants. COL applicants must ensure that safety-related, certain non-safety-related, and certain post-accident monitoring equipment can perform their intended functions in various anticipated environments.
- 3 10 CFR 50.63, as it relates to withstanding and recovering from an SBO event.
- 4 10 CFR 52.47(b)(1), as it relates to the requirement that a design certification application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act of 1954, and NRC regulations.
- 5 10 CFR 52.80(a), as it relates to proposing ITAAC in a COL application, if the inspections, tests and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity, with the COL, the provisions of the Atomic Energy Act of 1954, and NRC regulations.

14.3.6.4 *Technical Evaluation*

The staff reviewed COL FSAR, Revision 7, Section 14.3.6 and checked the referenced U.S. EPR FSAR Tiers 1 and 2 to ensure that the COL Information Items and other information applicable to COL FSAR Section 14.3.6 have been properly addressed. The staff's review confirmed that all of the COL information items were contained in the COL application and incorporated relevant information by reference in the COL application.

The staff reviewed the following COL information items pertaining to the electrical systems in COL FSAR Section 14.3.

COL Information Items:

COL Information Item 14.3-1

For COL Information Item 14.3-1, the COL applicant identified all site-specific ITAAC in COL FSAR Table 14.3-2, "Site-Specific SSC ITAAC Screening Summary," that are selected for CCNPP Unit 3, but are not included in U.S. EPR FSAR Tier 1, Chapter 14, "Verification Programs." COL FSAR Table 14.3-3, "Interface Requirements Screening Summary," also identified the electrical interface SSCs, based on the safety-significant design features analyzed for the facility. COL FSAR, Part 10, Appendix B, Section 2.4 listed site-specific ITAAC for the electrical power systems for (1) electrical buried duct banks, (2) offsite power system, (3) power transmission system, (4) and UHS Makeup Water System and its ventilation systems. The staff finds that all electrical equipment was appropriately screened and selected as site-specific ITAAC items.

COL Information Item 14.3-2

For the selection methodology to address site-specific ITAAC the COL applicant referred to the selection criteria and methodology defined in COL FSAR Section 14.3.2, "Tier 1, Chapter 2, System Based Design Descriptions and ITAAC," and provided the information below:

- COL FSAR Table 14.3-1, "Site-Specific Analyses," based on safety-significant features.
- COL FSAR Table 14.3-2, "Site-Specific SSC ITAAC Screening Summary," based on U.S. EPR FSAR Tier 1, Section 4.
- COL FSAR Table 14.3-3, "Interface Requirements Screening Summary," based on U.S. EPR FSAR Tier 1, Section 4.

The staff reviewed the above description of selection methodology (criteria and process) for the above COL ITAAC. The staff finds the selection methodology for CCNPP Unit 3 conforms to the design features and characteristics defined in U.S. EPR FSAR Tier 1, Section 4.

Supplemental Information

COL FSAR Table 14.3-3, Sections 4.10 and 4.11 provide interface requirements for offsite power and power transmission systems for U.S. EPR FSAR Tier 1 (COL ITAAC Sections 2.5.5 and 2.5.6), which includes switchyard and main generator output to the transmission system. The staff notes this is consistent with the selection criteria for interface requirements stated in U.S. EPR FSAR Tier 1.

For the offsite power system, the COL applicant stated that the maximum transmission system frequency decay rate for the U.S. EPR design is bounded by the reactor coolant pump (RCP) free coast down for a complete loss of forced reactor coolant flow analysis during a loss of offsite power. The U.S. EPR interface requirement for the offsite power system (transmission system) is subjected to the RCP sustained frequency decay of greater than 3.5 Hz/sec (maximum frequency decay rate). In RAI 126, Question 14.03.06-1, the staff requested that the COL applicant verify that the transmission system will not subject the reactor coolant pumps to a sustained frequency decay of more than 3.5 Hz/sec. In an August 6, 2009, response to RAI 126, Question 14.03.06-1, the COL applicant stated that an ITAAC will be added to COL application Part 10 as part of COL ITAAC Table 2.4-26, "Offsite Power System ITAAC," Item No. 6. The addition will include the acceptance criteria, "The RCP free coast down frequency

rate for a complete loss of forced reactor coolant flow analysis due to a loss of offsite power event bounds the maximum transmission system frequency decal rate.” The staff finds that the COL applicant has adequately addressed the issue and, therefore, considers RAI 126, Question 14.03.06-1, resolved.

License Conditions

In Part 10 of the COL application, Appendix A, the COL applicant identified a number of COL information items that cannot be resolved prior to issuance of the COL license. RG 1.206, Section C.III.4.3, allows the COL applicant to propose COL information items as COL license conditions. Among the list of COL information items identified as license conditions, the following COL information items belong to the electrical systems pertaining to EQ and SBO:

COL Information Item 3.11-1 discusses maintenance of the equipment qualification test results and qualification status file during the equipment selection, procurement phase and throughout the installed life of the plant.

COL Information Item 3.11-3 discusses development and submittal of the equipment qualification testing program, including milestones and completion dates, prior to installation of the applicable equipment.

COL Information Item 8.3-1 in COL FSAR Section 8.3.1.1.5 requires that prior to initial fuel load, the COL applicant shall establish procedures to monitor and maintain emergency diesel generator reliability to verify the selected reliability level goal of 0.95 is being achieved as intended by RG 1.155 for SBO.

The COL applicant proposed license conditions for the EQ of equipment files and testing programs that could not be completed at the time of fuel loading. The COL applicant also proposed that monitoring and maintaining selected EDG reliability in accordance with the guidance in RG 1.155 for SBO at the time of fuel loading cannot be established. The staff finds that the above EQ related issues are already identified as a license condition under item No. 3 of Operational Program for satisfying 10 CFR 50.49(a), and the COL applicant’s establishing diesel generator reliability assessment before fuel loading as license condition is acceptable since it conforms to the guidance in RG 1.155, Section C.III.4.3.

Site-Specific ITAAC

In Part 10 of the COL application, Appendix B, ITAAC tables, the staff identified the following three ITAAC that consist of two interface ITAAC and one site-specific ITAAC, that are applicable to the CCNPP Unit 3 electrical system.

- Table 2.4-26, “Offsite Power System ITAAC”
- Table 2.4-27, “Power Generation System ITAAC
- Table 2.4-28, “Class 1E Emergency Power Supply Components for Site-Specific Systems ITAAC

For two of the above interface ITAAC, the COL applicant stated no departure or supplements from U.S. EPR FSAR Tier 1, Section 4, “Interface Requirements,” were taken. The staff reviewed the above Tables 2.4-26 and 2.4-27 in Part 10 of the COL application and finds that U.S. EPR Tier 1 has been incorporated by reference.

