CCNPP3COLA NPEmails

From: Arora, Surinder
Sent: Friday, March 19, 2010 3:19 PM
To: 'Poche, Robert'
Cc: Colaccino, Joseph; CCNPP3COL Resource; Jennings, Jason
Subject: CCNPP Unit 3 - Chapter 12 SER - MAY CONTAIN SENSITIVE PROPRIETARY INFORMATION
Attachments: CCNPP Chapter 12 SER.pdf; CCNPP Chapter 12 UniStar Letter.pdf

Rob,

While the formal hard copy of the transmittal letter and the attached SER is being mailed to you, attached is an advanced copy for your use. Please advise within 10 Calendar days from the date of the letter that the attached SER w/OI's does or does not contain any proprietary or sensitive information.

Thanks.

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12 RADIATION PROTECTION

This chapter describes the staff's review of the radiation protection measures employed by the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3, including estimated radiation exposures to plant personnel. This chapter also provides information on facility and equipment design and programs used to meet the radiation protection standards of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for Protection Against Radiation," to achieve occupational and public radiation exposures that are as low as reasonably achievable. This chapter describes methods for "Ensuring that Occupational Radiation Exposures are As Low As Reasonably Achievable" (Section 12.1); and addresses "Radiation Sources" (Section 12.2); "Radiation Protection Design Features" (Section 12.3); :Dose Assessment" (Section 12.4); and the "Operational Radiation Protection Program" (Section 12.5). Chapter 12 of the CCNPP Unit 3 combined license (COL) final safety analysis report (FSAR) incorporates by reference Chapter 12 of the U.S. EPR FSAR Tier 2 with supplementary information provided in FSAR Sections 12.1.3, "Operational Considerations"; 12.2.1.13, "Miscellaneous Sources"; 12.3.4.5, "Implementation of Regulatory Guidance"; 12.3.5.1, "Overall Plant Doses"; and 12.5. The staff's review confirmed that there is no additional, supplemental, or outstanding information, outside of the U.S. EPR FSAR, that is related to the other sections in Chapter 12.

12.1 Ensuring that Occupational Radiation Exposures are As Low As Reasonably Achievable (ALARA)

12.1.1 Introduction

ALARA (acronym for "as low as is reasonably achievable") means making every reasonable effort to maintain exposures to radiation as far as practicable below the dose limits of 10 CFR Part 20. This includes taking into account the state of technology and the economics of improvements in relation to benefits to the public health and safety. It also includes using procedures and engineering controls based upon sound radiation protection principles.

12.1.2 Summary of Application

FSAR Section 12.1 incorporates by reference U.S. EPR FSAR Tier 2, Section 12.1, "Ensuring that Occupational Radiation Exposures are As Low As Reasonably Achievable."

In addition, in FSAR Section 12.1, the applicant provided the following:

Combined License Information Items:

The applicant provided additional information in Section 12.1.3 to address COL Information Item 12.1-1 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 fully describe, at a functional level, elements of the ALARA program for ensuring that occupational radiation exposures are ALARA. This program will conform with provisions of 10 CFR Part 20 and be consistent with the guidance in Regulatory Guide (RG) 1.8, "Qualification and Training of Personnel for Nuclear Power Plants," RG 8.2, "Guide for Administrative Practices in Radiation Monitoring," RG 8.7, "Instructions for Recording and Reporting Occupational Radiation Exposure Data," RG 8.8, "Information Relevant to Ensuring that Occupational

Radiation Exposures at Nuclear Power Stations Will Be as Low as Is Reasonably Achievable," RG 8.9, "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program," RG 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as Is Reasonably Achievable," RG 8.13, "Instruction Concerning Prenatal Radiation Exposure," RG 8.15, "Acceptable Programs for Respiratory Protection," RG 8.27, "Radiation Protection Training for Personnel at Light-Water-Cooled Nuclear Power Plants," RG 8.28, "Audible-Alarm Dosimeters," RG 8.29, "Instruction Concerning Risks from Occupational Radiation Exposure," RG 8.34, "Monitoring Criteria and Methods To Calculate Occupational Radiation Doses," RG 8.35, "Planned Special Exposures," RG 8.36, "Radiation Dose to the Embryo/Fetus," RG 8.38, "Control of Access to High and Very High Radiation Areas of Nuclear Plants," and the applicable portions of NUREG-1736, "Consolidated Guidance: 10 CFR Part 20 - Standards for Protection Against Radiation."

In response to this item, the COL applicant incorporates by reference (IBR) Nuclear Energy Institute (NEI) 07-08, Revision 3, "Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures Are As Low As Is Reasonably Achievable (ALARA)." The applicant also incorporated by reference Nuclear Energy Institute (NEI) 07-03, Revision 7, "Generic FSAR Template Guidance for Radiation Protection Program Description."

The referenced NEI documents provide generic program descriptions for use in developing Combined License applications. Operational policies, regulatory compliance, and operational considerations are addressed.

12.1.3 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 and within the safety evaluation reports (SERs) related to NEI Templates 07-03A and 07-08A.

In addition, the relevant requirements of the U.S. Nuclear Regulatory Commission (NRC) regulations for the supplemental information related to ALARA, and the associated acceptance criteria, are given in Section 12.1, "Assuring that Occupational Radiation Exposures Are As Low As Is Reasonably Achievable," of 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).

The applicable regulatory requirements for the supplemental ALARA information are as follows:

1. 10 CFR 19.12, "Instructions to Workers," as it relates to keeping workers who receive occupational radiation exposure informed as to the storage, transfer, or use of radioactive materials or radiation in such areas, and instructed as to the risk associated with occupational radiation exposure, precautions and procedures to reduce exposures, and the purpose and function of protective devices employed.

2. 10 CFR 20.1101, "Radiation Protection Programs," and the definition of ALARA in 10 CFR 20.1003, "Definitions," as they relate to those measures that ensure that radiation exposures resulting from licensed activities are below specified limits and ALARA.

The related acceptance criteria are as follows:

1. RG 1.8, “Qualification and Training of Personnel for Nuclear Power Plants,” as it relates to the qualifications and training of radiation protection personnel.

2. RG 8.8, “Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as Is Reasonably Achievable,” as it relates to providing radiation protection information to ensure that occupational radiation exposure is kept as low as reasonably achievable.

3. RG 8.10, “Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as Is Reasonably Achievable,” as it relates to commitment by the applicant’s management and vigilance by the radiation protection manager and the radiation protection staff to maintain occupational radiation exposure as low as reasonably achievable.

4. RG 8.27, “Radiation Protection Training for Personnel at Light-Water-Cooled Nuclear Power Plants,” as it relates to instructing personnel involved in licensed activities regarding their role and responsibilities for making every reasonable effort to maintain radiation exposures as low as reasonably achievable.

5. NUREG-1736, “Consolidated Guidance: 10 CFR Part 20 − Standards for Protection Against Radiation,” as it relates to the requirements for a radiation protection program to maintain doses as low as reasonably achievable.

12.1.4 Technical Evaluation

The staff reviewed FSAR Section 12.1 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 FSAR represents the complete scope of information relating to this review topic. The staff’s review confirmed that the information contained in the application and incorporated by reference addresses the required information relating to this section. U.S. EPR FSAR Tier 2, Section 12.1 is being reviewed by the staff under Docket No. 52-020. The staff’s technical evaluation of the information incorporated by reference related to ensuring that occupational radiation exposures are ALARA will be documented in the staff SER on the design certification application for the U.S. EPR.

The staff reviewed the information contained the FSAR:

Combined License Information Items:

The staff reviewed COL Information Item 12.1-1 from U.S. EPR FSAR Tier 2, Table 1.8-2 included under FSAR Section 12.1.3.

COL Information Item 12.1-1 states:

> The COL applicant that references the U.S. EPR design certification will fully describe, at a functional level, elements of the ALARA program for ensuring that occupational radiation exposures are ALARA. This program will comply with provisions of 10 CFR Part 20 and be consistent with the guidance in RGs 1.8, 8.2, 8.7, 8.8, 8.9, 8.10, 8.13, 8.15, 8.27, 8.28, 8.29, 8.34, 8.35, 8.36, 8.38, and the applicable portions of NUREG-1736.

