

11.0 RADIOACTIVE WASTE MANAGEMENT

11.1 Source Terms

This section addresses the sources of radioactivity that are generated within the core and that have the potential of leaking to the reactor coolant system during normal operation, including anticipated operational occurrences (AOOs), by way of defects in the fuel cladding. The radioactive source terms are used to identify the potential dose to members of the public and plant operators as a result of normal plant operation. This discussion includes consideration of parameters used to determine the (1) concentration of each isotope in the reactor coolant and steam, (2) fraction of fission product activity released to the reactor coolant, and (3) concentrations of all nonfission product radioactive isotopes in the reactor coolant.

Section 11.1 of the South Texas Project (STP) combined license (COL) Final Safety Analysis Report (FSAR) incorporates by reference with no departures or supplements Section 11.1, "Source Terms," of the certified Advanced Boiling-Water Reactor (ABWR) design control document (DCD) Revision 4, which is referenced in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, Appendix A. U.S. Nuclear Regulatory Commission (NRC) staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remains for review.¹ The staff's review confirmed that there is no outstanding issue related to this subsection. Pursuant to 10 CFR 52.63(a)(5) and Part 52, Appendix A, Section VI.B.1, all nuclear safety issues relating to the source terms have been resolved.

11.2 Liquid Waste Management System

11.2.1 Introduction

The liquid waste management system (LWMS) controls, collects, processes, handles, stores, and disposes of liquid radioactive waste generated as the result of normal operation, including AOOs. The LWMS reduces and controls radioactive releases into the environment. The LWMS has four major subsystems where liquid wastes from various plant systems can be segregated and processed separately. The major subsystems of the LWMS are the following:

- equipment (low-conductivity) drain subsystem
- floor (high-conductivity) drain subsystem
- chemical drain subsystem
- detergent drain subsystem

The design basis of the various subsystems relies on mobile mixed bed demineralizers, charcoal beds and cartridge filters, reverse osmosis, and organic and neutralization treatments with specified minimum design objectives. Cross-connections between subsystems provide additional flexibility in processing wastes by alternate methods and redundancy if one subsystem is inoperative. The LWMS normally operates on a batch basis. The system provides for (1) sampling at several process points, (2) administrative controls, and (3) detection and alarm of abnormal conditions against accidental discharges into the environment. The LWMS is located in the radwaste building. Airborne releases from LWMS components (e.g.,

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

review and approval. In Section 3 of Part 7, "Departures Report," of the application, the applicant indicates that this standard departure has been evaluated and determined to comply with the requirements of 10 CFR Part 52, Appendix A, Section VIII.B.5. However, because the applicant has completely redesigned the LWMS, NRC staff was not able to determine the acceptability of the applicant's evaluation per the requirements in 10 CFR Part 52, Appendix A, Section VIII.B.5, based on the information provided in the application.

Accordingly, the staff audited the applicant and conducted an independent evaluation to determine whether the applicant's evaluation of this departure complies with Section VIII of Appendix A to Part 52 (ML092510426). As a result of the audit, the staff issued request for additional information (**RAI 11.02-5 (EPM RAI 3453)**) requesting the applicant to re-evaluate the initial departure evaluations and to determine whether STD DEP 11.2-1 "would" impact a system malfunction or cause a malfunction with a different result.

In a letter (U7-C-STP-NRC-090155, dated November 16, 2009), the applicant provided a response to RAI 11.02-5. The staff reviewed the applicant's response to RAI 11.02-5 and found that it addresses the requirements of the STP procedures and 10 CFR Part 52, Appendix A, Section VIII.B.5. The response provides sufficient design details to conclude that the applicant evaluated the LWMS departure in accordance with 10 CFR Part 52. The applicant's process for evaluating departures and other changes to the DCD are subject to NRC inspections. **RAI 11.02-5 is closed.**

Evaluation of Plant Specific Information

Liquid Effluent Release Rates

NRC staff evaluated the liquid effluent releases listed in FSAR Table 12.2-22. The staff issued **RAI 11.02-3 (EPM RAI 2466)** concerning the changes in the LWMS design and the DCD annual liquid effluent Table 12.2-22. The applicant states that the GALE Code, NUREG-0016, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Boiling Water Reactors (BWR-GALE Code)," which was used to estimate the amount of liquid effluent activity released had been re-run taking into account the change in the LWMS and the results in COL Table 12.2-22, which were similar to those in the DCD table. **RAI 11.02-3 was closed** based on the applicant's initial response letter (U7-C-STP-NRC-090047, dated May 21, 2009). However, upon further review, the staff issued supplemental **RAIs 12.02-15 (EPM RAI 4137)** and **RAI 12.02-16 (EPM RAI 4138)** requesting additional calculation information to confirm the liquid and gaseous effluent source terms from the initial DCD GALE Code calculation to the revised GALE Code calculation based upon the present LWMS and gaseous waste management system (GWMS). The staff is currently performing an independent evaluation of the liquid effluent release data. The independent evaluation will be used to verify the applicant's calculations and results. **RAI 12.02-15 and RAI 12.02-16 are open items in FSAR section 12.2.**

Compliance with 10 CFR 20.1301(e) (40 CFR Part 190)

NRC staff reviewed Section 11.2 of the COL application for compliance with 10 CFR 20.1301(e) and general radiation protection standard 40 CFR Part 190 of the U.S. Environmental Protection Agency (EPA). The staff was unable to determine whether the applicant is in compliance with this regulation. The staff issued **RAI 11.02-4 (EPM RAI 2955)** requesting the applicant to provide additional information. The applicant's response letter (U7-C-STP-NRC-090125, dated September 3, 2009), states that the ER provided the "bases and assumptions" for compliance

with 10 CFR 20.1301(e) and 40 CFR Part 190. The applicant did not incorporate necessary ER information into the FSAR. **RAI 11.02-4 was closed as unresolved.** The staff issued supplemental **RAI 12.02-12 (EPM RAI 3795)** requesting the applicant to provide the bases and assumptions used to show compliance with 10 CFR 20.1301(e) and 40 CFR Part 190, and incorporate the information into the FSAR. **RAI 12.02-12 is an open item in FSAR section 12.2.**

Compliance with Cost-Benefit Ratio in 10 CFR Part 50, Appendix I

To assess compliance with numerical guidance II.D in Appendix I to Part 50, NRC staff evaluated the methodology used for determining the benefit-cost ratio prescribed in RG 1.110. The staff was unable to determine whether the applicant is in conformance with the guidance prescribed in RG 1.110. The staff issued **RAI 11.02-1 (EPM RAI 2246)**, which requested the applicant to provide additional information. The applicant's response letter (U7-C-STP-NRC-090037, dated April 23, 2009), states that the required information is available for review. **RAI 11.02-1 was closed as unresolved.** The staff issued supplemental **RAI 11.02-6 (EPM RAI 3524)** and requested the same information requested in RAI 11.02-1. The applicant responded in a letter, (U7-C-STP-NRC-090173, dated October 12, 2009), with all of the required information and calculations justifying the information in FSAR Section 11.2 concerning the LWMS cost-benefit-analysis. The staff conducted an independent evaluation to verify the applicant's submittal. The applicant's calculations were verified by independently performing the required calculations and found to be acceptable. **RAI 11.02-6 is closed.**

Compliance with the Dose Limits of 10 CFR Part 50 and Liquid Effluent Concentration Limits in Appendix B of Part 20

NRC staff reviewed FSAR Section 11.2.3 to determine whether the applicant complies with the dose criteria in 10 CFR Part 50, Appendix I, Section II.A and the liquid effluent concentration limits in Appendix B to Part 20. The staff was unable to determine whether the applicant is in compliance with these regulations. The staff issued **RAI 11.02-2 (EPM RAI 2237)** requesting the applicant to provide this information. **RAI 11.02-2 was closed as unresolved**, as the applicant responded by letter, (U7-C-STP-NRC-090040, dated April 27, 2009), stating that the evaluation showing compliance was in the STP ER and did not place any information into the FSAR. The staff issued supplemental **RAI 12.02-8 (EPM RAI 3586)** requesting the same information as in RAI 11.02-2. The applicant has provided the required information and calculations justifying the information in FSAR Section 11.2.3 and the methodology used to determine the estimated liquid effluent release concentrations and doses. The applicant provided proposed COL FSAR revisions to include the information to support compliance with the liquid effluent dose limits. **RAI 12.02-8 is a confirmatory item in FSAR section 12.2.**

Compliance with 10 CFR 20.1406 – Condensate Storage Tank

NRC staff reviewed FSAR Sections 9.2.4, 9.2.9, 11.2.1, 11.2.2, and 11.2.3 to determine the design, function and the interface of the condensate storage tank (CST) with the LWMS. The staff issued **RAIs 11.02-7, 11.02-8, and 11.02-9 (EPM RAI 3676)**, which requested the applicant to provide (1) the CST radioactive source terms and volumes; (2) the actual location of the CST and information that addresses 10 CFR 20.1406 concerns; and (3) the CST radioactive source term in the tank addressing the concentration limits, the associated dose rates surrounding the tank, and data similar to all other tanks in the LWMS. The applicant has submitted a response letter, U7-C-STP-NRC-090189, dated December 30, 2009, to these RAIs.