ITAAC Table 2.4-28 includes site-specific system ITAAC associated with the UHS Makeup Water System and its ventilation system. It was unclear to the staff how the remote UHS Class 1E equipment discussed above will be integrated with the overall Class 1E electrical system. Therefore, in RAI 126, Question 14.03.06-2, the staff requested that the COL applicant confirm whether the site-specific Class 1E electrical systems and components will be designed as the same or an integral part of the overall plant Class 1E emergency power supply system.

In an August 6, 2009, response to RAI 126, Question 14.03.06-2, the COL applicant referenced the ITAAC item in ITAAC Table 2.4.-28. The table included ITAAC for inspections, tests, and analysis as well as acceptance criteria applicable to the Class 1E plant electrical distribution system. Additionally, ITAAC Table 2.4.-28 included ITAAC for electrical distribution equipment (MCCs, transformers, and breakers), displays and controls in the MCR, Remote Shutdown System, and protection systems (grounding, lighting protection) and indicated that they are subjected to the same ITAAC requirements for Class 1E plant electrical distribution system. The COL applicant stated that these requirements are contained in U.S. EPR FSAR Tier 1, Table 2.5.1-3 for the Class 1E Emergency Power Supply System (EPSS) and are incorporated by reference in Part 10 of the COL application, Appendix B, Section 2.1, "Design Certification ITAAC." The staff finds that the COL applicant adequately addressed the issue and, therefore, considers RAI 126, Question 14.03.06-2 resolved.

14.3.6.5 *Post Combined License Activities*

For COL information items that cannot be resolved prior to issuance of the COL license, the COL applicant identified the following post COL activities as license conditions for COL FSAR Section 14.3.6 in accordance with RG 1.206, Section C.III.4.3.

Table 3.11-1 Post Combined License Activities

Item No.	Description	COL FSAR Section	COL SER Section
3.11-1	The COL applicant shall develop and maintain: (1) a list of electrical equipment meeting the criteria of 10 CFR 50.49 and (2) a record of qualification for each applicable electrical and mechanical equipment type. The record shall contain the necessary environmental qualification information to meet the requirements of 10 CFR 50.49. This information will be stored and retained in accordance with the Quality Assurance Program Description of QAPD. This information will remain current and in an auditable form that meets the requirements of 10 CFR 50.49(j) and the QAPD.	3.11-1	14.3.6.4
3.11-3	The COL applicant shall develop and submit the equipment qualification testing program, including milestones and completion dates, prior to installation of the applicable equipment.	3.11-3	14.3.6.4
8.3-1	Prior to initial fuel load, the COL applicant shall establish procedures to monitor and maintain Emergency Diesel	8.3.1.1.5	14.3.6.4

	Generator (EDG) reliability to verify the selected reliability level goal of .95 is being achieved as intended by RG 1.155.		
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14.3.6.6 *Conclusions*

The staff reviewed the information in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to the Electrical Systems ITAAC incorporated by reference in the COL FSAR have been documented in the staff's SER on the design certification for the U.S. EPR.

The staff reviewed the COL ITAAC that pertains to the electrical system ITAAC and also reviewed the referenced U.S. EPR FSAR to ensure that the content of the COL information provided by the COL applicant represents the complete scope of the site-specific information related to the staff's review of electrical system ITAAC. The staff finds that the electrical system ITAAC information provided in U.S. EPR FSAR Tier 1 is incorporated by reference with no departure and the site-specific ITAAC are adequate to support the COL application.

The staff concludes that the COL applicant has provided sufficient electrical systems-related information to comply with 10 CFR 52.80(a) and the ITAAC provide reasonable assurance that, the facility has been constructed and will operate in conformance with the combined license, the provisions of the Atomic Energy Act of 1954, and NRC regulations.

14.3.7 **Plant Systems**

SRP Section 14.3.7 addresses the review of ITAAC for plant systems. The staff reviewed the proposed ITAAC to determine whether, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in accordance with the COL and NRC regulations. The staff also verifies that the ITAAC contained in the certified design apply to those portions of the facility design that are approved in the design certification.

The scope of plant systems ITAAC review includes new and spent fuel handling systems, power generation systems, air systems, cooling water systems, emergency diesel generator support systems, radioactive waste systems, and HVAC systems. The scope of review also includes issues which affect multiple SSCs such as equipment qualification, and protection from fires, floods, and tornado missiles. The site-specific ITAAC for ventilation systems are addressed in Chapter 9 of this report.

14.3.7.1 *Summary of Application*

The COL application does not contain a section numbered 14.3.7. This section of the report evaluates plant systems Part 10 ITAAC of the COL application, Appendix B, Section 2.4, in accordance with NUREG-0800, Section 14.3.7.

14.3.7.2 *Regulatory Basis*

The regulatory bases are the relevant requirements of the following NRC regulations:

1. 10 CFR 52.47(b)(1), as it relates to the requirement that a design certification application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act of 1954, and NRC regulations.
2. 10 CFR 52.80(a), as it relates to the requirements that a COL application 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 the acceptance criteria met, the facility has been constructed and will operate in conformance with the combined license, the provisions of the Atomic Energy Act of 1954, and NRC regulations.

14.3.7.3 *Technical Evaluation*

The staff reviewed the design description ITAAC, and functional arrangement to confirm completeness and consistency with the system design bases as described in COL FSAR. The staff verified that key performance characteristics and safety functions of SSCs were based on safety significance.

The staff's review of the plant systems ITAAC are included in the review of the individual plant system sections in this report. Table 14.3.7-1 of this report provides a list of the site-specific plant systems and ITAAC and associated U.S. EPR FSAR Tier 2 sections. The reviews of the ITAAC, including discussions of noteworthy questions and COL applicant responses, are included in the section of this report corresponding to the COL FSAR sections.

14.3.7.4 *Post Combined License Activities*

There are no post COL activities related to this section.

14.3.7.5 *Conclusions*

The staff reviewed the information in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to the Plant Systems ITAAC incorporated by reference in the COL FSAR have been documented in the SER on the design certification application for the U.S. EPR. The staff's SER on the U.S. EPR is not yet complete. The staff will update Section 14.3.7 of this report to reflect the final disposition of the U.S. EPR design certification application.

The design certification applicant has proposed suitable ITAAC as required by 10 CFR 52.47(b)(1). The staff reviewed the Plant Systems portion of the site-specific ITAAC. The staff concludes that if all the open items and confirmatory items addressed above are resolved, the COL applicant will have provided sufficient Plant Systems-related information to comply with 10 CFR 52.80(a) and the ITAAC will provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria are met, the facility has been constructed and will be operated in conformance with the combined license, the provisions of the Atomic Energy Act of 1954, and NRC regulations.

However, the staff is unable to finalize its conclusions in accordance with NRC regulations until open items have been resolved.