In response to this item, the COL applicant incorporates by reference NEI 07-08, Revision 3, "Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures Are As Low As Is Reasonably Achievable (ALARA)." The applicant also incorporated by reference NEI 07-03, Revision 7, "Generic FSAR Template Guidance for Radiation Protection Program Description."

The referenced NEI documents provide generic program descriptions for use in developing COL applications. The ALARA program, as well as Radiation Protection Program management policies, organization, facilities, equipment, and procedures are addressed.

Staff has issued RAI 147 Question 12.01-4 requesting the applicant to revise the FSAR to incorporate by reference the NRC-accepted versions of the above templates, specifically NEI 07-08A, Revision 0, and NEI 07-03A, Revision 0. In a October 14, 2009, response, the applicant stated that the FSAR would be revised to incorporate by reference NEI 07-03A, Revision 0, and that once NEI 07-08A, Revision 0, was published, the FSAR would also be revised to incorporate by reference NEI 07-08A. **RAI 147, Question 12.01-4, which is associated with the above request, is being tracked as a confirmatory item.**

NEI 07-08A states that company and station policies are to keep all radiation exposure of personnel within limits defined by 10 CFR Part 20. The ALARA policy conforms to and will be implemented in accordance with the ALARA provisions of the guidance in RGs 8.8 and 8.10. As stated in FSAR Section 13.1, "Organizational Structure of Applicant," specific individuals will be assigned responsibility and authority for implementing ALARA policy at CCNPP Unit 3. All station personnel will be responsible for ALARA. Individual workers are responsible for conforming with ALARA requirements, which are presented in worker training in accordance with the training requirements contained in 10 CFR 19.12. The extent of worker training provided will be commensurate with the worker's job responsibilities.

By referencing NEI 07-08A, the applicant commits to ALARA policies and practices which will comply with the applicable regulations in 10 CFR Part 20 and conform to the guidance found in RG 1.8; RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)"; RG 8.2; RG 8.7; RG 8.8; RG 8.9,; RG 8.10; RG 8.13, "Instruction Concerning Prenatal Radiation Exposure"; RG 8.15; RG 8.27; RG 8.28; RG 8.29; RG 8.34; RG 8.35; RG 8.36; RG 8.38, "Control of Access to High and Very High Radiation Areas of Nuclear Plants"; and the applicable portions of NUREG-1736.

In addition, NEI 07-08A describes an ALARA program based on mature programs in use at other operating commercial nuclear facilities and incorporating lessons learned from plant operating experience. Industry operating experience is regularly reviewed and applicable exposure control technique lessons learned are incorporated into plans, procedures, and policies. These plans and procedures are developed in accordance with the guidance in RG 1.8, RG 8.8, and RG 8.10.

Overall facility operations, as well as the radiation protection program, integrate the procedures necessary to ensure that radiation doses are ALARA. The radiation protection procedures, which are described in FSAR Sections 12.1 and 12.5, are developed in accordance with the standards described in FSAR Sections 13.5, "Plant Procedures," and 17.5, "Quality Assurance Program Guidance," and meet the applicable requirements of 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations," 10 CFR Part 20, 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," 10 CFR Part 70,

"Domestic Licensing of Special Nuclear Material," and 10 CFR Part 71, "Packaging and Transportation of Radioactive Material." Examples of some of the ALARA work practices incorporated in these procedures, and described in NEI 07-08A include: Use of appropriate dosimetry to record personnel doses, use of pre-job briefs and post-jobs debriefs to ascertain lessons-learned, use of dry-run training and mockups to improve worker efficiency for complex jobs in high radiation areas, use of protective clothing, respiratory equipment and special ventilation systems for work in contaminated environments, use of remote monitoring of personnel to reduce worker exposures, the establishment of low dose "waiting areas," and the use of permanent or temporary shielding to reduce worker exposure at the work site.

However, because the ALARA radiation protection procedures are described in NEI Template 07-03 the staff requested in RAI 89, Question 12.01-2, that the applicant update FSAR Section 12.1 to reference NEI 07-03 in addition to NEI 07-08, or to provide an alternative description of ALARA radiation protection procedures. In addition, FSAR Section 12.1 does not address the implementation of the ALARA program procedures. Therefore, in follow-up RAI 147, Question 12.01-5, the staff requested that the applicant incorporate implementation of an ALARA program into the Radiation Protection Program milestones outlined in FSAR Table 13.4-1, "Operational Programs Required by NRC Regulations and Program Implementation," of the FSAR such that compliance with 10 CFR 20.1101 and 10 CFR 19.12 is demonstrated. In their April 23, 2009, and October 14, 2009, responses to RAI 89, Question 12.01-2 and RAI 147, Question 12.01-5, the applicant proposed revising FSAR Section 12. to incorporate by reference NEI 07-03, Revision 7, in addition to NEI 07-08, Revision 3 (at the time of the applicant's response, the NRC accepted versions of the templates had not been published). The applicant also provided a FSAR markup revising the Radiation Protection Program entry in FSAR Table 13.4-1 to reference FSAR Section 12.1 and clarifying the wording in FSAR Table 13.4-1 to state that the applicable elements of the radiation protection program necessary to support each stage of construction and operation will be implemented at each milestone. The staff confirmed that Revision 6 of the FSAR, dated September 30, 2009, contains the changes committed to in response to RAI 89, Question 12.01-2. Accordingly, the staff determines that the applicant has adequately addressed this issue and, therefore, the staff considers RAI 89, Question 12.01-2 resolved. However, the addition of FSAR Section 12.1 as a reference in FSAR Table 13.4-1 as provided for in the response to RAI 147, Question 12.01-5 is being tracked as a confirmatory item and will be evaluated when the next revision of the FSAR is submitted to the NRC. **RAI 147, Question 12.01-5, which is associated with the above request, is being tracked as a confirmatory item.**

Therefore the staff considers the resolution of COL Information Item 12.01-1, regarding ALARA operational considerations, to be confirmatory subject to staff verification of the COL revision incorporating by reference the NRC accepted version of the NEI templates as well as a revised FSAR Table 13.4-1

12.1.5 Post Combined License Activities

There are no post COL activities related to this section.

12.1.6 Conclusions

The staff reviewed the application and checked the referenced U.S. EPR FSAR. The staff's review confirmed that the applicant addressed the required information relating to ensuring that

occupational radiation exposures are ALARA and, pending the satisfactory resolution of the above confirmatory items, there is no outstanding information expected to be addressed in the FSAR related to this section.

The staff reviewed the information in the U.S EPR FSAR Tier 2, Chapter 12 on Docket No. 52-020. The results of the staff's technical evaluation of the information related to ensuring that occupational radiation exposures are ALARA incorporated by reference in the FSAR has been documented in the staff SER on the design certification application for the U.S. EPR. The SER on the U.S. EPR FSAR is not yet complete. **RAI 22, Question 01-5 is being tracked as an open item** as part of this Chapter. The staff will update Chapter 12 of this report to reflect the final disposition of the design certification application.