The staff evaluated these responses. RAI 11.02-7 requested RAI 11.02-8 requested RAI 11.02-9 requested **RAIs 11.02-7, 11.02-8, and 11.02-9 are open items.**

Conformance with BTP 11-6 – Postulated Radioactive Releases Due To Liquid-Containing Tank Failures Review Responsibilities

NRC staff reviewed FSAR Subsection 15.7.3.1 in reference to BTP 11-6 and determined that because of the design, function, and use of the radwaste building, all compartments containing liquid radwastes are steel-lined up to a height capable of containing the release of all the liquid radwastes into the compartment. Because of the design capabilities, the guidance in BTP 11-6 assumes that there will not be any major accident releasing liquid radwastes into the environment via the liquid pathway. The staff found that the consequences of an accidental failure of LWMS would be mitigated by the design of the radwaste building.

Conformance with Inspection and Enforcement Bulletin 80-10

The guidance in Inspection and Enforcement (IE) Bulletin 80-10 includes information on the identification and restriction of non-contaminated systems that have the potential of becoming contaminated. In FSAR Subsection 11.2.1.2, “Design Criteria,” the applicant commits to use procedures to ensure that the guidance and information in IE Bulletin 80-10 are followed.

Subsection 11.2.1.2.4 addresses design requirements to minimize contamination of the facility and the environment, facilitate decommissioning, and minimize the generation of radioactive waste in compliance with 10 CFR 20.1406. NRC staff found the applicant’s commitment to use the guidance in IE Bulletin 80-10 acceptable to prevent the contamination of nonradioactive systems. 10 CFR 20.1406 compliance is discussed in SER section 12.

COL License Information Item

- COL License Information Item 11.1 Plant-Specific Liquid Radwaste Information

ABWR DCD Tier 2 Section 11.2.5.1, “COL License Information,” states that the COL applicant shall provide several COL license information items that apply on a plant-specific basis. For the STP COL application, these COL license information items are addressed as follows:

The COL applicant shall provide the following items on a plant-specific basis:

- 1 DCD COL license information item 11.1, item 1 states that the applicant shall provide “Compliance with Appendix I to 10 CFR Part 50 and the guidance given in ANSI N13.1, “Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities.” RG 1.21 “Measuring and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants,” and RG 4.15, “Quality Assurance for Radiological Monitoring Programs (Normal Operation)—Effluent Streams and the Environment,”

The applicant states in Section 11.2.1.2 Design Criteria the commitment to Appendix I to 10 CFR Part 50, and refers to section 12.2 which describes how the compliance will be accomplished for liquid and gaseous effluents.

The NRC staff found this information acceptable because compliance with Appendix I to 10 CFR Part 50 and the associated ANSI Standards, and regulatory guides is described in

section 12.2 of the FSAR. Evaluations of section 12.2 demonstrate compliance with the 10 CFR Part 50, Appendix I criteria and relevant ANSI standards. The applicant adequately addresses COL License Information Item 11.1, Item 1.

2. DCD COL license information item 11.1, item 2 states that “A radiation monitor in the discharge line automatically terminates liquid waste discharges from the sample tanks in the LCW, HCW or detergent waste subsystem if radiation measurements exceed a predetermined level set to meet 10 CFR Part 20, Sections 1001 - 2402, Appendix B, Table 2, Column 2 for the applicable subsystem is provided.”

The applicant states in section 11.5 that a radiation monitor in the discharge line, is required for plant operation to monitor liquid discharges from the radwaste system to alarm and initiate automatic closure of the waste discharge valve on the affected treatment system. The operation limits for this monitor are specified in the Offsite Dose Calculation Manual as required by RG 1.21, revision 1.

The NRC staff found this information acceptable because the requirements for process and effluent radiological monitoring and sampling systems are addressed in section 11.5 of the FSAR. The applicant adequately addresses COL License Information Item 11.1, Item 2.

3. DCD COL license information item 11.1, item 3 states that “Specific administrative controls and liquid effluent source terms to limit the liquid wastes to 3700 MBq/yr (excluding tritium) shall be provided.”

The applicant states in section 11.2 that the offsite dose calculation manual (ODCM) will provide specific administrative controls and liquid effluent source terms to limit the liquid wastes to 3700 MBq/yr (excluding tritium). The ODCM will be implemented per the schedule in Table 13.4S-1.

The NRC staff found this information acceptable because this COL License Information Item is addressed in section 11.2 and Table 13.4S-1. The applicant adequately addresses this COL License Information Item 11.1, Item 3.

4. DCD COL license information item 11.1, item 4 states that “Procedures for demonstration of compliance with 10 CFR Part 50, Appendix I, Sections II and III shall be provided.”

The applicant states that The Process and Effluent Monitoring and Sampling Program has specific procedures to comply with 10 CFR Part 50, Appendix I, Sections II and III. The Process and Effluent Monitoring and Sampling Program requires specific procedures to implement the ODCM and the Radiological Environmental Monitoring Program (REMP). The requirements in these programs will comply with 10 CFR Part 50, Appendix I and will be implemented per the schedule in Table 13.4S-1.

The NRC staff found this information acceptable because this COL License Information Item is addressed in section 11.5 and Table 13.4S-1. The applicant adequately addresses this COL License Information Item 11.1, Item 4.

5. DCD COL license information item 11.1, item 5 states that there will be “Administrative controls to limit the instantaneous discharge concentrations of the radionuclides in liquid effluents to an unrestricted area to within 10 times the limits in 10 CFR Part 20, Appendix B, Table 2, Column 2.”

The applicant states in section 11.2 that the ODCM has administrative controls to limit the instantaneous discharge concentrations of the radionuclides in liquid effluents to an unrestricted area to within 10 times the limits in 10 CFR Part 20, Appendix B, Table 2, Column 2, and will be implemented per the schedule in Table 13.4S-1.

The NRC staff found this information acceptable because this COL License Information Item is addressed in section 11.2 and the ODCM. The applicant adequately addresses this COL License Information Item 11.1, Item 5.

6. DCD COL license information item 11.1, item 6 states that “Quality assurance (operations) provisions of the liquid radwaste systems shall be provided.”

The applicant states that the non-safety related SSC Quality Control Program for the LWMS is described in the STP 3 & 4 Quality Assurance Program description in section 17.5S.

The NRC staff found this information acceptable because this COL License Information Item is addressed in section 11.2 and section 17.5S. The applicant adequately addresses this COL License Information Item 11.1, Item 6.

Supplemental Information

Preoperational Tests

In COL FSAR Subsection 14.2.12.1.75, “Liquid and Solid Radwaste Systems Preoperational Tests,” and FSAR Subsection 14.2.12.2.38, “Liquid Radioactive Waste Management System Performance,” the applicant states that the LWMS will be tested during the Preoperational Test Program. The LWMS equipment will be performance tested to demonstrate conformance with design process capabilities. An integrity test will be performed on the system upon completion. NRC staff finds that this item conforms to the guidance in SRP 14.2 because these tests determine the correct installation and functional operability of the system equipment.

Inspection, Tests, Analysis, and Acceptance Criteria

Inspection, Test, Analysis, and Acceptance Criteria (ITAAC) are all incorporated by reference with no changes.

11.2.5 Post Combined License Activities

There are no post COL activities related to this section.

11.2.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information related to the LWMS. With the exceptions of **Open Items RAI 11.02-7, RAI 11.02-8, RAI 11.02-9, RAI 12.02-12, RAI 12.02-15, and RAI 12.02-16**, there is no outstanding information expected to be addressed in the COL FSAR related to this section. As a result of these open items, the staff is unable to finalize its conclusions related to the LWM System in accordance with the NRC requirements.

11.3 Gaseous Waste Management System

11.3.1 Introduction

The GWMS receives and processes radioactive gases and hydrogen bearing gases generated during process operation. There are two main sources of plant gaseous radioactive effluents. One source is from building ventilation systems servicing radiologically controlled areas, and the other source is from the power cycle offgas system (OGS). The GWMS and its OGS are used to control, collect, process, hold for decay, and discharge gaseous radioactive wastes generated during normal operations, including AOOs. The major components of the OGS include preheaters; recombiners; cooler/condensers; dryers; activated charcoal beds (guard and delay); and associated valves, pumps, and instrumentation. The OGS is located in the turbine building. The gases removed from the condenser are radioactive and must be treated before being released into the environment to ensure that radioactivity levels are reduced to acceptable levels and as low as reasonably achievable (ALARA). The GWMS is designed to reduce and control radioactive releases into the environment. Releases from the OGS are directed via the turbine building stack. Releases from building ventilation exhaust systems servicing radiologically controlled areas are directed through their respective buildings, the reactor/fuel building stack, the turbine building stack, and the radwaste building stack.

11.3.2 Summary of Application

Section 11.3 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 11.3 of the certified ABWR DCD Revision 4 referenced in 10 CFR Part 52, Appendix A, with the following departures:

Tier 2 Departures Requiring Prior NRC Approval

- STD DEP 10.4-5 Condensate and Feedwater System

In Section 2.2, "Departures from the Generic Technical Specifications," of Part 7 of the COL application, the applicant identifies two effects from this departure: Technical Specification (TS) and non-TS effects. In Section 11.3, this departure refers only to Table 11.3-3, Figure 11.3-1, and Figure 11.3-2, which relate to the changing equipment items: recombiner to reheater catalyst to recombiner and recombiner condenser to condenser. The changing of equipment items are considered as not affecting the TS.

Tier 2 Departures Not Requiring Prior NRC Approval

- STD DEP 10.4-3 Main Condenser Evacuation System

This site-specific departure adds an additional mechanical vacuum pump so the design now consists of two vacuum pumps.