Table 14.3.7-1 Plant Systems ITAAC

Description of FSAR Tier 1 Sections	Part 10, Appendix B: ITAAC Table Number	Related COL FSAR Section Numbers
Ultimate Heat Sink Makeup Water Intake Structure Ventilation System	2.4-20	9.4.15
Fire Protection Building Ventilation System	2.4-21	9.4.16
Ultimate Heat Sink Makeup Water System	2.4-22	9.2.5
Raw Water Supply System	2.4-23	9.2.9
Fire Water Distribution System	2.4-24	9.5.1
Fire Suppression System	2.4-25	9.5.1

14.3.8 Radiation Protection

The staff reviewed the site-specific ITAAC contained in Part 10 of the COL application, Appendix B, Section 2.4 and concluded that there are no issues related to radiation protection that require evaluation by the staff.

14.3.9 **Human Factors Engineering** The staff reviewed the site-specific ITAAC contained in Part 10 of the COL application, Appendix B, Section 2.4 and concluded that there are no issues related to human factors engineering that require evaluation by the staff.

14.3.10 **Emergency Planning** The staff evaluation of the Emergency Planning ITAAC is discussed in Section 13.3c.19, "Proposed Emergency Planning ITAAC," of this report.

14.3.11 **Containment Systems** The site-specific ITAAC for containment systems are addressed in Chapter 6 of this report.

14.3.12 Physical Security Hardware

14.3.12.1 Introduction

COL application (COLA) Part 10 ITAAC, Appendix B describes the ITAAC for engineered physical security systems (PSS), hardware, and features provided to facilitate and implement the CCNPP Unit 3 physical protection program. The COL applicant provided the site-specific physical security ITAAC, which supplemented the physical security ITAAC within the scope of

the U.S. EPR design certification, to complete the verification of PSS, hardware, and features to meet design and intended security functions for a physical protection system and physical programs. COL FSAR Chapter 14 incorporates by reference the U.S. EPR FSAR and provides both a supplement and a departure for the initial plant test program.

In the COLA, the COL applicant provided the site-specific design descriptions for PSS, hardware, and features (e.g., vital area and vital area barrier, protected area barrier, isolation zone, bullet-resistant barriers specific to the last access control function, personnel, vehicle, and material access control portals and search equipment, picture badge identification system, emergency exit for the protected area perimeter), descriptions of intended security functions and performance requirements, and supporting technical bases for the COL applicant's design and licensing bases for the physical protection of the CCNPP Unit 3. The site-specific information, along with the referenced U.S. EPR design certification for a physical protection system, the physical protection program, and a security organization, establish how the COL applicant will meet performance and prescriptive requirements of 10 CFR Part 73, "Physical Protection of Plants and Materials." In COL FSAR Chapter 14, Table 14.03.12-58-1, the COL applicant identified the COL interface requirements that address site-specific physical security ITAAC.

U.S. EPR FSAR Tier 2, Chapter 14, established COL Information Item 14-3.1 that requires a COL applicant that references the U.S. EPR design certification describe physical security ITAAC not identified in the U.S. EPR FSAR Tier 1, Table 3.1-1, "Security ITAAC." Specifically, it requires the COL applicant to provide ITAAC for emergency planning, physical security, and site-specific portions of the facility that are not included in the U.S. EPR FSAR Tier 1 ITAAC. In COLA Part 10, Appendix B, Section 2.2, "Physical Security ITAAC," the COL applicant described physical security ITAAC for verifying the design, construction, and installation of PSS, hardware, and features to meet COL Information Item 14.3-1.

14.3.12.2 *Summary of Application*

The following portions of the COLA and referenced technical reviews contained the COL applicant's design descriptions and information related to PSS, hardware, and features meeting regulatory requirements:

COL FSAR Section 13.6

COL FSAR Section 13.6, "Security," incorporates by reference, the U.S. EPR FSAR Tier 1 and Tier 2. U.S. EPR FSAR Tier 2, Chapter 13, "Conduct of Operations," Section 13.6, "Security," and Section 13.6.2, "U.S. EPR Physical Security," describes PSS, hardware, and features of the U.S. EPR standard design that are incorporated by reference. The COL applicant described the site-specific PSS, hardware, and features that are outside the scope of the design certification and provided the design of a physical protection system (i.e., detection, assessment, communication, and response) for the protection of the CCNPP Unit 3. The COL applicant's CCNPP Unit 3 security assessment and AREVA TR ANP-10295P, "U.S. EPR Security Features Technical Report," Revision 3, February 3, 2012, describe the design bases of PSS, hardware, and features credited for physical protection. The design bases support the acceptance criteria verified through inspections, tests, or analyses of identified physical security ITAAC.

COL FSAR Chapter 14, Verification Programs

COL FSAR Chapter 14, describes the verification program that includes descriptions of the initial plant test program, ITAAC, comparison of RG 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants," and U.S. EPR test abstracts, test programs, listing of

additional tests, and comparison of U.S. EPR FSAR Tier 2 preoperational tests and U.S. EPR Tier 1 test requirements. In COL FSAR Chapter 14, the COL applicant did not indicate departures or supplements to the U.S. EPR FSAR or provide additional site-specific information for the test program descriptions (e.g., initial plant test program, organization staffing and responsibilities, jurisdictional controls, work control, test specifications, procedures, conduct of testing, test results, and certification and qualification) that are applicable to conducting ITAAC verification, pre-operational testing, acceptance testing, and test administration. COL FSAR Table 14.3-3, "Interface Requirements Screening Summary," describes the U.S. EPR FSAR Tier 1 interface requirements and the selection of physical security ITAAC.

COL Application Part 10 ITAAC and Proposed License Condition

COL application Part 10, Section 2.2, "Physical Security ITAAC," incorporates by reference the physical security ITAAC contained in the U.S. EPR FSAR Tier 1 and describes the site-specific physical security ITAAC in COL ITAAC Table 2.2-1, "Physical Security ITAAC." The site-specific physical security ITAAC combine with those contained in the U.S. EPR FSAR Tier 1 to establish the required verification of PSS, hardware, and features for meeting the requirement of 10 CFR 103(g). In COLA Part 10, "ITAAC and ITAAC Closure," Appendix B, Table 2.2.1, the COL applicant provided the required design commitments, inspections, tests, and analyses, and acceptance criteria to satisfy COL Information Item 14.3-1.

Referenced Technical Reports or Safeguards Information Related Submittals

AREVA TR ANP-10295P is incorporated by reference and supports how physical security ITAAC will be verified. AREVA TR ANP-10295P, Appendix G describes the test abstracts to verify physical security ITAAC in U.S. EPR FSAR Tier 1 and the site-specific physical security ITAAC described in COL ITAAC Table 2.2.1. The test abstracts provide the framework to develop detailed test procedures for conducting the inspections, tests, and analyses. If met, the acceptance criteria will demonstrate that the plant incorporates the design, and the construction and installations are such that the identified PSS, hardware, and features will operate in accordance with the design requirements and perform intended security functions. AREVA TR ANP-10295P and the CCNPP Unit 3 security assessment describe the design and licensing bases that support the ITAAC design commitments and the acceptance criteria that are verified through ITAAC or construction acceptance testing.