The staff used the acceptance criteria defined in NUREG-0800, Section 12.1 to evaluate the applicant's responses as to how they plan to resolve the U.S. EPR FSAR COL information item involving operational considerations. The staff evaluated the supplemental information the applicant provided in this section to address the ALARA program at the site. The applicant stated that this supplemental information is provided in NEI Templates 07-08 and 07-03. These templates describe an ALARA program which meets the ALARA provisions of 10 CFR 20.1101(b), the training requirements of 10 CFR 19.12, and the guidance provided in RGs 8.8 and 8.10. [FSAR Section 13.4, "Operational Program Implementation," presents the milestones, as license conditions, for the implementation of the Radiation Protection Program (Operational Program No. 10), which will encompass the site's ALARA program, once confirmatory item RAI 22 Question 12.01-5 is resolved and FSAR Table 13.4-1 is revised to reference FSAR Section 12.1 in addition to Section 12.5. Therefore, the applicant's ALARA program description, implemented in accordance with the Radiation Protection Program milestones described in FSAR Table 13.4-1 meets the acceptance criteria guidance defined in NUREG-0800, Section 12.1. Accordingly, the staff determined that the information contained in these templates adequately addresses an acceptable ALARA program. However, since the COL has not been revised to reference the NRC accepted versions of NEI 07-08 and NEI 07-03, the staff considers the resolution of COL Information Item 12.1-1, regarding operational considerations, to be confirmatory, and subject to staff verification of the FSAR revision incorporating the NRC-accepted templates NEI 07-08A and NEI 07-03A. **RAI 147, Question 12.01-4, which is associated with the above request, is being tracked as a confirmatory item and will be evaluated when the next revision of the FSAR is submitted to the NRC.**

12.2 Radiation Sources

12.2.1 Introduction

The determination of projected radiation sources during normal operations, anticipated operational occurrences, and accident conditions in the plant, is used as the basis for designing the radiation protection program and for shield design calculations. This includes definition of isotopic composition, location in the plant, source strength, and source geometry. In addition, the airborne radioactive material sources in the plant are considered in the design of the ventilation systems and used for the design of personnel protective measures and for dose assessment.

12.2.2 Summary of Application

FSAR Section 12.2 incorporates by reference U.S. EPR FSAR Tier 2, Section 12.2, “Radiation Sources.”

In addition, in FSAR Section 12.2, the applicant provided the following:

Combined License Information Items:

The applicant provided additional information in FSAR Section 12.2.1.13 to address COL Information Item 12.2-1 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 site-specific information for required radiation sources containing byproduct, source, and special nuclear material that may warrant shielding design considerations. This site-specific information will include a listing of isotope, quantity, form, and use of all sources in this latter category that exceed 100 millicuries.

In response to this item, the COL applicant has provided a table of radiation sources in COL FSAR Section 12.2.1.13. This includes radiation sources used for startup and for calibration.

12.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed within the FSER related to the U.S. EPR FSAR.

In addition, the relevant requirements of NRC regulations for the miscellaneous radiation sources, and the associated acceptance criteria, are given in NUREG-0800, Section 12.2, “Radiation Sources.”

The applicable regulatory requirements for radiation sources are as follows:

1. 10 CFR 20.1101(b) and the definition of ALARA in 10 CFR 20.1003, as they relate to persons involved in licensed activities making every reasonable effort to maintain radiation exposures ALARA.

2. 10 CFR 20.1801, “Security of Stored Material,” as it relates to securing licensed materials against unauthorized removal.

3. 10 CFR 20.1501, “General,” as it relates to the performance of surveys to comply with the regulations in 10 CFR Part 20.

4. 10 CFR 20.2207, “Reports of Transactions Involving Nationally Tracked Sources,” as it relates to ensuring that each nationally tracked source submits a National Source Tracking Transaction Report.

12.2.4 Technical Evaluation

The staff reviewed FSAR Section 12.2 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 FSAR represents the complete scope of information relating to this review topic. The staff’s

review confirmed that the information contained in the application and incorporated by reference addresses the required information relating to this section. U.S. EPR FSAR Tier 2, Section 12.2 is being reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the information incorporated by reference related to radiation sources is 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 FSAR:

Combined License Information Items:

The staff reviewed COL Information Item 12.2-1 from U.S. EPR FSAR Tier 2, Table 1.8-2 included under FSAR Section 12.2.1.13.

COL Information Item 12.2-1 states:

> The COL applicant that references the U.S. EPR design certification will provide site specific information for required radiation sources containing byproduct, source, and special nuclear material that may warrant shielding design considerations. This site-specific information will include a listing of isotope, quantity, form, and use of all sources in this latter category that exceed 100 millicuries.

RG 1.206 states that the applicant should describe any required radiation sources containing byproduct, source, and special nuclear material that may warrant shielding considerations, and, for any such sources, should provide a listing by isotope, quantity, form, and use for all of these sources that exceed 3.7 E+9 Bq (100 millicuries). This information allows the staff to conclude with reasonable assurance that the physical characteristics and access controls associated with the site-specific contained sources meet the requirements of 10 CFR 20.1101, 10 CFR 20.1801 and 10 CFR 20.2207.

The staff initially determined that the application did not identify the location, source geometry, and basis for the values in the source table meant to address COL Information Item 12.2-1 per the guidance contained in RG 1.206. The procedures and controls that would govern the use and control of these sealed sources, such that the requirements of 10 CFR 20.1801 would be met, were also not discussed by the applicant. Therefore, in RAI 119, Question 12.02-2, the staff requested that the applicant provide a more complete description of site-specific sources and describe the procedures and controls used to comply with the requirements of 10 CFR 20.1801.

The staff also recognized that a neutron calibration source was not given in the applicant's source table and that no additional information was provided. Therefore, in RAI 108, Question 12.02-1, the staff requested that the applicant explain how it planned to calibrate neutron instrumentation in order to meet the requirements of 10 CFR 20.1501.

In May 20, 2009, and July 13, 2009, responses to RAI 108, Questions 12.02-1 and RAI 119, Question 12.02-2, the applicant provided a revised table, located in FSAR Section 12.2.1.13, which addressed the issues identified above. The revised table lists the geometry and location of each source, as well as adding an additional neutron calibration source which the applicant states will be used to calibrate onsite neutron instrumentation. The basis for selecting the source quantities or source strengths is described in footnotes at the bottom of the table. The staff confirmed that Revision 6 of the FSAR, dated September 30, 2009, contains the changes committed to in the RAI responses. Accordingly, the staff finds that the applicant has

adequately addressed these issues and, therefore, the staff considers RAI 108, Question 12.02-1 and RAI 119, Question 12.02-2 Part (a) resolved.

To demonstrate compliance with 10 CFR 20.1801, the applicant stated that NEI 07-03A provided additional information on the procedures and controls that will be used to secure contained sources from unauthorized removal or access. In addition, 10 CFR 20.2207 requires that each licensee who receives a nationally tracked source must complete and submit a National Source Tracking Transaction Report. Only the 400 Curie Cs-137 source triggers this requirement and, therefore, the applicant stated that a report would be submitted to the NRC no later than the next business day after the transaction to procure the source had occurred. The staff confirmed that NEI 07-03A did state that applicants would establish, implement, and maintain procedures and facilities to assure positive control over licensed radioactive material possessed under the applicant's license. In addition, the staff confirmed that U.S. EPR FSAR Tier 2, Section 12.3.1.6, "Access Building," and U.S. EPR FSAR Tier 2, Figure 12.3-16 (which the FSAR incorporates by reference), "[[Access Building at +0 Ft Elevation Radiation Zones]]," describes a radioactive source storage room sufficient to control access and secure sources, in accordance with 10 CFR 20.1801. The staff determined that the applicant's commitment to develop and implement procedures and facilities, as described in NEI 07-03A and U.S. EPR FSAR Tier 2, Section 12.3.1.6, acceptable for demonstrating adequate control of licensed radioactive material in accordance with the applicable portions of 10 CFR Parts 19, 20, 50, 70, and 71. Therefore, the staff considers RAI 119, Question 12.02-2 Part (b) resolved.

Because the resolution of the COL item 12.2-1 is dependant on the incorporation by reference of NEI 07-03A, the staff considers the resolution of COL information Item 12.1-1, regarding site specific sources, to be confirmatory subject to staff verification of the COL revision incorporating by reference NEI 07-03A, revision 0. **RAI 147, Question 12.01-4, which is associated with the above request, is being tracked as a confirmatory item.**

12.2.5 Post Combined License Activities

There are no post COL activities related to this section.