- STD DEP 11.3-1 Gaseous Waste Management System

This departure modifies the GWMS design approved in the ABWR DCD. The changes include deleting equipment, deleting tanks, maximizing charcoal efficiency, creating one pathway for gaseous treatment versus parallel lines, and adding an evacuation system to provide stable offgas flow to the plant exhaust.

COL License Information Item

- COL License Information Item 11.2 Compliance with Appendix I to 10 CFR Part 50

The COL applicant shall demonstrate compliance with Appendix I to 10CFR50 numerical guidelines for offsite radiation doses as a result of gaseous or airborne radioactive effluents during normal plant operations, including anticipated operational occurrences shall be provided.

11.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG–1503. In addition, the relevant requirements of Commission regulations for the GWMS and associated acceptance criteria are in Section 11.3 of NUREG–0800.

In particular, the regulatory basis for accepting the supplementary information on GWMS is established in 10 CFR 20.1301(e); 10 CFR 20.1302; 10 CFR 20.1406; 10 CFR 50.34a; Appendix A to 10 CFR Part 50, GDC 3, 60, and 61; Appendix I to 10 CFR Part 50, Sections II.B, II.C, and II.D; and 10 CFR 52.80(a). SRP acceptance criteria include codes and standards listed in Table 1 of RG 1.143; Regulatory Position C.2 of RG 1.143; RGs 1.109, 1.111, and 1.112; and BTP 11-5 of Section 11.3 to the SRP. The guidance of RG 1.140 is addressed in the design considerations of ventilation systems described in FSAR Revision 0, Section 9.4 for building exhaust systems and venting tanks and vessels. Full descriptions of the applicable regulatory and acceptance criteria are in SRP Section 11.3 (NUREG–0800).

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

11.3.4 Technical Evaluation

As documented in NUREG–1503, the staff reviewed and approved Section 11.3 of the certified ABWR DCD. NRC staff reviewed Section 11.3 of the STP Units 3 and 4 COL FSAR. The staff also checked the referenced ABWR DCD to ensure that the combination of information in the COL FSAR and information in the ABWR DCD represents the complete scope of information relating to this review topic.¹ The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to the GWMS.

The applicant provides new and revised information on the STP Units 3 and 4 GWMS. The staff reviewed the application using the guidance of SRP Section 11.3 and RG 1.206 Section C.I.11.3, with the following specific considerations:

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

Tier 2 Departures Requiring Prior NRC Approval

- STD DEP 10.4-5 Condensate and Feed Water System

In Section 2.2, "Departures from the Generic Technical Specifications," of Part 7 of the COL application, the applicant identifies two effects from this departure: TS and non-TS effects. In Section 11.3, this departure refers only to Table 11.3-3, Figure 11.3-1, and Figure 11.3-2, which relate to the changing equipment items: recombiner to reheater, catalyst to recombiner, and recombiner condenser to condenser. The applicant stated that the changing of equipment items are not considered as affecting the TS.

In its review of STD DEP 10.4-5, the staff identified areas in which additional information was necessary to complete its evaluation. The staff noted that the description in FSAR Section 11.3.3.3, "Process Facility," removes provisions for supplying an alternative source of cooling for the offgas condenser. The staff requested information in **RAI 11.3-03** to confirm that the guidance in SRP 11.3, "Gaseous Waste Management System," has been satisfied.

The applicant responded (letter U7-C-STP-NRC-090125, dated September 3, 2009), to RAI 11.3-03 in a letter dated September 3, 2009. In RAI 11.3-03, the staff asked the applicant to provide in the FSAR additional discussion on how the turbine building cooling water provides equivalent reliability and quality as reactor condensate as a suitable coolant for the offgas condensers. In its response, the applicant provided information confirming reliability and water quality of the turbine cooling water (TCW). In the response, the applicant concluded that the TCW will at least be as reliable as the condensate system and the water quality will be of higher quality and cooler than the condensate system based upon staff review. The staff finds that this design change does not adversely affect the gaseous waste management system. The safety conclusions as stated in Section 11.3 of the SER for the reference ABWR DCD are not changed. **RAI 11.03-3 is closed.**

Tier 2 Departures Not Requiring Prior NRC Approval

The applicant's evaluation in accordance with 10 CFR Part 52, Appendix A, Section VIII item B.5 determined that the following departures did not require prior NRC approval. With respect to the impact of these departures on this section, NRC staff found it reasonable that these departures do not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD are subject to NRC inspections.

- STD DEP 10.4-3 Main Condenser Evacuation System

This site-specific departure adds an additional mechanical vacuum pump so the design now consists of two vacuum pumps, which changes the source of motive steam supplying the steam jet air ejectors during power operation.

This departure does not require any further evaluation as it pertains to the review scope of this section. The main condenser vacuum releases continue to be processed through the monitored and sampled combined plant release point as designed. Further, the staff's review and evaluation of the acceptability of this departure is in Section 10 of this Safety Evaluation Report (SER).

This departure makes the following changes to the GWMS:

- changes the offgas recombiner from an integral unit to an independent pre-heater, recombiner, and condenser arranged in a recombiner train
- adds an offgas evacuation system downstream of the high-efficiency particulate air (HEPA) filter to stabilize the offgas flow to the plant exhaust
- revises the charcoal adsorber vault temperature to a tighter range to maximize charcoal efficiency
- changes the number of charcoal adsorber vessels from nine (one guard bed and eight adsorbers) to five (one guard bed and four adsorbers); also, the arrangement of the charcoal adsorbers is changed from four parallel lines, each with two adsorbers in a series, to four larger adsorbers in a series
- revises the mass of charcoal in each of the charcoal adsorber vessels from 13,600 kilograms (kg) (for the eight adsorbers) to 27,200 kg (for the four larger adsorbers); the total mass of charcoal in the adsorbers is unchanged; note that the accident analyses in Section 15.7 assume the bypass of the charcoal adsorbers downstream of the guard bed, so the accident analyses are unaffected
- changes the mass of charcoal in the guard bed from 4,500 kg to 4,721 kg in Section 11.3 to be consistent with the accident analyses described in Section 15.7.1.

In its review of STD DEP 11.3-1 and STD DEP 10.4-5, the staff identified areas in which additional information was necessary to complete its evaluation. The staff noted that Table 11.3-3, "Equipment Malfunction Analysis," includes only the preheater, recombiner, and condenser. Also, the staff noted that Figures 11.3-1, "Offgas System PFD," and 11.3-2 "Offgas System P&ID," that substantial changes were made to the figures, including the removal of notes and other design information. The staff requested information in **RAI 11.3-04** to confirm acceptability of the applicant's evaluation per the requirements in 10 CFR Part 52, Appendix A, Section VIII.B.5.

The applicant responded (letter U7-C-STP-NRC-090125, dated September 3, 2009), to RAI 11.3-04 in a letter dated September 3, 2009. In its response the applicant stated that due to a redesigned offgas system the DCD P&ID's including notations are not applicable. The staff finds that changes to the table and figures listed above do not conflict with the applicant's evaluation per the requirements in 10 CFR Part 52, Appendix A, Section VIII.B.5.

In the response to RAI 11.3-04, the applicant also included additional information pertaining to 20.1406. The applicant proposed to add Section 11.3.2.1, "Offgas System Compliance with Part 20.1406," to the FSAR to confirm compliance with this regulation. The staff has reviewed this additional information for Section 11.3.2.1 and finds it acceptable regarding the minimization of the generation of radioactive waste. Accordingly, the question is resolved, but because the COL FSAR has not yet been changed, **RAI 11.03-4 is a confirmatory item.**

Section 3 of the Part 7, "Departures Report," of the COL application indicates that this standard departure was evaluated and found to comply with the requirements of 10 CFR Part 52,

Appendix A, Section VIII.B.5. The NRC staff was not able to determine the acceptability of the applicant's evaluation per the requirements in 10 CFR Part 52, Appendix A, Section VIII.B.5. Accordingly, the staff audited the applicant and conducted an independent evaluation. The purpose of these activities was to ascertain whether enough information existed to determine the acceptability of the applicant's screening evaluations for each technical and regulatory aspect of this departure. The staff found that there is sufficient information for this particular departure and that the evaluation performed by the applicant is acceptable because it satisfies the requirements in Section VIII.B.5 of Appendix A to 10 CFR Part 52.

Evaluation of Plant Specific Information

Compliance with Cost-Benefit Ratio in 10 CFR Part 50, Appendix I

To assess compliance with numeric guideline II.D in 10 CFR Part 50, Appendix I, NRC staff evaluated the methodology used to determine the benefit-cost ratio prescribed in RG 1.110. Because the staff was not able to determine whether the applicant is in conformance with the guidance prescribed in RG 1.110, the staff issued **RAI 11.03-1, (EPM RAI 2245)** requesting the applicant to provide additional information. The applicant's initial response (letter U7-C-STP-NRC-090047, dated May 21, 2009), did not supply enough information and **RAI 11.03-1 was closed as unresolved**. The staff issued supplemental **RAI 11.03-7 (EPM RAI 3522)** requesting additional information. In response to this RAI 11.03-7, (letter U7-C-STP-NRC-090173, dated October 12, 2009), the applicant provided all essential information and methodology used to determine the benefit-cost ratio prescribed in RG 1.110. The staff conducted an independent evaluation to verify the applicant's submittal and concurred with the applicant's calculations by independently performing the required calculations. **RAI 11.03-7 is closed.**

Compliance with 10 CFR 20.1301(e) (40 CFR Part 190)

NRC staff reviewed Section 11.3 for compliance with 10 CFR 20.1301(e) and EPA's general radiation protection standard 40 CFR Part 190. The information is evaluated in SER Section 11.2 and is associated with RAI 12.02-12. **RAI 12.02-12 is an open item.** The evaluation of 10 CFR 20.1301(e) compliance is included in SER Section 11.2.