AREVA TR ANP-10295P and CCNPP Unit 3 security assessments contain safeguards information, security-related, or proprietary information and, therefore, protected in accordance with 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements," and 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," respectively.

14.3.12.3 *Regulatory Basis*

1. 10 CFR 52.47(b)(1), as it relates to the requirements that a design certification application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act of 1954, and NRC regulations.
2. 10 CFR 52.79(a)(35)(i) and 10 CFR 52.79 (a)(ii), as they related to the requirement that information submitted for a COL application include a description of how the COL applicant will meet the requirements of 10 CFR Part 73 and a description of

implementation of the physical security plan. Also, 10 CFR 73.55(b)(3)(i) requires that the COL applicant provide capabilities to detect, assess, interdict, and neutralize the design-basis threat (DBT) and maintain such capabilities at all time. The design of PSS, hardware, and features that are beyond the scope of the design certification is required as COL Information Items 13.6-1 through 13.6-3 to provide the site-specific descriptions, along with the design bases and requirements for PSS, hardware, and features that are subject to ITAAC verification.

3. 10 CFR 52.80(a), as it relates to the requirement that the COL application to contain additional technical information for ITAAC and criteria necessary and sufficient to provide reasonable assurance that the facility has been constructed and will operate in conformance to the COL, the provisions of the Atomic Energy Act of 1954, and NRC regulations. A COL applicant that references the U.S. EPR design certification addresses interfaces with the U.S. EPR FSAR and must comply with COL Information Item 14.3-1 for descriptions of physical security ITAAC that are not included in descriptions of physical security ITAAC within the scope of the U.S. EPR certified design.
4. 10 CFR 73.55(b), as it relates to the requirement that the COL applicant establish and maintain a physical protection program and security organization. The objective of the physical protection program and security organization will be to provide high assurance that activities involving special nuclear material are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety. The physical protection program, consisting of engineered and administrative controls and a management system, shall be designed to protect against the DBT of radiological sabotage, as stated in 10 CFR 73.1, "Purpose and Scope." The physical security ITAAC provides verification of engineered PSS, hardware, and features that are relied on for meeting performance and prescriptive regulatory requirements.

14.3.12.4 *Technical Evaluation*

The staff's technical review consists of determining whether the COL applicant adequately met requirements of 10 CFR 52.80(a), which required that the COL application contain information for ITAAC and criteria necessary and sufficient to provide reasonable assurance that the facility was constructed and will operate in conformance to the COL, the provisions of the Atomic Energy Act of 1954, and NRC regulations. The staff review determined whether the proposed physical security ITAAC provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria are met, a plant that incorporates the U.S. EPR standard design and site-specific design will be built and will operate in accordance with applicable regulatory requirements. The staff also will review whether the COL applicant adequately described the management system (processes, procedures, and controls) for the framework to conduct inspections, tests, and analyses required with reasonable assurance to verify design and performance requirements and intended security functions of PSS, hardware, and features for ITAAC and closure supporting the requirements of the 10 CFR 52.103(g) finding.

The staff reviewed the information provided by the COL applicant to meet the requirements of 10 CFR 52.47(b)(1), which states that the U.S. EPR design certification application contain the proposed ITAAC within the scope of the design certification and is not within the scope of the technical review of the COL application.

The PSS, hardware, and features in the U.S. EPR standard design and the site-specific information in the COL application must be reliable and available to provide high assurance of performances and intended security functions. The PSS, hardware, and features are required to meet the performance and prescriptive requirements of 10 CFR Part 73. The staff notes that, within this context, the COL applicant addressed portions of PSS, hardware, and features that are outside the scope of U.S. EPR standard design. The design bases for PSS, hardware, and features within the scope of the COL are described in COLFSAR Section 13.6, and Part 8 of the COLA (i.e., PSP and the CCNPP Unit 3 Security Assessment), and established the design bases and the design performance and requirements for the identified ITAAC design commitments and acceptance criteria.

14.3.12.4.1 Conformance with Regulatory Guides and Standard Review Plans

The COL applicant compliance with NUREG-0800 SRP is described in COL FSAR Section 1.9, "Conformance with Regulatory Criteria." The COL applicant incorporates by reference U.S. EPR FSAR Tier 2, Section 1.9 which addresses conformance to Regulatory Guides and SRP (e.g., U.S. EPR FSAR Tier 2, Tables 1.9-2, "U.S. EPR Conformance with Regulatory Guides," and Table 1-2, "U.S. EPR Conformance with Standard Review Plan (NUREG-0800)), with no exceptions.

14.3.12.4.2 Design Commitments, Inspection, Tests, Analyses, and Acceptance Criteria

The physical security ITAAC contained in the U.S. EPR FSAR Tier 1 is incorporated by reference in COLA Part 10, Appendix B, Section 1. Specifically, in COL FSAR Section 14.3.2.2.3 the COL applicant stated, "[Physical Security] PS-ITAAC are provided in the U.S. EPR FSAR, Tier 1, Section 3.1.1. These ITAAC are incorporated by reference in Part 10 of the COL Application. In addition, ITAAC are provided in Part 10, Section 2.2, Table 2.2-1, "Site Specific Physical Security ITAAC," to address interface requirements contained in Section 3.1.2, Tier 1 of the U.S. EPR FSAR, as specified in Table 14.3-3. The physical security ITAAC identified in the U.S. EPR design certification and associated test abstracts have been reviewed and are not subject to further technical reviews.

The U.S. EPR FSAR established COL Information Item 14.3-1 for the COL applicant to provide the physical security ITAAC not addressed in the standard design. In COLA Part 10, Appendix B, Table 2.2-1, the COL applicant described the site-specific physical security ITAAC to satisfy COL Information Item 14.3-1. The ITACC included the following that comply with SRP Section 14.3.12:

- ITAAC No. 1 addressed SRP Section 14.3.12 ITAAC No. 1(b), vital area and vital area barrier.
- ITAAC Nos. 2.a, 2.b, and 2.c addressed SRP 14.3.12 ITAAC Nos. 2(a), 2(b), and 2(c), protected area barrier.
- ITAAC Nos. 3.a, 3.b, and 3.c addressed SRP 14.3.12 ITAAC Nos. 3(a), 3(b), and 3(c), isolation zone.
- ITAAC No. 4 addressed SRP 14.3.12 ITAAC No. 6, bullet resistant barriers specific to the last access control function.
- ITAAC Nos. 5.a and 5.b addressed SRP 14.3.12 Nos. 8(a) and 8(b), personnel, vehicle, and material access control portals and search equipment.