12.2.6 Conclusions

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

In addition, the staff concludes that the relevant information presented within the FSAR is acceptable and meets the requirements of 10 CFR 20.1101(b), 10 CFR 20.1801, 10 CFR 20.2207 and 10 CFR 20.1501. The staff based its conclusion on the following:

In this section, the staff used the acceptance criteria defined in NUREG-0800, Section 12.2 to evaluate the applicant's response as to how they plan to resolve the U.S. EPR FSAR COL information item describing other contained sources. RG 1.206 states that the COL applicant should specify the physical characteristics and associated access controls for any site-specific contained radioactive sources that may warrant additional shielding design consideration, such that NRC staff can conclude with reasonable assurance that the ALARA, access control and reporting requirements of 10 CFR 20.1101, 10 CFR 20.1801 and 10 CFR 20.2207 are met. In a

May 20, 2009, response to RAI 108, Question 12.02-1 and RAI 119, Question 12.02-2, the applicant specified additional detail related to site-specific calibration, primary start-up and secondary sources including that they would be secured and documented in accordance with 10 CFR 20.1801 and 10 CFR 20.2207. In addition, a neutron calibration source was added to FSAR Section 12.2 to address onsite calibration of neutron detectors. The staff concluded that the applicant had adequately responded to this U.S. EPR FSAR COL information item by providing a description of those site-specific sources which were not described in the U.S. EPR FSAR. However, since the FSAR has not been revised to reference the NRC-accepted NEI 07-03A, the staff considers the resolution of COL Information Item 12.2-1, regarding site specific sources, to be confirmatory, and subject to staff verification of the FSAR revision incorporating the NRC-accepted template NEI 07-03A. **RAI 147, Question 12.01-4, which is associated with the above request, is being tracked as a confirmatory item and will be evaluated when the next revision of the FSAR is submitted to the NRC.**

12.3 Radiation Protection Design Features

This section documents the staff's review of FSAR Sections 12.3 and 12.4, because NUREG-0800, Section 12.3-12.4, "Radiation Protection Design Features," is written to cover both sections. [Note that U.S. EPR FSAR Tier 2, Section 12.4, "Dose Assessment," which is incorporated by reference into the FSAR with no departures or supplements, refers to U.S. EPR FSAR Tier 2, Section 12.3.5, "Dose Assessment," for a description of the dose assessment.]

12.3.1 Introduction

This section focuses on radiation protection design features, including the equipment used for assuring that occupational radiation exposures will be as low as reasonably achievable. Dose rates during normal operation, anticipated operational occurrences, and accident conditions are considered. Radiation zones are defined for various modes of plant operation. Design features to control personnel radiation exposures include the physical layout of equipment, shielding and barriers to high radiation areas, and fixed area radiation and continuous airborne radioactivity monitoring instrumentation, including instrumentation for accident conditions. The estimated annual personnel doses associated with major functions, such as operation, handling of radioactive waste, normal maintenance, special maintenance (e.g., steam generator tube plugging), refueling, and inservice inspection provide a measure of the effectiveness of the proposed design features.

12.3.2 Summary of Application

FSAR Section 12.3 incorporates by reference U.S. EPR FSAR Tier 2, Section 12.3.

In addition, in FSAR Sections 12.3.4.5 and 12.3.5.1, the applicant provided the following:

Combined License Information Items:

The applicant provided additional information in FSAR Section 12.3.4.5 to address COL Information Items 12.3-1 and 12.3.3 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 on the extent to which the guidance provided by RGs 1.21, 1.97, 8.2, 8.8, and

American National Standards Institute/Health Physics Society ANSI/HPS-N13.1-1999 is employed in sampling, recording, and reporting airborne releases of radioactivity.

A COL applicant that references the U.S. EPR design certification will describe the use of portable instruments, and the associated training and procedures, to accurately determine the airborne iodine concentration within the facility where plant personnel may be present during an accident, in accordance with requirements of 10 CFR 50.34(f)(2)(xxvii) and the criteria in Item III.D.3.3 of NUREG-0737. The procedures for locating suspected high-activity areas will be described.

In response to these items, the COL applicant describes the typical frequencies and types of surveys during normal operation that would detect unusual radiation levels. These include job coverage surveys, area radiation surveys, contamination surveys, and airborne radioactivity surveys. An in-plant radiation monitoring program provides the capability to accurately determine airborne iodine concentrations in areas within the facility where personnel may be present under accident conditions. A portable monitoring system is used to determine the airborne iodine concentration in areas where plant personnel may be present during an accident.

The applicant provided additional information in FSAR Section 12.3.5.1 to address COL Information Item 12.3-2 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 provide site-specific information on estimated annual doses to construction workers in a new unit construction area as a result of radiation from onsite radiation sources from the existing operating plant(s). This information will include bases, models, assumptions, and input parameters associated with these annual doses.

In response to this item, the COL applicant provides an analysis of the estimated exposure of construction workers to radiation. During the construction of Unit 3 at the Calvert Cliffs site, construction workers will be exposed to radiation sources from the routine operation of Units 1 and 2. The four main sources of radiation to Unit 3 construction workers are gaseous effluents, liquid effluents, the independent spent fuel storage installation (ISFSI), and the interim resin storage area. For an occupational year (including overtime), estimated at 2,200 hours onsite, the maximum dose would be on the road by the ISFSI or the resin storage area. The maximum dose is calculated to be 390 millisievert (39 mrem) for the occupational year and less than 0.02 millisievert (2 mrem) in any one hour. The applicant estimates the total worker collective dose for the combined years of construction to be 0.171 person-Sievert (17.1 person-rem).

12.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed within the FSER related to the U.S. EPR FSAR.

In addition, the relevant requirements of the NRC regulations for the radiation protection design features, and the associated acceptance criteria, are given in NUREG-0800, Section 12.3-12.4.

The applicable regulatory requirements for radiation protection design features are as follows:

1. The requirements associated with monitoring of radioactivity under normal conditions are principally:

- 10 CFR 20.1101(b) and the definition of ALARA in 10 CFR 20.1003, as they relate to persons involved in licensed activities making every reasonable effort to maintain radiation exposures ALARA.

- 10 CFR 20.1301, "Dose Limits for Individual Members of the Public," and 10 CFR 20.1302, "Compliance with Dose Limits for Individual Members of the Public," as they relate to public dose limits for adults.

- 10 CFR 20.1501 and 1502, "Conditions Requiring Individual Monitoring of External and Internal Occupational Dose," as they relate to the performance of surveys to comply with the regulations in 10 CFR Part 20.

- 10 CFR 20.1406, "Minimization of Contamination," as it relates to the facility design and procedures for operation of the plant for minimizing contamination of the facility site.

The related acceptance criteria are as follows:

- RG 1.69, "Concrete Radiation Shields and Generic Shield Testing for Nuclear Power Plants," as it relates to occupational radiation protection shielding structures for nuclear power plants.

- RG 8.10, as it relates to the commitment by management and vigilance by the radiation protection manager and staff to maintain occupational radiation exposures ALARA.

- RG 4.21, "Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning," as it relates to a design and operational philosophy for minimizing contamination of the facility and environment, facilitating decommissioning and minimizing waste generation.

2. The requirements associated with monitoring of radioactivity under accident conditions are principally:

   - 10 CFR 20.1201, as it relates to occupational dose limits for adults.

   - 10 CFR 50.34(f)(2)(xxvii), "Contents of applications; technical information," as it relates to assessing the radiation hazard in areas that may be accessed during the course of an accident.

   The related acceptance criteria are as follows:

   - RG 8.8, as it relates to actions taken during facility design, engineering, construction, operation, and decommissioning to maintain occupational radiation exposures ALARA.

   - NUREG-0737, Item III.D.3.3, "Clarification of TMI Action Plan Requirements," as it relates to accurately determining the airborne radioiodine concentrations in areas that may need to be accessed during the course of an accident.

   - RG 1.97, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants," Revision 4, and Branch Technical Paper (BTP) 7-10, "Guidance on Application of Regulatory Guide 1.97," as they relate to instrumentation for radiation monitoring following an accident.

