CCNPP3COLA NPEmails

From: Royer, Deanna
Sent: Tuesday, March 30, 2010 3:11 PM
To: robert.poche@unistarnuclear.com
Cc: CCNPP3COL Resource; Arora, Surinder; Patel, Jay; Roy, Tarun; Colaccino, Joseph
Subject: CCNPP Unit 3 - Chapter 5 SER - MAY CONTAIN SENSITIVE PROPRIETARY INFORMATION
Attachments: Ch 5 CCNPP SER.pdf; Ch 5 CCNPP Letter.pdf

Good Afternoon 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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No figures were included in this chapter.

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5 REACTOR COOLANT SYSTEM AND CONNECTED SYSTEMS

As explained in Section 5.0 of Chapter 5 of the U.S. EPR Final Safety Analysis Report (FSAR), Tier 2, the reactor coolant system (RCS) for the U.S. EPR is a closed, four-loop system designed to transfer heat generated by the reactor core, located in the reactor pressure vessel (RPV), to the secondary side of the steam generators for plant power generation. The RCS consists of one RPV, four steam generators, four reactor coolant pumps (RCP), one pressurizer, one pressurizer relief tank (PRT), and the piping that connects the components. The RCS is located in the Reactor Building.

Chapter 5 of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Combined License (COL) Final Safety Analysis Report (FSAR) incorporates by reference, with no departures, U.S. EPR FSAR Tier 2, Chapter 5. U.S. EPR FSAR Tier 2, Table 1.8-2 lists the COL information items that a COL applicant who references the U.S. EPR design certification must address in the COL application. Supplementary information is provided in the CCNPP Unit 3 FSAR (COL FSAR) for Sections 5.2.1, "Compliance with Codes and Code Cases"; 5.2.3, "Reactor Coolant Pressure Boundary Materials"; 5.2.4, "Inservice Inspection and Testing of the RCPB"; 5.3.1, "Reactor Vessel Materials"; 5.3.2, "Pressure-Temperature Limits, Pressurized Thermal Shock, and Charpy Upper-Shelf Energy Data and Analyses"; and 5.4.2, "Steam Generators."

This chapter of the staff's safety evaluation report (SER) of the COL FSAR provides the staff's review of the CCNPP Unit 3 reactor coolant system (RCS) in four sections: Section 5.1, "Summary Description"; Section 5.2, "Integrity of the Reactor Coolant Pressure Boundary"; Section 5.3, "Reactor Vessel"; and Section 5.4, "Component and Subsystem Design". The staff has prepared Sections 5.1 through 5.4 of this report in accordance with the review procedures described in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," (hereafter referred to as NUREG-0800 or the SRP) using information presented in the U.S. EPR FSAR and the COL FSAR, and responses to staff requests for additional information (RAIs).

5.1 Summary Description

This section of the COL FSAR references a description of the RCS provided in the U.S. EPR FSAR and summarized below. A more detailed description of the content of the COL application, and the staff's evaluation of that information, is provided in Sections 5.2, "Integrity of the Reactor Coolant Pressure Boundary"; 5.3, "Reactor Vessel"; and 5.4, "Component and Subsystem Design."

The RCS configuration is a conventional four-loop pressurized water reactor design. The reactor pressure vessel (RPV) is located in the center of the Reactor Building and contains the fuel assemblies. The reactor coolant flows from the RPV through the hot leg pipes to the steam generators (SGs) and returns to the RPV via the cold leg pipes, which contain the reactor coolant pumps (RCPs). The pressurizer (PZR) is connected to one hot leg via a surge line and to two cold legs by spray lines.