Compliance with BTP 11-5 Postulated Radioactive Releases Due to a Waste Gas System Leak or Failure

NRC staff evaluated conformance with BTP 11-5, which addresses the consequences of the waste gas system failure. The staff issued **RAI 11.03-2 (EPM RAI 2983)** requesting the applicant to provide information and details on how the applicant performed this failure analysis. The staff also issued **RAI 11.03-5 (EPM RAI 2982)** requesting the applicant to review the information and the data presented in Subsection 15.7.1.1 with the updated BTP 11-5, Revision 3. The applicant's responses (letter U7-C-STP-NRC-090125, dated September 3, 2009) to these RAIs state that there are no departures from Subsection 15.7.1.1 of the certified design. Subsection 15.7.1.1 analyses in the ABWR DCD are based on the inadvertent bypass of the downstream charcoal delay beds, and the analyses are identical to the STP COL 15.7.1.1 event and the event described in BTP 11-5. The NRC staff review determined that the information provided by the applicant is acceptable. **RAI 11.03-2 and RAI 11.03-5 are closed.**

COL License Information Item

COL License Information Item 11.2

Compliance with Appendix I to 10 CFR Part 50

ABWR DCD Tier 2 Section 11.3.11.1, "COL License Information," states that the COL applicant shall provide the COL license information item that applies on a plant-specific basis. For the STP COL application, this COL license information item is addressed as follows:

COL License Information Item 11.2 states that the applicant shall demonstrate compliance with Appendix I to 10 CFR Part 50 numerical guidelines for offsite radiation doses resulting from gaseous or airborne radioactive effluents during normal plant operations, including AOOs. Subsection 11.3.11.1 of the FSAR states that all required information concerning this COL License Information is in FSAR Subsection 12.2.2.2.

NRC staff evaluated FSAR Subsection 12.2.2.2 and issued RAIs addressing the details of the dose analysis. **RAI 12.02-1 (EPM RAI 1557)** requested clarification of the gaseous effluent dispersion factor table utilized for routine radiological effluent releases. The applicant responded with a corrected dispersion factor table reference and committed to update section 12.2.2.1 appropriately. **RAI 12.02-1 is a confirmatory item in FSAR section 12.2.**

RAI 11.03-6 (EPM RAI 3280) requested that the applicant provide finalized dispersion factors used to calculate gaseous effluent doses from each plant. The applicant responded (letter U7-C-STP-NRC-090132, dated September 9, 2009), and provided dispersion factors that were reviewed and accepted by the staff. The staff's review of the annual average χ/Q and D/Q values (dispersion factors) is addressed in SER Subsection 2.3S.5, "Long-Term Atmospheric Dispersion Estimates for Routine Releases." **RAI 11.03-6 is a confirmatory item.**

RAI 12.02-7 (EPM RAI 3018) requested that the applicant provide detailed information to enable the staff to validate and verify the estimated doses from gaseous effluents with respect to 10 CFR Part 50, Appendix I. The applicant has responded (letter U7-C-STP-NRC-090155, dated September 22, 2009). RAI 12.02-7 is being evaluated by the staff based upon the applicant's response. **RAI 12.02-7 is an open item in SER section 12.2.**

Supplemental Information

Preoperational Tests

In COL FSAR Subsection 14.2.12.1.35, "Gaseous Radwaste Management/Offgas Systems Preoperational Tests," the applicant states that the GWMS is tested during the Preoperational Test Program. The GWMS equipment will be performance tested to demonstrate conformance with design process capabilities. An integrity test is performed on the system upon completion. The staff found that this item conforms to the guidance in SRP 14.2 because these tests determine correct installation and functional operability of the system equipment.

Inspection, Test, Analysis and Acceptance Criteria

ITAAC are all incorporated by reference with no changes.

11.3.5 Post Combined License Activities

There are no post COL activities related to this section.

11.3.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information related to the GWMS. With the exceptions of **Open Items RAI 12.02-7, RAI 12.02-12, Confirmatory Items RAI 11.03-4 and 11.03-6** there is no outstanding information expected to be addressed in the COL FSAR related to this section. As a result of these confirmatory items, the staff is unable to finalize its conclusions related to the GWMS in accordance with the NRC requirements.

11.4 Solid Waste Management System

11.4.1 Introduction

This section of the FSAR addresses how the solid waste management system (SWMS) manages radioactive wastes as liquid, wet, and dry solid wastes produced during normal operations and AOOs. The review includes an evaluation of any additional equipment that may be necessary to process liquid, dry, and wet wastes and route them to the point of discharge from the SWMS or prepare them for shipment to authorized offsite disposal sites or licensed radioactive waste processors. The SWMS has no safety-related function. There is no liquid plant discharge from the SWMS. A failure of the SWMS subsystem does not compromise any safety-related system or component or prevent a shutdown of the plant.

11.4.2 Summary of Application

The applicant incorporates by reference Tier 1 Section 2.9, "Radioactive Waste System," of the certified ABWR DCD. Tier 2 Section 11.4 contains one departure that changes the design of the SWMS. COL License Information Item 11.3 in section 11.4.3 of the DCD remains an item addressed in the FSAR by the applicant.

Tier 2 Departure Not Requiring Prior NRC Approval

- STD DEP 11.4-1 Radioactive Solid Waste Update

The applicant completely replaces Tier 2 Section 11.4 of the certified ABWR DCD, including all subsections, figures, and tables. This standard departure from the DCD SWMS design deletes the solidification, incineration, and compacting processes. Thus, no part of ABWR DCD Section 11.4 is incorporated by reference.

COL License Information Item

- COL License Information Item 11.3 Plant-Specific Solid Radwaste Information

COL License Information Item 11.3 contains the following six items:

1. A description of the incinerator complete with the source of incinerator heat, heat source storage facility and specific fire protection features to prevent any undue fire hazard shall be provided.
2. Demonstration that the wet waste solidification process and the spent resin and sludge dewatering process will result in products that comply with 10 CFR 61.56 shall be provided.
3. Establishment and implementation of a process control program (PCP) for solidifying the evaporator concentrates, using an approved solidification agent, and the dewatering processing of the spent resins and filter sludges shall be provided.
4. A discussion of onsite storage of low-level waste beyond that discussed in Tier 2 shall be provided.
5. Demonstration that all radioactive waste shipping packages meet the requirements in 10 CFR Part 71 shall be provided.
6. Based on the as-built design, establish set points for the liquid discharge radiation monitor.

11.4.3 Regulatory Basis

The relevant requirements of the Commission regulations for the SWMS and associated acceptance criteria are in Section 11.4 of NUREG-0800.

In particular, the regulatory basis and review criteria that the staff used for COL License Information Item 11.3 and the Tier 2 departures described above are in Section 11.4 of NUREG-0800.

In accordance with Section VIII, "Processes for Changes and Departures," of "Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor," the applicant identifies one Tier 2 departure. Tier 2 departures are subject to the requirements in Section VIII.B.5 of Appendix A to Part 52, which are similar to the requirements in 10 CFR 50.59.

11.4.4 Technical Evaluation

As documented in NUREG-1503, the staff reviewed and approved Section 11.4 of the certified ABWR DCD. NRC staff reviewed Section 11.4 of the STP Units 3 and 4 COL FSAR. The staff also checked the referenced ABWR DCD to ensure that the combination of information in the COL FSAR and information in the ABWR DCD represents the complete scope of information relating to this review topic.¹ The staff's review confirmed that the information in the application and the information incorporated by reference address the required information relating to the solid waste management system.

NRC staff reviewed and approved Section 11.4 of the generic DCD for the ABWR design, as documented in NUREG-1503. The applicant provides new and revised information on the STP

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

Units 3 and 4 SWMS. The staff reviewed the application using the guidance of SRP Section 11.4 and RG 1.206 Section C.I.11.4, with the following specific considerations:

Tier 2 Departure Not Requiring Prior NRC Approval

The applicant's evaluation in accordance with 10 CFR Part 52, Appendix A, Section VIII item B.5 determined that the following departure did not require prior NRC approval. With respect to the impact of this departure on this section, NRC staff found it reasonable that this departure does not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD are subject to NRC inspections.

- STD DEP 11.4-1 Radioactive Solid Waste Update

STD DEP 11.4-1, "Radioactive Solid Waste Update," the applicant completely replaced the SWMS design in the ABWR DCD. The changes include deleting equipment, adding tanks, and using modular equipment. Section 3 of the Departures Report indicates that this standard departure was evaluated and determined to comply with the requirements of 10 CFR Part 52, Appendix A, Section VIII.B.5. However, because the DCD was completely replaced and the system redesigned, NRC staff was not able to find enough information provided by the applicant to determine the acceptability of the applicant's evaluation, per the requirements in 10 CFR Part 52, Appendix A, Section VIII.B.5. The staff issued **RAI 11.04-1 (EPM RAI 202)** requesting the applicant to provide this evaluation to confirm that the requirements in 10 CFR Part 52, Appendix A, Section VIII.B.5 have been satisfied. The applicant's response (letter ABR-AE-08000046, dated June 26, 2008), to the staff's RAI re-created and submitted the screening evaluations of 10 CFR Part 52, Appendix A, Section VIII.B.5. The staff found the applicant's response acceptable. **RAI 11.04-1 is closed.**

The RAI response concerning the recreation of the 10 CFR Part 52 evaluation for this departure prompted an on-site NRC audit to review and evaluate whether the applicant processed Chapter 11 departures from the approved ABWR DCD in accordance with the requirements of Appendix A to Title 10 CFR Part 52. The staff reviewed the applicant's evaluation procedures and processes and the bases for the applicant's determination that prior NRC approval is not required to ensure that the process results in changes that are consistent with the requirements of Part 52, Appendix A, Section VIII.B.5.