3. The requirements associated with personnel access control facilities are:

   - 10 CFR 20.1101(a) as it relates to the development and implementation of a radiation protection program sufficient to ensure compliance with the provisions of 10 CFR Part 20.

   - 10 CFR 52.79(d) as it relates to COL applicants providing sufficient information to demonstrate that the characteristics of the site fall within the site parameters specified in the design certification.

   The related acceptance criteria are as follows:

   - RG 8.8, as it relates to radiation protection support facilities.

   - RG 1.206, as it relates to the site and plant design interfaces and conceptual design information that COL applicants must address when referencing certified designs.

12.3.4 Technical Evaluation

The staff reviewed FSAR Section 12.3 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 FSAR represents the complete scope of information relating to this review topic. The staff's review confirmed that the information contained in the application and incorporated by reference addresses the required information relating to this section. U.S. EPR FSAR Tier 2, Section 12.3 is being reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the information incorporated by reference related to radiation protection design features is documented in the staff safety evaluation report on the design certification application for the U.S. EPR.

The staff reviewed the information contained in FSAR Sections 12.3.4.5 and 12.3.5.1:

Combined License Information Items:

The staff reviewed COL Information Items 12.3-1 and 12.3-3 from U.S. EPR FSAR Tier 2, Table 1.8-2 included under FSAR Section 12.3.4.5.

COL Information Items 12.3-1 and 12.3-3 state:

> A COL applicant that references the U.S. EPR design certification will provide site-specific information on the extent to which the guidance provided by RG 1.21, 1.97, 8.2, 8.8, and [American National Standards Institute/ Health Physics Society] (ANSI/HPS)-N13.1-1999 is employed in sampling, recording, and reporting airborne releases of radioactivity.
>
> A COL applicant that references the U.S. EPR design certification will describe the use of portable instruments, and the associated training and procedures, to accurately determine the airborne iodine concentration within the facility where plant personnel may be present during an accident, in accordance with requirements of 10 CFR 50.34(f)(2)(xxvii) and the criteria in NUREG-0737, Item III.D.3.3. The procedures for locating suspected high-activity areas will be described.

The staff reviewed FSAR Section 12.3.4.5 in regard to airborne radiation monitoring operational considerations included in FSAR Section 12.3.4, "Area Radiation and Airborne Radioactivity Monitoring Instrumentation." The COL applicant stated that the guidance in RGs 1.21, "Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste," Appendix A, "Tables"; 1.97; 8.2; 8.8; and ANSI/HPS-N13.1-1999, will be used to develop procedural criteria and methods for obtaining representative measurements of radiological conditions, including airborne radioactivity concentrations. This conforms to NUREG-0800, Section 12.3, and is therefore acceptable.

The COL applicant described responsibilities and typical performance criteria for several types of surveys, including job coverage surveys, radiation surveys, contamination surveys, and airborne radioactivity surveys. The performance criteria cover such topics as types and frequency of surveys, and the use of appropriate equipment.

The Radiation Protection Manager or his designee will determine surveillance requirements, as well as survey frequencies based on the need to identify and control radiation, contamination, and airborne radioactivity and the actual or potential radiological conditions encountered by personnel. This conforms to RG 8.10, and is therefore acceptable.

Radiation, contamination, and/or airborne surveys will be performed and documented with sufficient detail and frequency to fully assess the radiological hazard, including the assessment of potentially changing radiological hazards that may be present for the work being conducted. Situations in which airborne surveys will be performed are described in detail in FSAR Section 12.3.4.5 and include provisions for monitoring airborne radioactivity during any work or operation in the radiological controlled area (RCA) where airborne radioactivity is a possibility, and where respiratory protection or engineering controls are being used to prevent intakes. Daily airborne radioactivity surveys will be performed where the potential for such radioactivity exists (including containment), where it is necessary to assess airborne radioactivity after a significant radioactive spill or spread of contamination, and before initial entry (and periodically thereafter) of areas potentially containing airborne radioactivity.

The applicant will provide portable continuous air monitors (CAMs) to monitor airborne concentrations in areas where radioactivity levels could fluctuate and early detection would minimize worker exposure. Air samplers will be placed with consideration of the air flow patterns in the facility. Counting equipment will be selected based on the sample type and the radionuclides suspected of being in the sample. Those samples which indicate a level of activity greater than a radiation protection procedure specified level will be forwarded to the appropriate personnel for isotopic analysis.

FSAR Section 12.3.4.5 states that survey results will be documented and processed per site document control and records procedures and will conform to RG 8.2. Radiation protection personnel will assess survey documentation to evaluate the adequacy and appropriateness of the surveys and associated record, as well as the presence of any adverse trends. Survey documentation will be used to update room and area postings, as well as any barricades that may be present.

In conformance with NUREG-0737, Item III.D.3.3, the applicant's portable post-accident iodine monitors will use either a silver zeolite or charcoal iodine sample cartridge and a single channel analyzer sufficient to determine the airborne iodine concentrations in areas which must be accessed post-accident. The use of these monitors will be incorporated into the emergency plan implementing procedures, while an in-plant radiation monitoring program will train

personnel, implement procedures for monitoring, and maintain the portable iodine sampling and analysis equipment in conformance with the guidance in RG 1.21, Appendix A; RG 8.8; and NUREG-0737, Item III.D.3.3.

In addition, the applicant incorporated by reference the information contained in NEI template 07-03A. This document describes a radiation protection program which adheres to the guidance in RGs 8.2 and 8.8 and specifies that an adequate number of airborne radioactivity monitors will be available for monitoring and to perform surveys in accordance with the requirements of 10 CFR 20.1501 and 10 CFR 20.1502. The template also describes training and personnel qualifications necessary to perform surveys.

The staff determined that the information in NEI 07-03A, together with the applicant's objectives and criteria for radiation, contamination, and/or airborne surveys described above, demonstrate compliance with those portions of 10 CFR Part 20, as well as conformance with those portions of RG 1.21, Appendix A; RG 1.97; RG 8.2; RG 8.8; ANSI/HPS-N13.1-1999; and NUREG-0737, Item III.D.3.3, that are related to the performance and recording of radiation and airborne radioactivity surveys and monitoring, and are therefore acceptable. However, the COL application has not yet been revised to reference the NRC-accepted version of NEI 07-03, NEI 07-03A. Therefore, the staff considers the resolution of U.S. EPR FSAR COL Information Items 12.3-1 and 12.3-3 to be confirmatory subject to verification of the applicant's submittal to the NRC of a revised COL application referencing the NRC-accepted NEI Template 07-03A. **RAI 147, Question 12.01-4, which is associated with the above request, is being tracked as a confirmatory item.**

The staff reviewed COL Information Item 12.3-2 from U.S. EPR FSAR Tier 2, Table 1.8-2 included under FSAR Section 12.3.5.

COL Information Item 12.3-2 states:

> A COL applicant that references the U.S. EPR design certification will provide site-specific information on estimated annual doses to construction workers in a new unit construction area as a result of radiation from onsite radiation sources from the existing operating plant(s). This information will include bases, models, assumptions, and input parameters associated with these annual doses.

In FSAR Section 12.3.5.1, the applicant evaluated the potential radiological dose impacts to construction workers at CCNPP Unit 3 resulting from the operation of CCNPP Units 1 and 2. Construction workers for Unit 3 would be exposed to direct radiation and effluents from the operation of Units 1 and 2. The applicant discussed, as part of the dose assessment, the site layout, radiation sources, compliance with dose regulations, and individual and collective dose estimates to CCNPP Unit 3 construction workers.