COL FSAR Section 5.1, "Summary Description," incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Section 5.1. The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information

items listed in the U.S. EPR FSAR Tier 2, Table 1.8-2, interface items, and supplemental information required to be provided by the COL applicant have been addressed in the COL application. The staff's review confirmed that with the exception of the open and confirmatory items discussed below, all required COL items and supplementary information have been addressed in the COL application.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR Tier 2, Section 5.1 on Docket No. 52-020. The results of the staff's technical evaluation of the U.S. EPR FSAR information related to the summary description of the RCS incorporated by reference in the COL FSAR will be documented in the staff's SER on the U.S. EPR design certification application. The staff's SER on the U.S. EPR FSAR is not yet complete, and this is being tracked as part of RAI 222, Question 01-05. The staff will update Section 5.1 of this report to reflect the final disposition of the U.S. EPR design certification application.

5.2 Integrity of the Reactor Coolant Pressure Boundary

In COL FSAR Section 5.2, "Integrity of the Reactor Coolant Pressure Boundary," UniStar Nuclear (hereafter referred to as the COL applicant) incorporates by reference U.S. EPR FSAR Tier 2, Section 5.2, "Integrity of the Reactor Coolant Pressure Boundary," with supplemental information. COL FSAR Section 5.2 includes Section 5.2.1.1, "Compliance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a," and Section 5.2.1.2, "Compliance with Applicable Code Cases."

5.2.1 Compliance with Codes and Code Cases

5.2.1.1 *Compliance with 10 CFR 50.55a*

COL FSAR Section 5.2.1.1, "Compliance with 10 CFR 50.55a," addresses compliance with NRC regulations in 10 CFR 50.55a, "Code and Standards." In 10 CFR 50.55a, the NRC identifies the acceptable American Society of Mechanical Engineers (ASME) Codes, Editions, and Addenda required for design, fabrication, and construction of components used in light-water nuclear power plants. The applicable ASME Boiler and Pressure Vessel (B&PV) Code and ASME Code for Operation and Maintenance of Nuclear Power Plants (OM Code) including edition and addenda for ASME Code Class 1, 2, and 3 components are identified for component design, construction, inservice inspection (ISI), and inservice testing (IST). The classification of structures, systems, and components (SSCs) in accordance with the ASME Code is evaluated in Section 3.2.2 of this report.

COL FSAR Section 5.2.1.1 incorporates by reference, with no departures or supplements, U.S. EPR FSAR, Tier 2, Section 5.2.1.1. The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant have been addressed in the COL application. The staff's review confirmed that all required COL information items, interface items, and supplemental information have been addressed in the COL application.

The staff is reviewing the COL information in U.S. EPR FSAR Tier 2, Section 5.2.1.1, on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR regarding compliance with 10 CFR 50.55a will be documented in the staff's SER on the U.S. EPR design certification application. The staff will

update Section 5.2.1.1 of this report to reflect the final disposition of the U.S. EPR design certification application.

5.2.1.2 *Compliance with Applicable Code Cases*

5.2.1.2.1 Introduction

This section verifies the ASME Code Cases to be used by the applicant to provide assurance for the integrity of the reactor coolant pressure boundary (RCPB) at CCNPP Unit 3. This section also discusses NRC regulatory guides (RGs) that contain the acceptable ASME Code Cases with or without conditions.

5.2.1.2.2 Summary of Application

COL FSAR Section 5.2.1.2 incorporates by reference U.S. EPR FSAR, Tier 2, Section 5.2.1.2, with no departures.

COL Information Items

COL Information Item 5.2-2, in COL FSAR Section 5.2.1.2, "Compliance With Applicable Code Cases," directs a COL applicant that references the U.S. EPR design certification to identify additional ASME Code Cases to be used.

To address this COL information item, the COL applicant indicated that no additional ASME Code Cases would be utilized at CCNPP Unit 3.

5.2.1.2.3 Regulatory Basis

The regulatory basis of the COL information incorporated by reference from the U.S. EPR FSAR is addressed within the staff's SER on the U.S. EPR FSAR.