- ITAAC No. 6 addressed SRP 14.3.12 ITAAC No. 9, picture badge identification system.
- ITAAC No. 7 addressed SRP 14.3.12 ITAAC No. 15, emergency exit for the protected area perimeter.

The above reflects the COL applicant's March 30, 2012, response to RAI 317, Question 14.03.12-8, which included proposed revisions to site-specific physical security ITAAC that complement the proposed changes to the physical security ITAAC described for the U.S. EPR standard design. The COL applicant indicated that the proposed revisions to Part 10 of the COL application, Appendix B, Table 2.2-1, as provided in the RAI response, will be incorporated in a future revision of the COLA.

Other site-specific ITAAC requirements in the CCNPP Unit 3 COLA included the following:

- An ITAAC, in Part 10 of the COL application, Appendix B, Table 2.4-13, "Security Access Building Inspections, Tests, Analyses, and Acceptance Criteria." The ITAAC addressed the requirement that the security access building does not affect the ability of any safety-related structure, system, or component to perform its safety functions following a seismic event. The inspection and criteria described related to the as-built section of the structure to withstand seismic load and confirm the minimum separation distance of the as-built security access building from the nearest Seismic Category I structure, system, or components, which are greater than 60.96 m (200 ft). The ITAAC verification is not security-related and is not provided to meet a performance or prescriptive regulatory requirement established in 10 CFR Part 73.
- In COL FSAR Section 14.2.14.12, "UHS Makeup Water Intake Structure Communications System," the COL applicant established test abstracts related to intra-plant communications systems to provide communications between vital plant areas. The verification includes the security radio system functions d in the UHS Makeup Water Intake Structure and acceptance criteria (Item J, which requires the security communications system to operate as designed). The ITAAC verification is in addition to that established for physical security U.S. EPR FSAR Tier 1, ITAAC No 1.16.

In COLA Part 10, Appendix B, Section 2, "COL Application ITAAC," the COL applicant stated that the "[c]ompletion of the ITAAC is a proposed condition of the combined license to be satisfied prior to fuel load," and that "[t]he Physical Security ITAAC are contained in the U.S. EPR FSAR Tier 1, which is incorporated by reference in Section 1 [of Appendix B]. Site-specific physical security ITAAC are provided in Table 2.2-1, "Physical Security ITAAC." The site-specific ITAAC were selected based on the interface requirements in FSAR Section 14.3 (Table 14.3-3 – "Interface Requirement Screening Summary")."

In Part 10 of the COL application, Appendix B, Table 2.2-1, the COL applicant described the arrangement of ITAAC tables applicable to PSS, hardware, and features. Consistent with the U.S. EPR FSAR Tier 1 descriptions of ITAAC, the first column proposed design requirements and commitments extracted from the design descriptions that must be verified by the COL holder. The second and third columns identify proposed methods of verifications and objective criteria that demonstrate that design requirements and commitments are met, respectively.

The design performance and requirements related to the PSS, hardware, and features credited to provide security functions and the design and performance requirements, including locations and configurations, for bullet resistance barriers, physical access controls, access authorization, and emergency exits, are in accordance with regulatory requirements of 10 CFR Part 73. The

design descriptions for PPS, hardware, and features that are within the scope of the COL provide the security functions to detect, delay, interdict, and respond while protecting against the DBT for radiological sabotage and meet prescriptive regulatory requirements.

The staff concludes the following:

- The COL applicant described site-specific physical security ITAAC to verify attributes of systems and associated components, hardware, or configurations to meet design bases and security functions of providing detection, assessment, communications, delays, and facilitating response. The identified site-specific design commitments, inspections, tests, analyses, and acceptance criteria conform to NUREG-0800, Section 14.3.12, which included physical barriers, isolation zone, bullet resistance barriers, physical access controls, access authorization, and emergency exits.
- The list of site-specific physical security ITAAC provided in Part 10 of the COL application, Appendix B, Table 2.2-1 have been revised to conform to NUREG-0800, Section 14.3.12, ITAAC Nos. 1(b), 2(a), 2(b), 2(c), 3(a), 3(b), 3(c), 6, 8(a), 8(b), 9, and 15 and to adequately capture design commitments, ITA, and acceptance criteria to include requirements of 10 CFR 73.55(e), 10 CFR 73.55(g), and 10 CFR 73.55(j). In Part 10 of the COL application, Appendix B, Table 2.2-1, the COL applicant proposed all remaining security ITAAC that are not addressed or are partially addressed in U.S. EPR FSAR Tier 1 Table 3.1.1 to establish physical security ITAAC that conform to NUREG-0800, Section 14.3.12 to meet the requirements of 10 CFR 52.80. The staff concludes that the COL applicant's March 30, 2012, response to RAI 317, Question 14.03.12-8 with proposed revisions to Part 10 of the COL application, Appendix B, Table 2.2-1 to indicate site-specific physical security ITAAC that are within the COLA, acceptable, because the revisions comply with NUREG-0800, Section 14.3.12. **RAI 317, Question 14.03.12-8 is being tracked as a confirmatory item** until the Part 10 of the COL application, Appendix B, is revised accordingly.
- The COL applicant identified site-specific PSS, hardware, and features for ITAAC verification within the scope of the COL. The combination of the COL site-specific ITAAC and the U.S. EPR standard design ITAAC that are incorporated by reference establish a set of physical security ITAAC that conform to the guidance in NUREG-0800, Section 14.3.12, and are adequate to verify that the construction, installations, or configurations will operate or meet intended security functions in accordance with the design and licensing bases for the physical protection of the CCNPP Unit 3, in accordance with 10 CFR 52.80(a).
- The COL applicant adequately addressed COL Information Item 14.3-1 by identifying site-specific physical security ITAAC, as indicated in Part 10 of the COL application, Appendix B, Table 2.2-1. The ITAAC complement the physical security ITAAC that are incorporated by reference from the U.S. EPR standard design to establish a set of physical security ITAAC for PSS, hardware, and features that must be verified by the COL holder to meet the requirement of 10 CFR 52.103(g).

14.3.12.4.3 Verification Programs and System Acceptance Process

COL FSAR Chapter 14, "Verification Programs," indicates that the reference U.S. EPR FSAR is incorporated by reference and is supplemented with site-specific information to address both U.S. EPR standard design and site-specific systems and hardware verification. The U.S. EPR

FSAR established the requirement that the verification programs include the initial test program for structures, systems, components, and design features for both the nuclear portion of the facility and the balance of the plant. The program must also verify that the as-built facility configurations and operations comply with the approved plant design and applicable regulations.

In a February 2, 2010, response to RAI 197, Question 14.03.12-1, the COL applicant confirmed that “[the] management control and process requirements of COL FSAR Chapter 14, Section 14.2, apply to all ITAAC, including those associated with physical security.”