The staff reviewed FSAR Section 12.3.5.1 which includes the applicant's response to COL Information Item 12.3-2 in regard to dose to construction workers. The estimated maximum individual dose rate for a construction worker is 0.39 mSv (39 mrem) per year. Collective dose to Unit 3 construction workers is estimated to be 0.1719 person-Sv (17.19 person-rem) over 6 years of construction. The estimated maximum dose to an individual construction worker is well within the 10 CFR 20.1301 and 10 CFR 20.1302 dose limits for individual members of the public of 100 mrem in one year and 2 mrem in any one hour. However, in response to the staff's request to justify the need to compare estimated construction worker doses to the offsite dose limits of 40 CFR Part 190, "Environmental Radiation Protection Standards For Nuclear

Power Operations," and 10 CFR Part 50 Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water Nuclear Power Reactor Effluents," (given that the workers would be located onsite), the applicant removed all references to the construction worker ALARA program from the FSAR. Therefore, in follow-up RAI 199, Question 12.03 − 12.04-6, the staff requested that the applicant describe in the FSAR the ALARA program elements that will be applied to the construction workers to assure that doses due to Operating Units 1 and 2 are maintained ALARA in accordance with 10 CFR 20.1101. **RAI 199, Question 12.03 − 12.04-6, which is associated with the above request, is being tracked as an open item.**

With regard to construction worker dose, the applicant's FSAR contained unit conversion errors. In RAI 199, Question 12.03 − 12.04-7, the staff requested that the applicant correct the dose values shown in units of Sieverts. **RAI 199, Question 12.03 − 12.04-7, which is associated with the above request, is being tracked as an open item.**

The COL applicant did not provide information related to compliance with the operational requirements of 10 CFR 20.1406 or adherence to the guidance contained in RG 4.21. Compliance with 10 CFR 20.1406 requires that the facility design and operational programs minimize the contamination of the facility and the environment, as well as facilitate decommissioning and minimize the generation of waste. In a December 17, 2009, response to RAI 44, Question 12.03 − 12.04-1, the applicant stated that the U.S. EPR FSAR Tier 2, Sections 12.3, "Radiation Protection Design Features," and 12.5, "Operational Radiation Protection Program," which are incorporated by reference into the COL application, demonstrate compliance with the operational requirements of 10 CFR 20.1406 by referencing NEI template 08-08A, "Generic FSAR Template Guidance for Life Cycle Minimization of Contamination." NEI 08-08A describes a generic operational program for meeting the operational requirements of 10 CFR 20.1406 and has been reviewed and accepted by the staff as an acceptable method of demonstrating compliance with the operational requirements of 10 CFR 20.1406. In addition, the applicant provided a FSAR markup showing a revised Table 13.4-1 incorporating 10 CFR 20.1406 in the list of regulatory requirements with which the Radiation Protection Program must demonstrate compliance. Therefore, the staff determined that the applicant's response to RAI 44, Question 12.03 − 12.04-1 is acceptable. The resolution of RAI 44, Question 12.03 − 12.04-1 is being tracked as a confirmatory item subject to staff verification of the FSAR revision incorporating by reference the U.S. EPR FSAR revision which references the NRC accepted template NEI 08-08A, as well as the revised Table 13.4-1. **RAI 44, Question 12.03 − 12.04-1, which is associated with the above request is being tracked as a confirmatory item.**

Although incorporating by reference U.S. EPR FSAR Tier 2, Section 12, and therefore the template NEI 08-08A, addresses the operational requirements of 10 CFR 20.1406, it does not address the site-specific structure, system, and component (SSC) design features which must also demonstrate compliance with 10 CFR 20.1406. In particular, operating experience has demonstrated that corroded buried piping can result in unmonitored radioactive liquid releases. Therefore, in RAI 199, Question 12.03 − 12.04-9, the staff requested that the applicant identify any site-specific buried piping that does or could potentially contain radioactive liquids and describe design features and/or monitoring for this piping that would minimize contamination in accordance with 10 CFR 20.1406. **RAI 199, Question 12.03 − 12.04-9, which is associated with the above request, is being tracked as an open item.** In addition, the staff requested that the applicant discuss whether vacuum breakers would be used for the site-specific effluent

discharge piping, particularly since inadequately maintained vacuum breakers on effluent discharge piping have in the past resulted in liquid radioactive releases and subsequent low-level contamination of the environment. The staff requested that the applicant describe design features and/or monitoring provisions for the vacuum breakers, if applicable, to ensure compliance with 10 CFR 20.1406. **RAI 199, Question 12.03 − 12.04-8, which is associated with the above request, is being tracked as an open item.**

Site-Specific Information Replacing Conceptual Design Information:

U.S. EPR FSAR Tier 2, Section 12.3.1.6, and U.S. EPR FSAR Tier 2, Figures 12.3-14, "[[Access Building at -31 Ft Elevation Radiation Zones]]," through 12.3-20, "[[Access Building at +54 Ft Elevation Radiation Zones]]," contain conceptual design information that is outside the scope of the U.S. EPR design certification related to the following access building facilities: The personnel decontamination area, portable instrument calibration facility, respiratory facility, equipment decontamination facility, radioactive materials storage area, and facility for dosimetry processing and bioassay. In an October 28, 2009, response to RAI 199, Question 12.3 − 12.4-5, the applicant stated that the FSAR will be revised to incorporate by reference the U.S. EPR conceptual design information described above. Specifically, the applicant provided a FSAR mark-up incorporating the U.S. EPR access building conceptual design information into the FSAR as the site-specific design. The staff determined that the level of detail provided on the U.S. EPR access building facilities, as supplemented by the information contained in the radiation protection program description in FSAR Section 12.5 by reference to NEI 07-03A, meets the guidance of RG 8.8, Section 4(e), "Support Facilities," and RG 1.206, Part C.III.1, "Site and Plant Design Interfaces and Conceptual Design Information." Therefore, the staff determined the applicant's response is acceptable subject to staff verification of the FSAR revision incorporating by reference the conceptual design information contained in U.S. EPR FSAR Tier 2, Section 12.3. **RAI 176, Question 12.03-12.04-5, which is associated with the above request, is being tracked as a confirmatory item.**

Post Combined License Activities

There are no post COL activities related to this section.

12.3.5 Conclusions

The staff reviewed the application and checked the referenced U.S. EPR FSAR. The staff's review confirmed that the applicant addressed the required information relating to radiation protection design features, and, pending the satisfactory resolution of the above open items, there is no outstanding information expected to be addressed in the FSAR related to this section.

In this section, the staff used the acceptance criteria guidance defined in NUREG-0800, Section 12.03-12.04 to evaluate the applicant's response to how they plan to resolve the U.S. EPR FSAR COL information item involving operational considerations for airborne radiation monitoring. In providing their proposed resolution to this U.S. EPR FSAR COL information item, the applicant commits to developing, establishing, and implementing procedures for obtaining representative measurements of plant airborne radioactivity in conformance with the guidance in RGs 1.21, Appendix A; RG 1.97; RG 8.2; RG 8.8; and RG 8.10, as well as ANSI/HPS-N13.1-1999. In providing their proposed resolution to this U.S. EPR FSAR COL information item, the applicant also referenced the information contained

in NEI Template 07-03, revision 7. The staff determined that the information in this template, together with the information provided in FSAR Section 12.3.4.5, to be acceptable to resolve this U.S. EPR FSAR COL information item. However, the COL application has not yet been revised to reference the NRC accepted version of the template. Therefore the staff considers the resolution of this U.S. EPR FSAR COL information item to be confirmatory subject to verification of the applicant's submittal to the NRC of a revised COL application referencing the NRC-accepted NEI Template 07-03A.

The staff evaluated the applicant's response to how they plan to resolve the U.S. EPR FSAR COL information item involving the instrumentation and procedures associated with post-accident measurement of in-plant airborne iodine concentrations. The applicant's response to this COL information item discussed the in-plant radiation monitoring program which would carry out the training of personnel, develop and implement procedures for monitoring, and ensure the provisions necessary for maintenance of the portable post-accident sampling and analysis equipment in conformance with the guidance in RG 1.21, Appendix A, and RG 8.8. The portable monitoring system itself will meet the requirements of 10 CFR 50.34(f)(2)(xxvii) and the guidance of NUREG-0737, Item III.D.3.3. Training and personnel qualifications are described in FSAR Section 12.5 by reference to NEI 07-03A. The staff determined that the information provided in FSAR Section 12.3.4.5 to be acceptable pending verification of the applicant's submittal to the NRC of a revised COL application referencing the NRC-accepted NEI Template 07-03A.