In addition, the relevant requirements of NRC regulations for the compliance with applicable ASME Code Cases, and the associated acceptance criteria, are described and explained in NUREG-0800, Section 5.2.1.2, which states as follows:

1. 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," and 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," provide the regulatory basis for the staff review of the information provided in the COL FSAR. For example, NRC regulations in 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 1, "Quality Standards and Records," require that nuclear power plant structures, systems, and components (SSC) important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed.

2. 10 CFR 50.55a, as related to the establishment of the minimum quality standards for the design, fabrication, erection, construction, testing, and inspection of nuclear power plant components, requires conformance with appropriate editions of published industry codes and standards.

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5.2.1.2.4 Technical Evaluation

The staff reviewed COL FSAR Section 5.2.1.2 and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant have been addressed in the COL application. The staff's review confirmed that all required COL information items and supplemental information have been addressed in this section of the COL application. U.S. EPR FSAR, Tier 2, Section 5.2.1.2 is being reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the information incorporated by reference related to applicable code cases will be documented in the staff's SER for the U.S. EPR.

In the U.S. EPR SER, the staff describes its evaluation of the ASME Code Cases given in U.S. EPR FSAR Tier 2, Table 5.2-1 for use by COL applicants implementing the U.S. EPR reactor design. The staff determined that compliance with the requirements of these code cases will result in a component quality that is commensurate with the importance of the safety functions of the components that satisfy the requirements of GDC 1 and 10 CFR 50.55a. The staff's SER for the U.S. EPR states that a COL applicant may identify within its COL application the planned use of additional code cases provided they do not alter the staff's safety findings on the U.S. EPR certified design.

U.S. EPR FSAR Tier 2, Section 5.2.1.2 refers to U.S. EPR FSAR Tier 2, Table 5.2-1 for a list of ASME Code, Section III Code Cases, and then states that the COL applicant will identify additional code cases to be used. COL FSAR Section 5.2.1.2 incorporates by reference U.S. EPR FSAR Tier 2, Section 5.2.1.2, with no departures, and includes supplemental information that no additional ASME Code Cases will be utilized. In RAI 13, Question 05.02.01.02-1, the staff requested that the COL applicant clarify whether any ASME B&PV Code Section XI or ASME OM Code Cases will be applied and discuss their use in conformance with RGs 1.147 and 1.192. In an October 13, 2008, response to RAI 13, Question 05.02.01.02-1, the COL applicant stated that U.S. EPR FSAR Tier 2, Table 5.2-1 lists the code cases applicable to the U.S. EPR design. The COL applicant stated that no other code cases will be utilized for CCNPP Unit 3 at this time. The staff determines the RAI response to have clarified the plans by the COL applicant to apply ASME Code Cases at CCNPP Unit 3. Therefore, the staff considers RAI 13, Question 05.02.01.02-1 resolved.

In RAI 31, Question 05.02.01.02-2, the staff requested that the COL applicant clarify whether any ASME Code Cases other than the two code cases given in U.S. EPR FSAR Tier 2, Table 5.2-1, will be used for the piping and component design, preservice inspection, and inservice inspection for CCNPP Unit 3. In a December 12, 2008, response to RAI 31, Question 05.02.01.02-2, the COL applicant stated that U.S. EPR FSAR Tier 2, Table 5.2-1 lists the code cases applicable to the U.S. EPR design. The COL applicant stated that no other code cases will be utilized at this time. The COL applicant's response to this RAI clarifies the use of ASME Code Cases for CCNPP Unit 3 and is acceptable. Therefore, the staff considers RAI 31, Question 05.02.01.02-2 resolved.

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COL Information Items

COL Information Item 5.2-2, in COL FSAR Section 5.2.1.2, "Compliance With Applicable Code Cases," directs a COL applicant that references the U.S. EPR design certification to identify additional ASME Code Cases to be used.