COL FSAR Section 14.2.2, the COL applicant described the organizational units that manage, supervise, or execute any phase of the test program. The descriptions addressed participation of each identified organizational unit and the principal participants, describing how, and to what extent, the plant’s operating and technical staff participates in each major test phase. This description includes information pertaining to the experience and qualification of supervisory personnel and other principal participants responsible for managing, developing, or conducting each test phase, including the management system for developing a training program in the organization.

AREVA TR ANP-10295P, Appendix G supplemented U.S. EPR FSAR Tier 2, Section 14.2, with descriptions of the administrative control program used to develop and implement the Initial Test Program (ITP) that are incorporated by reference. AREVA TR ANP-10295P, Appendix G established a system acceptance process that will be used by the COL holder (i.e., licensee) that includes requirement identification, construction verification, and compliance determination. AREVA TR ANP-10295P, Appendix G described the following:

- Requirements Identification – review system documents (e.g., COL FSAR, license conditions, physical security plans, cyber security plan, plant technical requirements documents, systems design requirements, system design documents, security assessment, supporting calculations – blast calculations, equipment manufacturer requirements).
- Construction Verification – review the “as constructed” systems against each identified requirement.
- Compliance Determination – document compliance with “as designed” requirements or document the “as constructed” acceptability subject to compliance with COL FSAR, license conditions, physical security plan, cyber security plan, security assessment, security assessment in “Calvert Cliffs Nuclear Power Plant Unit 3 Security Assessment,” Appendix D conceptual design criteria, and functional needs of security systems but deviates from one or more design details.

The inspections, tests, and analyses descriptions for the site-specific PSS, hardware, and features provided in COLA Part 10, Appendix B, Table 2.2-1 are specified in AREVA TR ANP-10295P, Appendix G.

The staff finds the following:

- The COL applicant incorporated by reference the U.S. EPR FSAR information related to physical security ITAAC, including the structure of the organizations and the management system (i.e., processes and procedures). COLA FSAR Chapter 14, supplements the physical security ITAAC and verification program with site-specific

information. The requirements included construction verification and compliance verifications, which are procedurally controlled to document the reviews, approvals, and closeouts and to establish records. The COL applicant adequately identified the framework for a management system for verifying physical security ITAAC.

- The COL applicant incorporated by reference the inspections, tests, and analyses requirements that installed PSS, hardware, and features are performed as construction and installation tests as specified in AREVA TR ANP-10295P. The COL applicant adequately described the organization and the processes and controls of the management system for verifying construction and installations, as specified by AREVA TR ANP-10295P, Appendix G, and as supplemented with site-specific information in COL FSAR Chapter 14, Section 14.2.
- The COL applicant appropriately established the management system (i.e., processes and controls) that verify PSS construction, installations, and performance that are identified for ITAAC verifications. The PSS, hardware, and features providing security functions that are not specifically identified as ITAAC also are addressed through appropriate system construction verifications.

14.3.12.4.4 Test Abstracts for Physical Protection Systems ITAAC

The COL applicant described test abstracts in AREVA TR ANP-10295P to support inspections, tests, and analyses to verify identified physical security U.S. EPR FSAR Tier 1 ITAAC. The test abstracts in AREVA ANP-10295P, Appendix G for the site-specific physical security ITAAC are provided in the same format and content applied for safety-related and plant system preoperational tests described in the U.S. EPR FSAR Tier 2 and COL FSAR Chapter 14. The test abstracts in AREVA TR ANP-10295, Appendix G provided the framework for developing detailed procedures to conduct inspections, tests, and analyses to verify acceptance criteria based on detailed design that, if met, will demonstrate that the plant incorporated the designs and identified physical protection systems and hardware as-built, will operate in accordance with the design certification, and will supplemented site-specific design for a physical security system.

The site-specific test abstracts consisted of objectives, prerequisites, test methods, data required, and acceptance criteria for the verification of the following physical protection systems:

- vital areas and vital area physical barriers
- protected area (PA) barriers
- isolation zones
- bullet-resistant barriers specific to the last access control function
- PA personnel, vehicle, and material access control portal and search equipment
- picture badge identification system
- emergency exits for the PA perimeter

The staff finds the following:

- The COL applicant incorporated by reference AREVA TR ANP-10295P, Appendix G, which contained the details of test abstracts for site-specific physical security ITAAC. The COL applicant incorporated by reference the U.S. EPR FSAR, which included AREVA TR ANP-10295P and adequately established the design and performance requirements for verifying site-specific and U.S. EPR standard design physical security ITAAC.
- The COL applicant adequately described that the test abstracts (i.e., objectives, prerequisites, test methods, data required, and acceptance criteria) for PSS, hardware, and features are adequate and support descriptions of ITAAC to meet the regulatory requirement of 10 CFR 52.80(a), which require the COL application to contain information for inspection, tests, and analyses, and acceptance criteria that provide reasonable assurance that the facility has been constructed and will operate in conformance to the COL, the provisions of the Atomic Energy Act of 1954, and NRC regulations.

14.3.12.4.5 Inspections, Tests, and Analyses for Physical Barriers for Access to Vital Equipment, Protected Area, and Isolation Zone

AREVA TR ANP-10295P, Appendix G.1, "Vital Area Inspections," is the source document for the COL applicant's inspections, tests, and analyses for ITAAC No. 1 to verify the design and performance requirements for the physical barriers. The COL applicant indicated that the objectives are to demonstrate that the access to vital equipment required passage through at least two physical barriers, in accordance with 10 CFR 73.55(e)(9)(i). The verification method included inspections to verify that two physical continuous barriers exist between areas outside of the PA and the location of vital equipment identified in AREVA TR ANP-10295P. The prerequisites identified included installation and construction of vital equipment and physical barriers. The verification method is inspections to verify that there are two physical continuous barriers between the areas outside of the PA and the locations of vital equipment, along with required protection of openings (e.g., access denial devices, access control devices, one dimension of less than .15m (6 in.), monitoring).

AREVA TR ANP-10295P, Appendix G.1 and G.3, "Protected Area Perimeter," and, "Intrusion Detection," contained the test abstract for ITAAC Nos. 2.a, 2.b, and 2.c identified in COL ITAAC Table 2.2-1. The COL applicant indicated that the objectives are to demonstrate that the PA barrier does not constitute any part of the vital area barrier, the penetrations through the PA are secured and monitored by an intrusion detection system (IDS), and unattended openings that intersect the PA are protected by physical barriers and IDS. The prerequisites included completion of construction of barriers and completion of construction testing of installed barrier systems and their functions. The verification methods included inspections of physical barriers, openings, and penetrating barriers and testing of IDS alarms and indications at the central alarm station (CAS) and the secondary alarm station (SAS). These methods are intended to satisfy the acceptance criteria that the requirements of 10 CFR 73.55(e)(8)(i)(C), 10 CFR 73.55(e)(8)(ii), and 10 CFR 73.55(i)(5)(iii) have been met.