The staff conducted an audit of the 10 CFR Part 52, Appendix A, Section VIII.B.5 evaluation process (ML092510426). The staff then issued **RAI 11.04-5 (EPM RAI 3498)** requesting the applicant to re-evaluate the initial departure evaluations to determine whether STD DEP 11.4-1 "would" create a system malfunction or cause a malfunction with a different result. The applicant's response (letter U7-C-STP-NRC-090173, dated October 12, 2009), re-evaluates the STD DEP and concludes that the changes to the SWMS will not increase the consequences of an equipment malfunction or cause a malfunction with a different result.

The staff reviewed the applicant's response to RAI 11.04-5 and found that it addresses the requirements of the STP procedures and 10 CFR Part 52, Appendix A, Section VIII.B.5. The response provides sufficient information to conclude that the applicant evaluated the SWMS departure in accordance with 10 CFR Part 52. The staff found the applicant's response acceptable. **RAIs 11.04-1 and 11.04-5 are closed.**

.COL License Information Item

- COL License Information Item 11.3 Plant-Specific Solid Radwaste Information

ABWR DCD Tier 2 Section 11.4.3, "COL License Information," states that the COL applicant shall provide several COL license information items that apply on a plant-specific basis. For the STP COL application, these COL license information items are addressed as follows:

1. DCD COL license information item 11.3, item 1 states "A description of the incinerator complete with the source of incinerator heat, heat source storage facility, and specific fire protection features to prevent any undue fire hazard shall be provided."

The applicant stated that this departure completely replaces the previously approved SWMS design in NUREG-1503 and deletes the incinerator process. The information requested in this COL license information item is no longer necessary or applicable.

The staff finds that the applicant adequately addresses COL License Information Item 11.4, Item 1.

2. DCD COL license information item 11.3, item 2 states "Demonstration that the wet waste solidification process and the spent resin and sludge dewatering process will result in products that comply with 10 CFR 61.56 shall be provided."

The applicant stated in STD-DEP-11.4-1 for FSAR Section 11.4 deletes the solidification process, so that portion of the COL license information item is no longer necessary or applicable.

The staff's review of the departure showed that the applicant has provided information and descriptions of the spent resin and sludge dewatering process and the mobile dewatering processing subsystem equipment in sufficient detail to confirm compliance with 10 CFR 61.56. The staff finds that the applicant adequately addresses COL License Information Item 11.4, Item 2.

3. DCD COL license information item 11.3, item 3 states "Establishment and implementation of a PCP for solidifying the evaporator concentrates, using an approved solidification agent, and the dewatering processing of the spent resins and filter sludges shall be provided."

The applicant stated Table 13.4S-1, "Operational Programs Required by NRC Regulation and Program Implementation," provides a milestone date for fuel loading to implement the PCP. The implementation of the PCP has been identified as a license condition.

The staff issued **RAI 11.04-2 (EPM RAI 202)** requesting the applicant to provide additional information concerning key elements of the program that are to be included in the PCP. The applicant's response (letter ABR-AE-08000046, dated June 26, 2008), to the RAI states that the site PCP utilized by STP Units 1 and 2 will also be utilized by STP Units 3 and 4.

The staff issued an additional **RAI 11.04-4 (EPM RAI 3172)** requesting the applicant to address the PCP and the potential incorporation of the Nuclear Energy Institute (NEI) Document NEI 07-10A, "Generic FSAR Template Guidance for Process Control Program (PCP)," in the FSAR. The applicant's response (letter U7-C-STP-NRC-090125, dated September 3, 2009), modifies Section 11.4.3 to state that the PCP will incorporate the

guidance in the NEI Template NEI 07-10A. Therefore, **RAI 11.04-2 is closed, and RAI 11.04-4 is a confirmatory item.**

4. DCD COL license information item 11.3, item 4 states “A discussion of onsite storage of low-level waste beyond that discussed in Tier 2 shall be provided.”

The applicant discusses onsite storage space for a 6-month volume of packaged waste beyond that discussed in ABWR DCD Section 11.4.2. The applicant also provides estimates of expected Class A, B, and C radwaste volumes.

The staff issued **RAI 11.04-3 (EPM RAI 2464)** requesting the applicant to provide additional information for the radwaste data presented. The staff questioned whether the data represented one or both units. The staff also asked for clarification of the radwaste volume differences. The applicant provided a response (letter U7-C-STP-NRC-090047, dated May 21, 2009), clarifying the radwaste information and has revised Section 11.4.2.2.6 in revision 3 of the FSAR. The staff found that the applicant’s response clarifies the data and the waste volumes for each unit. **RAI 11.04-3 is closed.** The staff finds that the applicant adequately addresses COL License Information Item 11.4, Item 4.

5. DCD COL license information item 11.3, item 5 states “Demonstration that all radioactive waste shipping packages meet the requirements in 10 CFR Part 71 shall be provided.”

In COL FSAR Subsection 11.4.1.2, “Design Criteria,” the applicant states that “The SWMS is designed to package solid wastes in Department of Transportation (DOT) 10 CFR Part 71 approved containers.”

The staff finds that this statement is sufficient to close this item because the applicant has committed to utilizing the SWMS to package solid wastes in accordance with DOT 10 CFR 71 approved containers in their design. The staff finds that the applicant adequately addresses COL License Information Item 11.4, Item 5.

6. DCD COL license information item 11.3, item 6 states “Based on the as-built design, establish set points for the liquid discharge radiation monitor.”

The applicant addresses this item in FSAR Section 11.5, stating that the ODCM describes the establishment of the liquid discharge radiation monitor setpoints.

The staff issued **RAI 11.04-6 (EPM RAI 3894)** requesting the applicant to clarify the tracking of COL license information items between DCD Table 1.9-1 and Section 11.4 and FSAR Section 11.4.3. The applicant responded (letter U7-C-STP-NRC-090223, dated December 9, 2009), to this RAI and committed to revise section 11.4 as requested. **RAI 11.04-6 is a confirmatory item.**

Supplemental Information

Preoperational Tests

In COL FSAR Subsection 14.2.12.1.75, “Liquid and Solid Radwaste Systems Preoperational Tests,” the applicant states that the SWMS is tested during the Preoperational Test Program. The SWMS equipment will be performance tested to demonstrate conformance with design

process capabilities. An integrity test is performed on the system upon its completion. NRC staff finds that this item conforms to the guidance in SRP 14.2.

Inspection, Tests, Analysis and Acceptance Criteria

ITAAC are all incorporated by reference with no changes.

11.4.5 Post Combined License Activities

License Condition for the Process Control Program before fuel loading.

NRC staff included the following two license conditions:

1. "Prior to fuel loading, the licensee shall implement an operational program for process and effluent monitoring and sampling." The program shall include the following subprograms and documents:
 - a. Radiological Effluent Technical Specifications/Standard Radiological Effluent Controls
 - b. Offsite Dose Calculation Manual
 - c. Radiological Environmental Monitoring Program
 - d. Process Control Program
2. The licensee shall submit to the NRC a schedule, no later than 12 months after the issuance of the combined operating license that supports planning for the conduct of NRC inspections of the four operating programs and documents listed in the above license condition (number 1). The schedule shall be updated every 6 months until 12 months before the scheduled fuel loading and every month thereafter, until either the 4 operational programs and documents have been fully implemented or the plant has been placed in commercial service.

11.4.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information related to the SWMS. With the exceptions of **Confirmatory Items RAI 11.04-4 and 11.04-6** there is no outstanding information expected to be addressed in the COL FSAR related to this section. As a result of these confirmatory items, the staff is unable to finalize its conclusions related to the SWMS in accordance with the NRC requirements.

11.5 Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems

11.5.1 Introduction

The process radiation monitoring system (PRMS) is used to monitor liquid and gaseous process streams and effluents from the LWMS, GWMS, and SWMS during normal operations and AOOs and under post-accident conditions. Another objective is to alert control room operators of abnormal levels of radioactivity in process streams and liquid and gaseous effluents, and to activate signals that initiate automatic safety functions, isolate process streams, and terminate effluent discharges if predetermined radioactivity levels or release rates exceed established alarm setpoints. The PRMS generates signals to initiate the operation of certain safety-related

equipment to control radioactive releases under normal and abnormal operations and accident conditions. Another function of the PRMS is to provide the means to collect samples from process and effluent streams for radiological analyses that assess compliance with NRC regulations.

The PRMS consists of skid-mounted and permanently installed sampling and monitoring equipment designed to indicate operational radiation levels and releases of radioactive materials, equipment or component failures, and system malfunctions or improper operations. The PRMS system includes beta and gamma radiation-sensitive detectors working in redundant channels, as required for each subsystem. The radiation detectors are capable of detecting the types and energies of radiation emitted from fuel, radioactive wastes, and process and effluent streams. Local readout and alarm modules are located at specific areas to provide information on the radiological status of plant systems and to alert personnel of abnormal or accident conditions.