As noted above, the COL applicant has not identified any code cases other than those included in the U.S. EPR FSAR as necessary at this time for the design and construction of CCNPP Unit 3. If the COL applicant determines in the future that additional ASME Code Cases are needed, the COL applicant may apply those ASME Code Cases that the staff has found acceptable in RGs 1.84, 1.147, or 1.192, including any applicable conditions. If the COL applicant determines that ASME Code Cases other than those approved for use by the staff are needed, the COL applicant must request NRC authorization to use such code cases.

Interface Requirements

U.S. EPR FSAR Tier 2, Section 1.8, "Interfaces with Standard Designs and Early Site Permits," identifies site-specific interfaces with the standard U.S. EPR design. The staff reviewed the COL applicant's proposal to satisfy the interfacing requirements with the U.S. EPR standard design by using the review procedures described in Standard Review Plan (SRP) Section 5.2.1.2. The staff has determined that the COL applicant's consideration of design interface items is acceptable based on compliance with NRC regulations.

5.2.1.2.5 Post Combined License Activities

There are no post COL activities related to this section.

5.2.1.2.6 Conclusions

The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant have been addressed in the COL application. The staff's review confirmed that the COL applicant addressed the required information relating to applicable code cases, and there is no outstanding information expected to be addressed in the COL FSAR related to this section.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR regarding the applicable code cases will be documented in the staff's on the U.S. EPR design certification application. The staff will update this report to reflect the final disposition of the U.S. EPR design certification application.

5.2.2 Overpressure Protection

COL FSAR Section 5.2.2 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Section 5.2.2, "Overpressure Protection." The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant relating to overpressure protection have been addressed in the COL application. The staff's review confirmed that all information required to be provided by the COL applicant relating to overpressure protection has been addressed in the COL application.

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Summary of Open Items Relating to the Low Temperature Overpressure Protection (LTOP) Analysis and Dynamic Load Analysis for Inlet Loop Seal in the U.S. EPR FSAR

- In RAI 332, Question 05.02.02-3, issued in the staff's review of the U.S. EPR FSAR, the staff requested that the design certification applicant, AREVA provide additional information on three issues:
    - Identify the analytical methods used to perform the LTOP analysis
    - Justify the events selected for the LTOP analysis
    - Address compliance with GDC 31
- In RAI 332, Question 05.02.02-12, the staff requested that AREVA provide a discussion on the dynamic load analysis for inlet loop seal to the PRSVs and PDS valves during the discharge of the safety valves.

RAI 332, Question 05.02.02-3 and Question 05.02.02-12, are being tracked as open items in the staff's review of the U.S. EPR FSAR. The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR Tier 2, Section 5.2.2 on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR regarding the overpressure protection will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update Section 5.2.2 of this report to reflect the final disposition of the U.S. EPR design certification application.

5.2.3 Reactor Coolant Pressure Boundary Materials

5.2.3.1 *Introduction*

This section of the COL FSAR addresses information related to the materials selection, fabrication, and processing of reactor coolant pressure boundary (RCPB) piping and components, and compatibility of RCPB materials with reactor coolant.

5.2.3.2 *Summary of Application*

COL FSAR Section 5.2.3 incorporates by reference U.S. EPR FSAR Tier 2, Section 5.2.3, with no departures or supplemental information.

5.2.3.3 *Regulatory Basis*

The regulatory basis of the COL information incorporated by reference from the U.S. EPR FSAR is addressed within the staff's FSER on the U.S. EPR FSAR.

5.2.3.4 *Technical Evaluation*

The staff reviewed COL FSAR Section 5.2.3 and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant relating to RCPB piping and components, and compatibility of RCPB materials with reactor coolant, have been addressed in the COL application. The staff's review confirmed that the information contained in the COL application and incorporated by reference from the U.S. EPR FSAR addresses all of the

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required information relating to this section. U.S. EPR FSAR, Tier 2, Section 5.2.3 is being reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR regarding reactor coolant pressure boundary materials will be documented in the staff's SER on the U.S. EPR design certification application.