AREVA TR ANP-10295P, Appendix G.3 also contained the test abstracts addressing ITAAC Nos. 3.a, 3.b, and 3.c and identified the objectives to demonstrate that the configuration of the zone adjacent to the PA barrier allows for observations and assessments: There is a minimum distance adjacent to the PA as the isolation zone; and where buildings are adjacent to the PA, the structure walls form an integral part of the PA barriers. The objectives and acceptance criteria established are intended to verify that configurations of the physical barriers

comply with the requirements of 10 CFR 73.55(e)(7)i(A) and 10 CFR 73.55(e)(8)(iv). Prerequisites identified include completion of construction of the isolation zone, structures that may be integral to the PA barrier, and construction testing. The verification methods included inspections of physical barriers and their constructed and installed configurations, along with measurements of the width of the isolation zone adjacent to the PA barrier. The test abstract also established design requirements, inspections, tests, and analyses, and acceptance criteria for areas where permanent buildings do not allow sufficient observation distance between the IDS and the protected area barrier (e.g., the building walls are immediately adjacent to, or are an integral part of, the protected area barrier) will be monitored with intrusion detection and assessment equipment designed to detect the attempted or actual penetration of the protected area perimeter barrier before completed penetration of the barrier and assessment of detected activities.

The ITAAC for security lighting of the isolation zone and the PA perimeter is established under the U.S. EPR standard design. The ITAAC addresses verification that isolation zones and exterior areas within the PA are provided with adequate illumination for surveillance and assessment. AREVA TR ANP-10295P, Appendix G, Section G.10 described the test abstracts that include testing methods to verify illumination levels and loss of normal power condition that activates secondary power for continued illumination, data required, and specific acceptance criteria to meet the objectives. The COL applicant stated that the acceptance criteria are: (1) Illumination levels are at least 0.2 foot-candles in external areas within the PA and isolations; and (2) loss of normal power results in activation of security lighting in outdoor areas within the plant-protected perimeter and isolation zones as designed.

The staff finds that the COL applicant provided adequate and reasonable descriptions of the test objectives, prerequisites, test methods, and acceptance criteria that support the identified ITAAC related to the physical barrier for access to vital equipment, PA, and isolation zone. The test abstracts adequately support the verification of site-specific ITAAC Nos. 1.b, 2.a, 2.b, 2.c, 3.a, 3.b, and 3.c.

14.3.12.4.6 Inspections, Tests, and Analyses for Bullet Resistant Physical Barriers

In AREVA TR ANP-10295P, Appendix G, Section G.4, "Bullet Resistance," the COL applicant described the abstract for ITAAC No. 4, for bullet resistant barriers. The COL applicant stated that the objectives are "[t]o demonstrate that the external walls, doors, ceiling, floors, and others opening into the Main Control Room, Secondary Alarm Station, Central Alarm Station, and the last access control functions for access to the Protected Areas are bullet resistant to at least a UL Level [intentionally not stated] round." The prerequisites identified included the completion of construction of the structural and availability of analysis, engineering documents, vendor documents, and type tests of minimum thickness, door assemblies, penetrations and other structural components, along with measuring instruments are calibrated per applicable procedures. The COL applicant referenced details of AREVA TR ANP-10295P, Section 3.0 for design and performances requirements for bullet resistant as the basis for adequate bullet resistant enclosure.

The test abstract identified additional details of acceptance criteria as: (1) Structural thickness exceeds the minimum value established in AREVA TR ANP-10295P, Section 3.0 for each external wall, floor, and ceiling in the MCR, SAS, CAS, and last access control function for access to the PA; (2) each door on the structural walls is bullet resistant to a minimum Underwriter's Laboratory (UL) standard as stated in AREVA TR ANP-10295P, Appendix G; and (3) each opening (e.g., HVAC ducts) includes a labyrinth design to ensure bullet pathways

intersect material of construction that is bullet resistant. The verification methods required physical inspections, including measurements of materials of construction, and type test. The COL applicant described the acceptance criteria as the exterior walls, ceilings, doors and floors, and penetrations and openings are bullet resistant and protected to meet the requirements of 10 CFR 73.55(e)(5), and the penetrations and other openings in the enclosure of the last access control functions for access to the PA is of bullet resistant materials and construction to meet the requirements of 10CFR 73.55(e)(5).

The staff finds that the COL applicant provided adequate and reasonable descriptions of the test objectives, prerequisites, test methods, and acceptance criteria for the verification of ITAAC related to bullet resistant barriers that protect the last access control functions for access to the PA, in accordance with requirements of 10 CFR 73.55(e)(5). The test abstracts adequately support the verification of site-specific physical security ITAAC No 4.

14.3.12.4.7 Inspections, Tests, and Analyses for Access Control Points

In AREVA TR ANP-10295P, Appendix G Section G.6, "Access Control and Searches," the COL applicant described the test abstracts for site-specific physical security ITAAC Nos. 5.a and 5.b. The COL applicant indicated that the test objectives are to demonstrate that access control points are established to control personnel and vehicles into the PA and to demonstrate that detection equipment at personnel access points are capable of detecting firearms, explosives, and incendiary devices and demonstrate access control systems for authorizing access to the PA.

The prerequisites identified included that the construction of personnel and vehicle access points have been completed, along with constructions (i.e., installation) of access control and search equipment. The verification methods described included inspections of the constructed configurations of personnel and vehicle access control into the PA and testing of equipment and testing of detection equipment.

AREVA TR ANP-10295P, Appendix G, Section G.6, described data required and specific acceptance criteria to meet the objectives. The acceptance criteria are: (1) Personnel and vehicle access other than the designated access portals requires breaching of barrier or lock; (2) the access control system can identify and authorize access of authorized personnel; (3) personnel search equipment meets detection of fire arms based on standards described in RG 5.7, "Entry/Exit Control for Protected Areas, Vital Areas, and Material Access Areas, Revision 1"; and (4) personnel search equipment meets explosive detection performance standards in RG 5.7. The acceptance criteria for ITAAC are to verify that access controls are provided and configured to meet the requirement of 10 CFR 73.55(g)(1)(i)(A) and 10 CFR 7.55(g)(1)(i)(B) and the detection systems are capable of detecting firearms, explosives, and incendiary devices to meet 10 CFR 73.55(h)(3)(i) at the PA personnel access points.

The staff finds that the COL applicant provided adequate and reasonable descriptions of the test objectives, prerequisites, test methods, required data, and acceptance criterion in AREVA TR ANP-10295P, Appendix G that are of sufficient detail. The test abstract supports the verification of site-specific physical security ITAAC Nos. 5.a and 5.b.

14.3.12.4.8 Inspections, Tests, and Analyses for Access Control System

In AREVA TR ANP-10295P, Appendix G, Section G.6, the COL applicant described the test abstract for site-specific physical security ITAAC No. 6 for security access to the control system.