11.5.2 Summary of Application

Section 11.5 of the STP Units 3 and 4 COL FSAR incorporates by reference Section 11.5 of the certified ABWR DCD Revision 4 referenced in 10 CFR Part 52, Appendix A. In addition, in FSAR Section 11.5, the applicant provides the following:

Tier 1 Departures

- STD DEP T1 2.3-1 Deletion of main steam isolation valve (MSIV) Closure and Scram on High Radiation

This departure deletes the Scram and MSIV automatic closure on the high main steam line radiation monitor signal.

- STD DEP T1 3.4-1 Safety-Related instrumentation and control (I&C) Architecture

This departure updates the safety-related I&C design architecture.

Tier 2 Departures Not Requiring Prior NRC Approval

- STD DEP 7.1-1 References to Setpoints and Allowable Values

This departure clarifies the references to setpoints and allowable values.

- STD DEP 11.5-1 Process and Effluent Radiation Monitoring and Sampling System

This departure addresses the process and effluent radiation monitoring and sampling system.

COL License Information Items

- COL License Information Item 11.4 Calculations of Radiation Release Rates

The COL applicant shall provide and describe in the operation and maintenance manual the procedures and/or methods for the conversion of the radiation measurements into release rates of gaseous discharge from the main plant stack. (Section 11.5)

- COL License Information Item 11.5 Compliance with the Regulatory Shielding Design Basis

The COL applicant shall describe in the operation and maintenance manual the sampling system design of the standby gas treatment system(SGTS) and of the main stack effluent monitoring subsystems and show compliance with the regulatory shielding requirements for low radiation exposure under accident conditions as stipulated in NUREG-0737, Item II.F.1, clarification 2 of Attachment 2. The requirement for the shielding design will be covered in the equipment design specifications. (Section 11.5)

- COL License Information Item 11.6 Provisions for Isokinetic Sampling

The COL applicant shall describe in the operation and maintenance manual the sampling technique used for monitoring and sampling of effluent gasses to assure that a representative gas sample is extracted and that the sampling system is capable of maintaining isokinetic conditions within 20% of the flow rate during and following an accident as stipulated in NUREG-0737, Item II.F.1, clarification 3 of Attachment 2. (Section 11.5)

COL License Information Item 11.7 Sampling of Radioactive Iodine and Particulates

The COL applicant shall describe in the operation and maintenance manual the collection technique used to extract representative samples of radioactive iodines and particulates during and following an accident. These measurements are used to determine the quantitative releases for dose calculations and assessment (as stipulated in NUREG-0737, Table II.F.1-2). (Section 11.5)

- COL License Information Item 11.8 Calibration Frequencies and Techniques

The COL applicant shall provide in the operation and maintenance manual for the system the calibration frequencies and techniques for the radiation sensors. This information shall be based on vendor data for the equipment. (Section 11.5)

Supplemental Information

The applicant provides Supplemental Information 11.5.7S to address the ODCM per RG 1.206, Section C.III.1.

11.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1503. In addition, the relevant requirements of Commission regulations for the PRMS and associated acceptance criteria are in Section 11.5 of NUREG-0800.

In particular, the regulatory basis for accepting the supplementary information for the PRMS is established in 10 CFR 20.1301, 10 CFR 20.1301(e), 10 CFR 20.1302, and 10 CFR 20.1406; 10 CFR 50.34a and 10 CFR 50.36a; Appendix A to 10 CFR Part 50, GDC 60, 63, and 64; Appendix I to 10 CFR Part 50, Sections II.A, II.B, II.C, and II.D; 10 CFR 52.80(a); and Generic Letter 89-01. Additional requirements include those of 10 CFR 50.34(f)(2)(xvii) and 10 CFR 50.34(f)(2)(xxvii) for monitoring gaseous effluents from potential accident release points, consistent with GDC 63 and 64. SRP acceptance criteria include RGs 1.21, 1.33, 1.97, 4.1, 4.8, and 4.15; industry codes and standards, including ANSI/HPS N13.1 and ANS N42.18; and BTP 7-10 of SRP Section 7.5.

In addition, in accordance with Section VIII, “Processes for Changes and Departures,” of, “Appendix A to Part 52--Design Certification Rule for the U.S. Advanced Boiling Water Reactor,” the applicant identifies Tier 1 and Tier 2 departures. Tier 1 departures requiring prior NRC approval are subject to the requirements in VIII.A.4. Tier 2 departures are subject to the requirements in Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59.

11.5.4 Technical Evaluation

As documented in NUREG–1503, the staff reviewed and approved Section 11.5 of the certified ABWR DCD. NRC staff reviewed Section 11.5 of the STP Units 3 and 4 COL FSAR. The staff also checked the referenced ABWR DCD to ensure that the combination of information in the COL FSAR and information in the ABWR DCD represents the complete scope of information relating to this review topic.¹ The staff’s review confirmed that the information in the application and the information incorporated by reference address the required information relating to the process and effluent radiological monitoring instrumentation and sampling systems.

The departures and supplements affecting FSAR Section 11.5 are evaluated as follows:

Tier 1 Departures

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

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

This departure deletes Scram and MSIV automatic closure on the high main steam line (MSL) radiation monitor (RM) trip. With this safety function deleted, the MSL tunnel area radiation monitoring is no longer required for safety and protection and can be moved from the list of radiation monitors required for safety and protection (Item [1] in FSAR Tier 2 Subsection 11.5.1.1.1), to functions required for plant operation (Item [g] in FSAR Tier 2 Subsection 11.5.1.1.2). In Part 7 Section 2.1, the applicant describes and evaluates this departure per Section VII.A.4 of Appendix A to 10 CFR Part 52. In summary, the MSL RM high trip is not specifically credited in any ABWR safety analysis. This trip was originally designed to mitigate effects in the event of a control rod drop accident for BWRs. The ABWR has no basis for the

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

control rod drop accident event to occur, as described in DCD FSAR Tier 2 Section 15.4.10. Furthermore, the U.S. BWRs have experienced spurious trips due to this MSL RM high trip. The trip setpoint must be set high enough to accommodate the normal high-radiation level during operation from the activated O-16 in the reactor producing radioactive N-16 that is carried in the MSL flow, but low enough to provide adequate protection. The MSL RM trip setpoints can be overwhelmed by minor variations in the N-16 flow and cause spurious trips. Thus, the NRC staff finds this departure acceptable because this design change represents an improvement in safety by reducing the probability of spurious scrams that induce unnecessary challenges to the plant and safety systems. SER Subsection 16.4.6.1 evaluates the changes necessitated by this departure to the plant-specific TS.

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

This departure is required because of five primary changes in the I&C architecture:

- Elimination of obsolete data communication technology
- Elimination of unnecessary inadvertent actuation prevention logic and equipment
- Clarification of digital controls nomenclature and systems
- Final selection of platforms (which changed the implementation architecture)
- Testing and surveillance changes for safety system logic and control (SSLC)

In Part 7, "Departures Report," Section 2.1, the applicant describes and evaluates this departure per the requirements in Section VII.A.4 of Appendix A to 10 CFR Part 52. The radiation detectors and monitors and related system components of Section 11.5 are affected by one or more of these reasons, especially in the data communications, platform selection, obsolete equipment and techniques, and human machine interfaces. This Tier 1 departure is evaluated for approval in SER Chapter 7. SER Subsections 16.4.1.1 and 16.4.6.1 evaluate the changes necessitated by this departure to the plant-specific TS. However, it is not clear why the departure was applied to only three subsections. NRC staff issued **RAI 11.05-06 (EPM RAI 2738)** requesting the applicant to clarify this discrepancy. The applicant further clarifies (letter U7-C-STP-NRC-090132, dated September 9, 2009), that the first item listed above, "Elimination of obsolete data communication technology," in part eliminates references to the essential multiplexer system (EMS) and the non-essential multiplexer system (NEMS) and replaces them with more current technology that has separate and independent system level data communication capabilities. NRC staff finds this acceptable because the three FSAR Tier 2 Subsections 11.5.2.2.6, 11.5.2.2.8, and 11.5.2.2.9, specifically use the multiplexer term in a manner that is no longer an accurate description of the radiation monitor data communications. Thus, Departure STD DEP T1 3.4-1 describes and evaluates the changes in these three subsections, which are the only sections in FSAR Section 11.5 to which this departure is appropriately and correctly applied. **RAI 11.5-06 is closed.**

Tier 2 Departures Not Requiring Prior NRC Approval

The applicant's evaluation in accordance with 10 CFR Part 52, Appendix A, Section VIII item B.5 determined that the following departures did not require prior NRC approval. With respect to the impact of these departures on this section, NRC staff found it reasonable that these departures do not require prior NRC approval. The applicant's process for evaluating departures and other changes to the DCD are subject to NRC inspections.

- STD DEP 7.1-1

References to Setpoints and Allowable Values

The purpose of this departure is to clarify in the FSAR that wherever the TS are referenced for setpoints or margins, the correct reference is to the methods for calculating the setpoints and margins, as described in the TS Bases. The applicant's TS for STP Units 3 and 4 include the allowable values in accordance with NUREG-1434, Revision 3. This departure is classified by the applicant as not requiring prior NRC approval. In Part 7, "Departures Report," Chapter 3.0 the applicant describes and evaluates this departure per the requirements of Section VII.B.5 of Appendix A to 10 CFR Part 52. In summary, references to the TS are deleted if they are not necessary or if they need to be replaced with another proper reference. The TS themselves are not being updated or reformatted under this departure.