5.2.3.5 *Post Combined License Activities*

There are no post COL activities related to this section.

5.2.3.6 *Conclusions*

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR regarding the reactor coolant pressure boundary materials incorporated by reference in the COL FSAR will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update Section 5.2.2 of this report to reflect the final disposition of the U.S. EPR design certification application.

In addition, the staff concludes that the relevant information presented within the COL FSAR is acceptable and meets the requirements of NRC regulations and that Section 5.2.2 of the U.S. EPR FSAR can be completely incorporated by reference.

5.2.4 Inservice Inspection and Testing of the RCPB

5.2.4.1 *Introduction*

Components that are part of the reactor coolant pressure boundary must be designed to permit periodic inspection and testing of important areas and features to assess their structural and leak tight integrity. Inservice inspection programs are based on the requirements of 10 CFR 50.55a in that Code Class 1 components, as defined in ASME B&PV Code, Section III, meet the applicable inspection requirements set forth in ASME B&PV Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components."

5.2.4.2 *Summary of Application*

COL FSAR Section 5.2.4 incorporates by reference U.S. EPR FSAR Tier 2, Section 5.2.4, with no departures.

COL Information Items

COL Information Item 5.2-3, in COL FSAR Section 5.2.4, "Inservice Inspection and Testing of the RCPB," directs a COL applicant that references the U.S. EPR design certification to identify the implementation milestones for the site-specific ASME Section XI preservice and inservice inspection program for the RCPB, consistent with the requirements of 10 CFR 50.55a(g). This COL information item also requires that the program will identify the applicable edition and addenda of the ASME Section XI, and any additional relief requests and alternatives to Code requirements.

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To address COL Information Item 5.2-3, the COL applicant indicated that the preservice inspection (PSI) and inservice inspection (ISI) programs for the RCPB would comply with the 2004 Edition of the ASME Code and that no relief requests or alternatives are required. According to COL FSAR Table 13.4-1, "Operational Programs Required by NRC Regulations and Program Implementation," the PSI program is required prior to initial plant startup and the ISI program is required prior to placement of the plant into commercial service. The COL applicant has indicated that the ISI program for CCNPP Unit 3 will comply with the requirements of the ASME Code version that has been incorporated by reference into 10 CFR 50.55a on the date 12 months before the date for initial fuel load.

5.2.4.3 *Regulatory Basis*

The regulatory basis of the COL information incorporated by reference from the U.S. EPR FSAR is addressed within the FSER for the U.S. EPR FSAR.

In addition, the relevant requirements of NRC regulations for inservice inspection and testing of the RCPB, and the associated acceptance criteria, are described and explained in NUREG-0800, Section 5.2.4.

The applicable regulatory requirements for inservice inspection and testing of the RCPB are as follows:

1. GDC 32, "Inspection of Reactor Coolant Pressure Boundary," as it relates to periodic inspection and testing of the RCPB.

2. 10 CFR 50.55a, as it relates to the requirements for testing and inspecting Code Class 1 components of the RCPB as specified in ASME Code Section XI.

5.2.4.4 *Technical Evaluation*

The staff reviewed COL FSAR Section 5.2.4 and checked the referenced sections of the U.S. EPR design certification FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant regarding preservice and inservice inspection and testing of the RCPB have been addressed in the COL application. The staff's review confirmed that the information contained in the COL application and incorporated by reference from the U.S. EPR FSAR addresses all of the required information relating to this section. U.S. EPR FSAR, Tier 2, Section 5.2.4 is being reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR regarding inservice inspection and testing of the RCPB will be documented in the staff's SER on the U.S. EPR design certification application.

The staff reviewed conformance of COL FSAR Section 5.2.4 to determine whether it conforms to the guidance in RG 1.206, Section C.III.1, Chapter 5, C.I.5.2.4, "Inservice Inspection and Testing Program."