The identified objective is to verify that numbered picture badge systems control access to the PA. The COL applicant described prerequisites that access the control system (e.g., numbered picture badge) and personnel access control points (e.g., physical barriers doors, turnstiles) for controls of access are installed, and construction has been completed. The test abstract included physical inspections and system testing for ITAAC verification. The acceptance criteria identified that the access authorization system uses numbered picture badges and authorizes access to PA in accordance with requirements of 10 CFR 73.55(g)(6)(ii).

The staff finds the COL applicant provided adequate and reasonable descriptions of the test objectives, prerequisites, test methods, required data, and acceptance criterion in AREVA TR ANP-10295P, Appendix G that is of sufficient detail. The test abstract supports the verification of site-specific physical security ITAAC No. 6.

14.3.12.4.9 Inspections, Tests, and Analyses for Emergency Exits through the Protected Area Perimeter

In AREVA TR ANP-10295P, Appendix G, Sections G.1 and G.3, the COL applicant described test abstracts that are applicable for site-specific physical security ITAAC No. 7, that addressed requirements for emergency exits through the PA. The COL applicant identified that the objectives are to demonstrate that any openings of a size that a person can pass through (including emergency exits) at the PA boundaries are alarmed and secured by physical barriers and locking devices and that IDS detects and annunciates alarms at the CAS and SAS. The prerequisites described included completion of construction of penetrations through the PA boundary and IDS acceptance testing. The verification methods included inspections and testing to verify the acceptance criteria that penetrations at the PA boundary of greater than a size that allow a person to pass through the PA boundary are secured by locking devices and alarmed in accordance with requirements of 10 CFR 73.55(e)(8)(iii).

The COL applicant described that the objectives are to demonstrate that locks used to secure openings (i.e., through the PA boundaries) are manipulative-resistant locks. The verification methods include inspections of each opening through the vital area boundary requiring locking, openings are protected with an approved manipulative-resistant locking device, and opening will lock. The COL applicant also described prerequisites, data required, and acceptance criteria in AREVA TR ANP-10295P, Appendix G, Section G.2. The acceptance criteria identified is that each opening through the PA area boundary capable of passage by personnel is protected by a manipulative-resistant functional lock.

AREVA TR ANP-10295P, Appendix G, Section G.7, addressed the verification of U.S. EPR standard design physical security ITAAC to verify that visual and audible alarms annunciate appropriately at the CAS and SAS, demonstrate tamper and system supervisory capabilities, demonstrate alarms on exits on VA and PA, demonstrate each alarm is recorded with specific information needed for response, and demonstrate that alarm status cannot be changed independently or by a single action. The verification methods include inspections and tests that involve initiation of alarm; tamper, supervisor, and trouble conditions of the alarm systems to verify the functions of alarms; indications and recording at the CAS and SAS; and testing to verify that changes of alarm status require two actions independently initiated by alarm operator from the CAS and SAS.

AREVA TR ANP-10295P, Appendix G, Section G.7, described data required and specific acceptance criteria for meeting the objectives. The COL applicant included the following as acceptance criteria: (1) Alarm and tamper indications, as well as self-checking alarm and system troubles annunciated at CAS and redundancy of functions at the SAS; (2) alarm system

records alarm, alarm check, and tamper alarms and alarm information; (3) emergency exit alarms in CAS and SAS; and (4) alarm stations that cannot change the status of detection independently without knowledge and concurrence of each other. The U.S. EPR standard design physical security ITAAC addressed the alarm indication requirements for indicating types of alarms and locations, and IDS provide visual display and audible annunciations in accordance with 10 CFR 73.55(i)(3)(i), 10 CFR 73.55(i)(3)(ii), and 10 CFR 73.55(i)(3)(iii).

The staff finds that the COL applicant provided adequate and reasonable descriptions of the test objectives, prerequisites, test methods, and acceptance criteria to verify that the emergency exits at the PA boundaries are secured and alarmed. The test abstracts adequately support the verification of site-specific physical security ITAAC No. 7.

14.3.12.5 *Combined License Information Items*

The U.S. EPR FSAR established COL Information Item 14.3-1, which requires a COL applicant that references the U.S. EPR standard design to provide ITAAC for site-specific portions of the plant systems specified in U.S. EPR FSAR Tier 2, Section 14.3.5, "Interface Requirements." COL Information Item COL 14.3-1 required that the COL applicant provide ITAAC for the facility's physical security hardware not addressed in the standard design, in accordance with RG 1.206, and provide test abstracts for specific inspections, tests, and analysis.

Except for the confirmatory item related to RAI No. 317, Question 14.03.12-8, discussed above, the staff concludes that the COL applicant adequately addressed COL Information Item 14.3-1 by describing site-specific physical security ITAAC and incorporating the test abstracts in AREVA TR ANP-10295P. The staff also concludes that the COL applicant satisfied COL Information Item 14.3(3) by providing site-specific ITAAC not addressed in the U.S. EPR FSAR and associated test abstracts.

14.3.12.6 *Conclusions*

The staff concludes the following:

The staff reviewed in information in the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the information related to the Physical Security Hardware ITAAC incorporated by reference in the COL FSAR have been documented in the staff's SER on the design certification application for the U.S. EPR. The staff's SER for the U.S. EPR is not yet complete. The staff will update Section 14.3.12 of this report to reflect the final disposition of the U.S. EPR design certification application.

- The COL applicant adequately described attributes for site-specific physical security ITAAC for verification that conforms to staff guidance in NUREG-0800, Section 14.3.12, and satisfied COL Information Item 14.3-1 that requires a COL applicant that references the U.S. EPR certified design to provide site-specific physical security ITAAC.
- The COL applicant adequately identified appropriate and reasonable descriptions of test abstracts for physical protection systems (e.g., objectives, prerequisites, test methods, data required, and acceptance criteria) that support the site-specific physical security ITAAC for meeting the regulatory requirement of 10 CFR 52.80(a).
- The COL applicant incorporated by reference the requirements of the U.S. EPR design certification that meet 10 CFR 52.47(b)(1), which established inspections, tests, and

analyses and acceptance criteria necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criterion are met, a plant that incorporates the design certification is built and will operate in accordance with the design certification.

- The COL applicant adequately established the management system (i.e., processes and controls) that verify the construction, installations, and performance of PSS, hardware, and features that are identified for ITAAC verification and those PSS that are not specifically identified as ITAAC are verified through appropriate system construction verifications.

The staff finds that the COL applicant has met 10 CFR 52.80(a), which requires the COL application to contain information for inspections, tests, and analyses and acceptance criteria necessary and sufficient to provide reasonable assurance that the facility has been constructed and will operate in conformance with the COL, the provisions of the Atomic Energy Act of 1954, and NRC regulations.

However, staff is unable to finalize its conclusions in accordance with NRC regulations until open items have been resolved.