This departure does not change any Tier 1 and Tier 2*, TS, TS Bases, or operational requirements. The applicant states in Chapter 3 of Part 7 that, in part, the setpoints for high-radiation levels are in accordance with the ODCM.

In FSAR Tier 2, the reference to TS is replaced with a reference to the ODCM in Subsection 11.5.1.2.2. However, in Subsection 11.5.3.4, "Setpoints," the trip setpoints are "based on calculations developed in accordance with controlled plant procedures." NRC staff issued **RAI 11.05-2 (EPM RAI 2702)** requesting the applicant to clarify this apparent discrepancy.

RAI 11.05-2 (EPM RAI 2702) also requested the applicant to clarify another discrepancy. FSAR Section 11.5 identifies STD DEP 7.1-1 as applying to Table 11.5-1, "Process and Effluent Radiation Monitoring Systems." Under the column "Automatic Control Function (ACF) Trip," the applicant uses a clause "Based on setpoint calculation" without a specific link to the ODCM. The applicant's response (letter U7-C-STP-NRC-090132, dated September 9, 2009), to the RAI states that in FSAR Tier 2 Subsection 11.5.3.4, the setpoints that initiate automatic functions are based on calculations developed in accordance with controlled plant procedures or, if pertaining to gaseous or liquid releases within the scope of the ODCM, in accordance with the ODCM. The applicant revised the FSAR text to state that the setpoint procedure for the "ACF Trip" in Table 11.5-1 for the reactor building vent exhaust, the fuel handling area air vent exhaust, and the radwaste liquid discharge is in the "ODCM." The applicant adjusted the departure description for STD DEP 7.1-1 in a similar manner. The staff found that all setpoints requiring ODCM determination were now correctly referenced to the ODCM, and the applicant's response has adequately addressed the staff's concerns. This addresses COL License Information Item 11.3. **This RAI 11.05-2 is a Confirmatory Item.**

- STD DEP 11.5-1

Process and Effluent Radiation Monitoring and Sampling System

This departure includes a number of changes that affect numerous subsections of FSAR Section 11.5. NRC staff discusses each of the subsections below.

Table 11.5-1, Table 11.5-2, and Table 11.5-3 are replaced and Table 11.5-7 is revised.

Chapter 5 of Part 7, "Departures Report," contains tables showing departures and all affected sections, tables, and figures. This departure is classified by the applicant as not requiring prior NRC approval. In Chapter 3 of Part 7, the applicant describes and evaluates this departure per the requirements of Section VII.B.5 of Appendix A to 10 CFR Part 52. In the justification for this departure, the applicant states that the functional requirements set forth in the referenced ABWR DCD will be met, but that the implementation of design and specific equipment is

determined by the vendor. The applicant states in Chapter 3 of Part 7 that the evaluation demonstrates that there is no impact on (1) the probability or consequences of an accident, (2) the malfunction of an SSC important to safety, or (3) the likelihood or consequences of a severe accident. Based on the evaluation of the changes proposed in Departure STD DEP 11.5, the applicant states that prior NRC approval of these changes is not required.

Deletion of references to specific types of detectors

The applicant deletes references to specific types of detectors, such as the digital gamma-sensitive Geiger-Mueller, the ionization chamber, or scintillation detectors. The applicant states that specific types of detectors will be selected based on the state-of-the-art and availability. Furthermore, the referenced ABWR DCD Tier 1 and Tier 2 Table 2.3.1, "Process Radiation Monitoring System," specifies the type of radioactivity that will be monitored in each system.

Combination of radiation monitor downscale (low) trip and the inoperative trip function

The downscale (low) trip and the inoperative trip have been combined into one trip function (downscale/inoperative) because both trips are used for the same purpose: to detect equipment failure. Also, output signals from the radiation monitors will be expressed in units of Sievert rather than in units of Gray. Units of Sievert specifically give the absorbed radiation dose in human tissue, while units of Gray refer to the absorbed radiation dose in any material. An example of obsolete or changing technology is the removal of "recorders" for data recording and trending. This function is now performed by trending software in digital I&C systems.

Deletion of incinerator for burning low-level radwaste

STP Units 3 and 4 will not have an incinerator for burning low-level radwaste. Therefore subsections in FSAR Section 11.5 (i.e., Subsections 11.5.1.1.2, 11.5.2.2.11, 11.5.4.3, 11.5.5.2, and 11.5.5.2) that refer to the incinerator have been modified. Thus, the incinerator stack discharge radiation monitor is not required. References to specific calibration techniques and maintenance procedures such as calibration reproducibility, error precision, and timeliness for maintenance have been removed. These techniques and methods are specific to site procedures that are often controlled by the ODCM or supplied by the equipment vendors.

Elimination of "Warning Alarm" and the "Detector Type" column

The "Warning Alarm" column and the "Detector Type" column were eliminated in replacement Table 11.5-1. Warning alarms are not provided, included, discussed, listed, or just "in the text" of the specific entry for each radiation monitor. The "Warning Alarm" text in DCD Table 11.5-1 is vague. To retain the specific detector types found in DCD Table 11.5-1 could limit selection based on the state-of-the-art and availability. The "Sensitivity" column and the "Type" column are both eliminated in replacement Tables 11.5-2 and 11.5-3. Sensitivities are not included because they are vendor specific.

Correction of the bypass valve closure trip function

To be consistent with the DCD instrument electrical diagram (Figure 7.6-5), the corrected bypass valve closure trip of the offgas post-treatment radiation monitor now states that it is initiated by the High-High Alarm. The High-High Alarm for the gland seal condenser exhaust was added to be consistent with DCD Figure 7.6-5.

Clarification of the location of radiation monitors

In FSAR Subsection 11.5.2.1.5, the departure retains the location of the radiation monitor in the control room for display, recording, and annunciation. In other subsections of Section 11.5, the departure deletes the specific location of the radiation monitor. Both SRP 11.5 and RG 1.206 provide guidance implying that the system description should include the location of equipment. NRC staff issued **RAI 11.05-3 (EPM RAI 2703)** requesting the applicant to provide the location of the radiation monitors and sufficient specific information for the staff to complete the evaluation, with an independent confirmation of compliance with NRC regulations and guidance, or to justify the deletion of the radiation monitor location. The applicant's response (letter U7-C-STP-NRC-090132, dated September 9, 2009), deletes "in the control room" from FSAR Tier 2 Subsection 11.5.2.1.5 and adds a footnote in Table 11.5-1 to clarify that although the radiation monitors are not in the control room, the alarms and indication for these radiation detectors are displayed locally and in the main control room. The staff noted that Table 11.5-1 also provides the location of the radiation detectors. These adjustments resolved the inconsistency. **RAI 11.05-3 is a Confirmatory Item.**

Identification of "main control inoperative room"

Also in Subsection 11.5.2.2.4, the departure adds the statement "These trip outputs are alarmed in the main control inoperative room." NRC staff issued **RAI 11.05-4 (EPM RAI 2705)** requesting the applicant to identify where the "main control inoperative room" is located or to correct the text. The applicant's response (letter U7-C-STP-NRC-090132, dated September 9, 2009), corrects the phrase by deleting the word "inoperative." **RAI-11.05-4 is a Confirmatory Item.**

Radiation effluent monitor calibrations

The applicant also states in STD DEP 11.5-1 in FSAR Subsection 11.5.5.2 that liquid and gaseous radiation process monitors may be calibrated using two methods. The first method uses certified commercial radionuclide sources traceable to the National Institute of Standards and Technology (NIST). The second method analyzes particulate iodine or gaseous grab samples with lab instrumentation. NRC staff finds it acceptable to calibrate radiation process monitors using traceable NIST radionuclide sources, but required additional information regarding the use grab samples with lab instrumentation. Accordingly, the staff issued **RAI 11-05 (EPM RAI 2953)** requesting the applicant to expand or revise FSAR Subsection 11.5.5.2, which discusses the calibration of radiation effluent process monitors.