In Section 5.2.4 of the staff's FSER on the U.S. EPR design certification FSAR, the staff concluded that the U.S. EPR ISI program for Code Class 1 components is acceptable and meets the requirements of 10 CFR 50.55a with regard to the preservice and inservice inspectability of these components. The specific version of the ASME Code, Section XI used as the baseline Code in the U.S. EPR FSAR is the 2004 Edition. Accordingly, the staff's evaluation

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of this section of the COL FSAR focused on the acceptability of the COL applicant's supplemental information and responses to U.S. EPR COL information items. The staff's evaluation of this section of the COL FSAR also addresses the operational program aspects of the ASME Code Class 1, 2, and 3 PSI and ISI programs.

COL Information Items

COL Information Item 5.2-3 in COL FSAR Section 5.2.4, "Inservice Inspection and Testing of the RCPB," directs a COL applicant referencing the U.S. EPR design certification to identify the implementation milestones for the site-specific ASME Section XI preservice and inservice inspection programs for the RCPB, consistent with the requirements of 10 CFR 50.55a(g). This COL information item also requires that the program identify the applicable edition and addenda of the ASME Code Section XI, and additional relief requests and alternatives to Code requirements.

In the supplemental information the COL applicant provided in COL FSAR Section 5.2.4, the COL applicant stated that the preservice and inservice inspection programs for the RCPB will meet the requirements of the 2004 Edition of the ASME Code, Section XI and that no relief requests or alternatives are required. The COL applicant also stated that the initial inservice inspection program shall incorporate the latest edition and addenda of the ASME Code approved in 10 CFR 50.55a on the date 12 months before initial fuel load, and the implementation milestones for the preservice and inservice inspection programs for the RCPB are identified in COL FSAR Table 13.4-1.

Regulation 10 CFR 50.55a(g) requires that inservice examinations of components and system pressure tests conducted during the initial 120-month inspection interval must comply with the requirements in the latest edition and addenda of the Code incorporated by reference in Paragraph (b) of 10 CFR 50.55a on the date 12 months before the date scheduled for initial loading of fuel under a combined license under 10 CFR Part 52. Pursuant to 10 CFR 52.79(a)(11), a COL applicant must provide a description of the program and its implementation that meets 10 CFR 50.55a for inservice inspection of ASME code components. The PSI and ISI programs are identified as operational programs in RG 1.206. As discussed in RG 1.206, a fully described PSI and ISI program should address: (1) System boundary subject to inspection; (2) accessibility; (3) examination categories and methods; (4) inspection intervals; (5) evaluation of examination results; (6) system pressure tests; (7) Code exemptions; (8) relief requests; and (9) ASME Code Cases. The COL application should fully describe this program as defined in SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria." In addition, as discussed in SECY-05-0197, which was approved by the Commission in an SRM dated February 22, 2006, the COL applicant should provide implementation and readiness milestones for this program.

The PSI and ISI programs are considered operational programs and are listed in the COL FSAR, Table 13.4-1, which lists the operational programs with specific milestones for program implementation. The COL applicant has identified a license condition as the implementation requirement for many of the operational programs given in COL FSAR Table 13.4-1. The license conditions would require (1) the implementation of the operational program for those operational programs for which the regulations do not contain specific implementation requirements by the time specified milestones are achieved (2) a licensee to provide operational program implementation schedules reflecting the milestones to facilitate NRC inspections. More

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specifically, the first license condition will require the licensee to implement the operational program or portions of the program identified in COL FSAR Table 13.4-1 on or before established milestones.