However, as a result of the open items, the staff is unable to finalize its conclusions as discussed below.

The staff also evaluated the applicant's compliance with 10 CFR 20.1406. The staff considers the applicant's compliance with the operational requirements of 10 CFR 20.1406 to be acceptable, pending verification of a revised FSAR incorporating by reference the NRC-accepted template NEI 08-08A, as well as, an updated FSAR Table 13.4-1. **RAI 44, Question 12.03-12.04-1, which is associated with the above request, is being tracked as a confirmatory item. The** staff also issued **RAI 199, Questions 12.3 − 12.04-8 and 12.03 − 12.04-9, which are being tracked as open items,** requesting that the applicant provide information on the site-specific SSC design features that will be used by CCNPP Unit 3 to address minimization of contamination and to facilitate decommissioning in compliance with 10 CFR 20.1406.

Finally, the staff evaluated the supplemental information the applicant provided to address dose to CCNPP Unit 3 construction workers. The staff evaluated this supplemental information using the acceptance criteria contained in Section 4.5, "Radiation Exposure to Construction Workers" of NUREG-1555, "Standard Review Plans for Environmental Reviews for Nuclear Power Plants." The staff issued RAI 199, Questions 12.03-12.04-6 requesting that the applicant describe the ALARA measures that will be taken to ensure that construction worker doses due to operating units 1 and 2 are maintained below the 10 CFR 20.1301 and 20.1302 public dose limits. In addition, the staff issued RAI 12.03-12.04-7 requesting that the applicant correct the unit conversion errors contained within the construction worker dose assessment. Pending the resolution of **RAI 199, Question 12.03 − 2.04-6, and Question 12.03-12.04-7, which are associated with the associated requests, are being tracked as open items.** The staff may determine that this information is acceptable and in compliance with the applicable portions of 10 CFR Part 20.

12.4 Dose Assessment

The staff's review of Section 12.4 of the CCNPP Unit 3 FSAR is documented in Section 12.3 above.

FSAR Section 12.4 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Section 12.4. U.S. EPR FSAR Tier 2, Section 12.4 refers the reader to U.S. EPR FSAR Tier 2, Section 12.3.5. The staff reviewed the application and checked the referenced design certification FSAR to ensure that no issue relating to this section remained for review. The staff's review confirmed that there is no outstanding issue related to this subsection.

12.5 Operational Radiation Protection Program

12.5.1 Introduction

The operational radiation protection program for a nuclear power facility assures that exposures of plant personnel to radiation are controlled and minimized. The administration of the radiation protection program and the qualifications of the personnel responsible for conducting various aspects of the radiation protection program and for handling and monitoring of radioactive materials are important components of the program. Adequate equipment, instrumentation, and facilities must also be provided for (1) performing radiation and contamination surveys, (2) in-plant airborne radioactivity monitoring and sampling, (3) area radiation monitoring, and (4) personnel monitoring. Procedures and methods of operation, including those for ensuring that occupational radiation exposure will be as low as reasonably achievable must be in place. These include procedures used in normal operation, refueling, inservice inspections, handling of radioactive material, spent fuel handling, routine maintenance, special maintenance, and sampling and calibration related to radiation safety.

12.5.2 Summary of Application

FSAR Section 12.5 incorporates by reference U.S. EPR FSAR Tier 2, Section 12.5.

In addition, in FSAR Section 12.5, the applicant provided the following:

Combined License Information Items:

The applicant provided additional information in FSAR Section 12.5 to address COL Information Item 12.5-1 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 fully describe, at the functional level, elements of the Radiation Protection Program. The purpose of the Radiation Protection Program is to maintain occupational and public doses ALARA. The program description will identify how the program is developed, documented, and implemented through plant procedures that address quality requirements commensurate with the scope and extent of licensed activities. This program will conform with the provisions of 10 CFR Parts 19, 20, 50, 52, and 71 and be consistent with the guidance in RGs 1.206, 1.8, 8.2, 8.4, 8.5, 8.6, 8.8, 8.9, 8.10, 8.13, 8.15, 8.27, 8.28, 8.29, 8.34, 8.35, 8.36, 8.38, and the consolidated guidance in NUREG-1736.

In response to this item, the COL applicant incorporates by reference NEI 07-03, Revision 7.

As discussed in Section 12.1.4 of this report, the FSAR needs to be revised to incorporate by reference NEI 07-03A, Revision 0. **RAI 147, Question 12.01-4, which is associated with the above request, is being tracked as a confirmatory item.**

NEI 07-03A provides a generic program description for use in developing COL applications. Management policies, organization, facilities, equipment, and procedures are addressed.

12.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed within the SER related to the U.S. EPR FSAR and within the SER related to the NEI 07-03A template.

In addition, the relevant requirements of NRC regulations for the occupational radiation protection program, and the associated acceptance criteria, are given in NUREG-0800, Section 12.5, “Operational Radiation Protection Program.”

The applicable regulatory requirements for the site-specific occupational radiation protection program are as follows:

- 10 CFR 20.1101(c), as it relates to the review and audit of the radiation protection program content and implementation
- 10 CFR 20.1602, as it relates to posting of, and control of access to, very-high-radiation areas.

The related acceptance criteria are as follows:

- RG 8.38, as it relates to the physical controls for personnel access to high and very high radiation areas.

12.5.4 Technical Evaluation

The staff reviewed FSAR Section 12.5 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 FSAR represents the complete scope of information relating to this review topic. The staff’s review confirmed that the information contained in the FSAR and incorporated by reference addresses the required information relating to this section. U.S. EPR FSAR Tier 2, Section 12.5 is being reviewed by the staff under Docket No. 52-020. The staff’s technical evaluation of the information incorporated by reference related to the operational radiation protection program is 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 FSAR:

Combined License Information Items:

The staff reviewed COL Information Item 12.5-1 from U.S. EPR FSAR Tier 2, Table 1.8-2 included under FSAR Section 12.5.

COL Information Item 12.5-1 states:

The COL applicant that references the U.S. EPR design certification will fully describe, at the functional level, elements of the Radiation Protection Program. The purpose of this Radiation Protection Program is to maintain occupational and public doses ALARA. The program description will identify how the program is developed, documented, and implemented through plant procedures that address quality requirements commensurate with the scope and extent of licensed activities. This program will conform with the provisions of 10 CFR Parts 19, 20, 50, 52, and 71 and be consistent with the guidance in RGs 1.206, 1.8, 8.2, 8.4, 8.5, 8.6, 8.8, 8.9, 8.10, 8.13, 8.15, 8.27, 8.28, 8.29, 8.34, 8.35, 8.36, 8.38, and the consolidated guidance in NUREG-1736.

The FSAR states that this COL information item is addressed in NEI Template 07-03. The NRC-accepted version of this template has been published as NEI 07-03A, Revision 0. NEI 07-03A provides a detailed description of the radiation protection program, that when incorporated by reference into the FSAR, provides reasonable assurance of the applicant's compliance with the applicable requirements of 10 CFR Part 19, 10 CFR Part 20, 10 CFR Part 50, 10 CFR Part 52, and 10 CFR Part 71 as well as reasonable assurance of the applicant's adherence to the guidance of RG 1.206, RG 1.8, RG 8.2, RG 8.4, RG 8.5, RG 8.6, RG 8.8, RG 8.9, RG 8.10, RG 8.13, RG 8.15, RG 8.27, RG 8.28, RG 8.29, RG 8.34, RG 8.35, RG 8.36, RG 8.38, and NUREG-1736.