The applicant's response (letter U7-C-STP-NRC-090132, dated U7-C-STP-NRC-090125, dated September 3, 2009), clarifies the intent to calibrate applicable radiation effluent monitors using applicable liquid or gaseous certified commercial radionuclide sources traceable to NIST. The applicant also states that grab samples are used for periodic in-service calibrations only and may only be used as a check on the calibration of a PRMS. The applicant further specifies that grab samples do not suffice as an actual acceptable regulatory calibration per RGs 1.21 and 4.15 and includes a COL change to this effect. The staff has reviewed this response and has determined that the change made to eliminate the applicants intent to use plant samples and plant analyses as calibrations is acceptable. **RAI 11-05 is a confirmatory item.**

The applicant's response to RAI 11-05 changed the calibration frequency of effluent radiation monitors during plant operations, during a plant shutdown, or during the refueling outage. The applicant changed the wording in the FSAR to state that "Each continuous monitor is calibrated

during plant shutdown or during the refueling outage if the detector is not accessible during power operation.” The STP FSAR stated “plant operation” and not plant shutdown. The staff issued **RAI 11.05-7 (EPM RAI 3751)** requesting the applicant to clarify this change. The applicant has responded has modified section 11.5.5.2 “Calibrations to state that they do not intend to use plant samples for calibrations, and that calibrations of continuous radiation monitors will take place, “during plant operation or during the refueling outage if the detector is not accessible during power operation.” The staff has reviewed this response, and it is acceptable. **RAI 11.05-7 is a confirmatory item.**

Supplemental Information 11.5.7S

Supplemental Information 11.5.7S states that an NRC-approved ODCM exists for the STP Units 1 and 2 nuclear power plant units on the same site. This supplement briefly summarizes the content of the STP Units 1 and 2 ODCM. The applicant states that the ODCM for STP Units 3 and 4 will be integrated into the STP Units 1 and 2 ODCM and will take into account the appropriate differences between the existing and new units. NRC staff issued **RAI 11.05-1 (EPM RAI 3171)** and **RAI 11.05-5 (EPM RAI 2706)** requesting the applicant to provide additional details on the ODCM integration and whether it will be completed before fuel loading. The applicant’s clarification states the intent to maintain a site-wide ODCM and where possible, the ODCM will be aligned with NEI 07-09A, “Generic FSAR Template Guidance for ODCM Program Description,” (Revision 0). Upon further discussion with the staff, the applicant issued a supplemental response (letter U7-C-STP-NRC-090203, dated September 3, 2009), stating that STP Units 3 and 4 will have their own ODCM and will incorporate NEI Template 07-09A relating to BWR plants. The staff determined that because the applicant has committed to use NEI 07-9A, **RAI 11.05-05 is closed. RAI 11.05-1 is a confirmatory item.**

COL License Information Items

- COL License Information Item 11.4 Calculation of Radiation Release Rates

ABWR DCD Tier 2 Section 11.5.6.1, “COL License Information,” states that the COL applicant shall provide the COL license information item that applies on a plant-specific basis. For the STP COL application, this COL license information item is addressed as follows:

DCD COL License Information Item 11.4 states, “The COL applicant shall provide and describe in the operation and maintenance manual the procedures and/or methods for the conversion of the radiation measurements into release rates of gaseous discharge from the main plant stack.”

The applicant states that the ODCM contains the methodology and parameters used to calculate offsite doses resulting from gaseous and liquid effluents. The ODCM includes methods for converting radiation measurements of gaseous discharge from the main plant stack into release rates.

NRC staff found this information acceptable because the guidance in NEI Template 07-9A, “Generic FSAR Template Guidance for ODCM Program Description,” (Revision 0), addresses this issue. The applicant adequately addresses COL License Information Item 11.4.

- COL License Information Item 11.5 Compliance with the Regulatory Shielding Design Basis

ABWR DCD Tier 2 Section 11.5.6.2, "COL License Information," states that the COL applicant shall provide the COL license information item that applies on a plant-specific basis. For the STP COL application, this COL license information item is addressed as follows:

DCD COL License Information Item 11.5 states, "The COL applicant shall describe in the operation and maintenance manual the sampling system design of the SGTS and of the main stack effluent monitoring subsystems and show compliance with the regulatory shielding requirements for low-radiation exposure under accident conditions as stipulated in NUREG-0737, Item II.F.1, clarification 2 of Attachment 2. The requirement for the shielding design will be covered in the equipment design specifications."

The applicant commits (COM 11.5-1) to implement the operation of the sampling system for the SGTS and the operation of the main stack effluent monitoring using operation and maintenance procedures that demonstrate compliance with the regulatory shielding requirements for low-radiation exposure under accident conditions, as stipulated in NUREG-0737, "Clarification of TMI Action Plan Requirements," Item II.F.1, clarification 2 of Attachment 2. The requirement for the shielding design will be covered in the equipment design and procurement specifications.

NRC staff found this commitment acceptable and COL License Information Item 11.5 adequately addressed because these operation and maintenance procedures will be based on recognized and proven quality guidance from NUREG-0737 that can be confirmed by both inspection of the procedures and observation of the system operation and results later by NRC inspections and audits..

- COL License Information Item 11.6 Provisions for Isokinetic Sampling

ABWR DCD Tier 2 Section 11.5.6.3, "COL License Information," states that the COL applicant shall provide the COL license information item that applies on a plant-specific basis. For the STP COL application, this COL license information item is addressed as follows:

DCD COL License Information Item 11.6 states, "The COL applicant shall describe in the operation and maintenance manual the sampling technique used for monitoring and sampling of effluent gases to assure that a representative gas sample is extracted and that the sampling system is capable of maintaining isokinetic conditions within 20 percent of the flow rate during and following an accident as stipulated in NUREG-0737, Item II.F.1, clarification 3 of Attachment 2."

The applicant commits (COM 11.5-2) to develop procedures before fuel loading that include the collection techniques used to extract representative samples of radioactive iodine and particulates under accident conditions. These collecting and sampling procedures require a sampling system that is capable of maintaining isokinetic conditions within 20 percent of the flow rate during and following an accident, as stipulated in NUREG-0737, Item II.F.1, clarification 3 of Attachment 2. These procedures will be developed in accordance with the plant operating procedure development plan in Section 13.5.

The staff found this commitment acceptable because an identifiable time period is specified and these collecting and sampling procedures will be based on recognized and proven quality

guidance from NUREG-0737 that can be confirmed by both inspection of the procedures and observation of the sampling system operation and results later by NRC inspections and audits.

- COL License Information Item 11.7 Sampling of Radioactive Iodine and Particulates

ABWR DCD Tier 2 Section 11.5.6.4, "COL License Information," states that the COL applicant shall provide the COL license information item that applies on a plant-specific basis. For the STP COL application, this COL license information item is addressed as follows:

DCD COL License Information Item 11.7 states, "The COL applicant shall describe in the operation and maintenance manual the collection technique used to extract representative samples of radioactive iodine and particulates during and following an accident. These measurements are used to determine the quantitative releases for dose calculations and assessment (as stipulated in NUREG-0737, Table II.F.1-2)."

The applicant commits (COM 11.5-3) to develop procedures before fuel loading that include the collection technique used to extract representative samples of radioactive iodines and particulates during and following an accident. These measurements are used to determine the quantitative releases for dose calculations and assessments (as stipulated in NUREG-0737, Table II.F.1-2). These procedures will be developed in accordance with the plant operating procedure development plan in Section 13.5.

NRC staff found this commitment acceptable because an identifiable time period is specified and these collecting and sampling procedures will be based on recognized and proven quality guidance from NUREG-0737 that can be confirmed by inspection of the procedures later by NRC inspections. The applicant adequately addresses COL License Information Item 11.7.

- COL License Information Item 11.8 Calibration Frequencies and Techniques

ABWR DCD Tier 2 Section 11.5.6.5, "COL License Information," states that the COL applicant shall provide the COL license information item that applies on a plant-specific basis. For the STP COL application, this COL license information item is addressed as follows:

DCD COL License Information Item 11.8 states, "The COL applicant shall provide in the operation and maintenance manual for the system the calibration frequencies and techniques for the radiation sensors. This information shall be based on vendor data for the equipment."

The applicant commits (COM 11.5-4) to develop procedures before fuel loading that specify the calibration frequencies and techniques for the radiation sensors. This information is to be based on vendor data for the equipment. These procedures will be developed in accordance with the plant operating procedure development plan in Section 13.5.

NRC staff found this commitment acceptable because an identifiable time period is specified and these operation, maintenance, and calibration procedures will be developed in accordance with the plant operating procedure development plan that can be confirmed by inspection of the procedures later by NRC inspections. The applicant adequately addresses COL License Information Item 11.8.

Supplemental Information

Preoperational Tests

In COL FSAR Subsection 14.2.12.1.23, "Process Radiation Monitoring System Preoperational Tests," the applicant states that the PRMS is tested during the Preoperational Test Program. The PRMS equipment will be performance tested to demonstrate conformance with design process capabilities. An integrity test is performed on the system upon completion. NRC staff found that the applicant's statement conforms to the guidance in SRP 14.2.

Inspection, Test, Analysis and Acceptance Criteria

ITAAC are all incorporated by reference with no changes.

11.5.5 Post Combined License Activities

Verification of Compliance with the COM 11.5-1 through COM 11.5-4

The applicant identifies commitments COM 11.5-1 through COM 11.5-4 as addressing COL License Information Items 11.5 through 11.8.

License Condition for the Offsite Dose Calculation Manual before fuel load

NRC staff includes the following two license conditions:

1. "Prior to fuel loading, the licensee shall implement an operational program for process and effluent monitoring and sampling." The program shall include the following subprograms and documents:
 - a. Radiological Effluent Technical Specifications/Standard Radiological Effluent Controls
 - b. Offsite Dose Calculation Manual
 - c. Radiological Environmental Monitoring Program
 - d. Process Control Program
2. The licensee shall submit to the NRC schedule, no later than twelve months after the issuance of the combined operating license that supports planning for the conduct of NRC inspections of the four operating programs and documents listed in the above license condition (number 1). The schedule shall be updated every six months until twelve months before the scheduled fuel loading and every month thereafter until either the four operational programs and documents have been fully implemented or the plant has been placed in commercial service.

11.5.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information related to the Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems. With the exceptions of **Confirmatory Items RAI 11.05-1, 2, 3, 4, 5, and 7**, there is no outstanding information expected to be addressed in the COL FSAR related to this section. As a result of these confirmatory items, the staff is unable to finalize its conclusions related to the SWMS in accordance with the NRC requirements.