NEI Template 07-03A contains two bracketed sections that allow for design and site-specific additions. One of these bracketed sections specifies that the applicant should provide additions in the form of site-specific information on Very High Radiation Areas (VHRAs), including physical description and access controls. In an April 30, 2009, response to RAI 53, Question 12.05-1, the applicant provided a FSAR mark-up which referenced U.S. EPR FSAR Tier 2, Figures 12.3-1, "Spreading Area at the -20 Ft Elevation of the Reactor Building," through 12.3-9, "Containment Building Section Looking Plant-East at the Reactor Cavity, Core Internals Storage, Transfer Pit, and Spreading Area," showing the location and design of all CCNPP Unit 3 VHRAs. For the U.S. EPR, these VHRAs include the spreading area under the reactor cavity, the reactor cavity itself, the core internals storage room, the instrument lance storage room, the spent fuel transfer pit inside the Reactor Building, the spent fuel transfer pit inside the Fuel Building, and the spent fuel pool. The FSAR will also be revised to describe the access controls for the CCNPP Unit 3 VHRAs including physical barriers and positive access controls (i.e., maintaining keys under the control of the radiation protection manager and allowing access only under special circumstances (outages) through the radiation work control program). In addition, the applicant has committed to implementing the radiation protection program as described in NEI 07-03A, which includes adherence to the guidance in RG 8.38. The applicant's description of the very high radiation areas including physical and administrative access controls, together with the adherence to RG 8.38 via the radiation protection program description provided by the applicant's reference to NEI 07-03A, provides reasonable assurance that the applicant will comply with the VHRA access requirements of 10 CFR 20.1602.

The second bracketed section calls for the applicant to describe the Quality Assurance Program that will be applied to the Radiation Protection Program. In an April 30, 2009, response to RAI 53, Question 12.05-1, the applicant provided a FSAR mark-up that references FSAR Section 17.5 as containing the applicable radiation protection quality assurance criteria. The staff confirmed that FSAR Section 17.5 addressed the quality of the radiation protection program's safety-related activities, as well as the periodic review of the content and implementation of the program, including transportation of radioactive materials. The

information in FSAR Section 17.5 related to the radiation protection program's quality assurance adheres to the guidance in SRP Section 12.5, and is therefore acceptable.

The staff confirmed that FSAR Revision 6, dated September 30, 2009, contains the changes committed to in the response to RAI 53, Question 12.05-1 as described above.

Operational Program

The applicant provided implementation schedules and milestones to address Operational Program No. 10, which is associated with the Radiation Protection Program, as required by 10 CFR 20.1101 and the license condition specified in FSAR Table 13.4-1. In addition, FSAR Table 13.4-1 lists four milestones for the Radiation Protection Program implementation. The four milestones given are: Prior to initial receipt of byproduct, source, or special nuclear materials; prior to fuel receipt; prior to fuel load; and prior to the first shipment of radioactive waste. Additional detail on the radiation protection program's implementation schedule and milestones, including the staff's safety evaluation, is provided in NEI 07-03A, Revision 0. Therefore ,the staff considers the resolution of COL Information Item 12.5-1, regarding the operational radiation protection program, to be confirmatory subject to staff verification of the COL revision incorporating the NRC-accepted version of the template NEI 07-03A, Revision 0. **RAI 53, Question 12.05-1, which is associated with the above request, is being tracked as a confirmatory item.**

Post Combined License Activities

The applicant will implement milestones of the Radiation Protection Program as specified in FSAR Table 13.4-1.

12.5.5 Conclusions

The staff reviewed the application and checked the referenced U.S. EPR FSAR. The staff's review confirmed that the applicant addressed the required information relating to the operational radiation protection program and, pending the satisfactory resolution of the confirmatory item related to RAI 53, Question 12.05-1, there is no outstanding information expected to be addressed in the FSAR related to this section.

In this section, the staff evaluated the description of the applicant's operational program for radiation protection. FSAR Section 13.4 presents the milestones, as license conditions, for the implementation of the Radiation Protection Program (Operational Program No. 10). FSAR Section 12.5 references NEI 07-03, Revision 7.

The staff used the acceptance criteria guidance defined in NUREG-0800, Section 12.5 to evaluate the applicant's responses to how they plan to resolve the COL information item involving the operational Radiation Protection Program. In providing their proposed resolution to these U.S. EPR FSAR COL information items, the applicant referenced the information contained in NEI Template 07-03. The NRC-accepted version of NEI 07-03, NEI 07-03A, describes a Radiation Protection Program which is sufficient to ensure compliance with the applicable provisions of 10 CFR Part 19, 10 CFR Part 20, 10 CFR Part 50, 10 CFR Part 52, and 10 CFR Part 71, and adherence to the guidance found in RG 1.8, RG 1.206, RG 8.2, RG 8.7, RG 8.8, RG 8.9, RG 8.10, RG 8.13, RG 8.15, RG 8.27, RG 8.28, RG 8.29, RG 8.34, RG 8.35, RG 8.36, RG 8.38, and NUREG-1736, when implemented in accordance with the milestones and license condition specified in FSAR Table 13.4-1. The staff determined that the information

in this template is acceptable to resolve the U.S. EPR FSAR COL Information Item 12.05-1, pending staff verification of the COL revision incorporating the NRC-accepted version of the template, NEI 07-03A, Revision 0, and with verification of program implementation at the construction stage**. RAI 53, Question 12.05-1, which is associated with the above request, is being tracked as a confirmatory item and will be evaluated when the next revision of the FSAR is submitted to the NRC.**

March 18, 2010

Mr. George Vanderheyden
President and CEO
UniStar Nuclear Energy, LLC
750 E. Pratt Street
Baltimore, MD 21202-3106

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT 3 COMBINED LICENSE APPLICATION - SAFETY EVALUATION REPORT WITH OPEN ITEMS FOR CHAPTER 12, "RADIATION PROTECTION"

Dear Mr. Vanderheyden:

By letter dated July 13, 2007, as supplemented by letters dated August 2, 2007, and December 14, 2007, Calvert Cliffs 3 Nuclear Project and UniStar Nuclear Operating Services, LLC (UniStar) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for a combined license (COL) for Calvert Cliffs Nuclear Power Plant (CCNPP), Unit 3, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." Subsequent to the original application, Calvert Cliffs 3 Nuclear Project and UniStar submitted Revisions 2 through 6 of the CCNPP, Unit 3 Final Safety Analysis report (FSAR) by letters dated March 14, 2008 (Agencywide Documents Access and Management System [ADAMS] ML080780459), August 20, 2008 (ML082390786), March 9, 2009 (ML090850421), and September 30, 2009 (ML092880200).

Based on our review of the application, the staff prepared the enclosed Safety Evaluation Report (SER), ADAMS ML090900234, with Open Items for Chapter 12, "Radiation Protection." Unless otherwise stated in the SER with Open Items, the staff's review was based on Revision 6 of the application. The SER is being provided to support the upcoming meeting of the subcommittee of the Advisory Committee on Reactor Safeguards (ACRS) scheduled to be held in April 2010. The ACRS Full Committee meeting will be held at a later date. Issuance of this SER is an important milestone in the staff's review to determine whether the CCNPP Unit 3 COL application meets the Commission's regulations.

The staff concludes that the enclosed SER does not contain any information for which exemption from public disclosure has been sought or approved. However, the NRC will withhold the enclosed SER from public disclosure for ten calendar days from the date of this letter to allow the opportunity to verify the staff's conclusion that the SER contains no such exempt information. If within that time, you do not request that all or portions of the SER be withheld from public disclosure in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," the enclosure will be made available for public

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If you have any questions or comments concerning this matter, I can be reached at 301-415-1421 or via e-mail address at surinder.arora@nrc.gov.

Sincerely,

/RA/

Surinder Arora, Project Manager
EPR Projects Branch
Division of New Reactor Licensing
Office of New Reactors

Docket No. 52-016

Enclosure:
As stated

cc: See next page

inspection through the NRC Public Document Room and the Publicly Available Records component of ADAMS. ADAMS is accessible from the Public Electronic Reading Room section of the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

If you have any questions or comments concerning this matter, I can be reached at 301-415-1421 or via e-mail address at surinder.arora@nrc.gov.

Sincerely,

/RA/

Surinder Arora, Project Manager
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Docket No. 52-016

Enclosure:
As stated

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