For PSI and ISI programs, the ASME Code, Section XI provides requirements for program implementation in paragraph IWB-2200(a) for PSI programs and paragraph IWA-2430(b) for ISI programs. As such, the first license condition for the program implementation requirement is not necessary in the COL application because the ASME code already requires its implementation. For the second license condition, the COL applicant states that the licensee shall submit to the NRC, a schedule 12 months after issuance of a COL that supports planning for and conduct of NRC inspections of operational programs as provided in COL FSAR Table 13.4-1 and includes the PSI and ISI operational programs. This license condition will also require that the schedule be updated every 6 months before scheduled fuel load, and every month thereafter until either the operational program given in the COL FSAR table has been fully implemented or the plant has been placed in commercial service, whichever comes first. The second license condition is necessary for the PSI and ISI programs. The COL applicant's proposed license condition is consistent with the policy and guidance established in SECY-05-0197, and is thus acceptable, and adequately addresses COL Information Item 5.2-3, COL FSAR Sections 5.2.4 and 6.6 addresses the PSI and ISI operational programs for ASME Code Class 1, 2, and 3 components. For CCNPP Unit 3, the COL applicant incorporated by reference the PSI and ISI programs descriptions from the U.S. EPR FSAR Tier 2, Sections 5.2.4, "Inservice Inspection and Testing of the RCPB," and 6.6, "Inservice Inspection of Class 2 and 3 Components," with no departures.

The system boundary subject to inspection is described in the U.S. EPR FSAR Tier 2, Sections 5.2.4 and 6.6.1, "Components Subject to Examination." The staff's evaluation of COL information incorporated by reference from the U.S. EPR FSAR is provided in Sections 5.2.4.4 and 6.6.4.1 of the staff's FSER on the U.S. EPR FSAR.

Accessibility to enable the performance of ISI in accordance with the ASME Code is described in the U.S. EPR FSAR Tier 2, Sections 5.2.4.1.1, "Arrangement and Accessibility of Systems and Components," and 6.6.2, "Accessibility." The staff's evaluation of the U.S. EPR FSAR for accessibility is provided in Sections 5.2.4.4.1 and 6.6.4.2 of the staff's FSER on the U.S. EPR FSAR.

Examination categories and methods are described in the U.S. EPR FSAR Tier 2, Sections 5.2.4.1.2, "Examination Categories and Methods," and 6.6.3, "Examination Techniques and Procedures." The staff's evaluation of COL information incorporated by reference from the U.S. EPR FSAR is provided in Sections 5.2.4.4.2 and 6.6.4.3 of the staff's FSER on the U.S. EPR FSAR.

Inspection intervals are described in the U.S. EPR FSAR Tier 2, Sections 5.2.4.1.3, "Inspection Intervals," and 6.6.4, "Inspection Intervals." The staff's evaluation of COL information incorporated by reference from the U.S. EPR FSAR is provided in Sections 5.2.4.4.3 and 6.6.4.4 of the staff's FSER on the U.S. EPR FSAR.

Evaluation of examination results is described in the U.S. EPR FSAR Tier 2, Sections 5.2.4.1.4, "Evaluation of Examination Results," and 6.6.6, "Evaluation of Examination Results." The staff's evaluation of COL information incorporated by reference from the U.S. EPR FSAR is provided in Sections 5.2.4.4.4 and 6.6.4.5 of the staff's FSER on the U.S. EPR FSAR.

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System pressure tests, including both leakage and hydrostatic pressure tests, are described in the U.S. EPR FSAR Tier 2, Sections 5.2.4.1.5, "System Pressure Tests," and 6.6.7, "System Pressure Tests." The staff's evaluation of COL information incorporated by reference from the U.S. EPR FSAR is provided in Sections 5.2.4.4.5 and 6.6.4.6 of the staff's FSER on the U.S. EPR FSAR.

At this time, the U.S. EPR FSAR and COL FSAR have not identified any exemptions or requests for relief from ASME Code, Section XI ISI requirements resulting from design, geometry, and materials of construction. The use of ASME Code Cases for the CCNPP Unit 3 ISI program (Section XI) for relief from ISI requirements is discussed in Section 5.2.1.2 of this report.

Other inspection programs include supplemental inspections for the reactor pressure vessel head and the ISI program provisions to detect and correct potential RCPB corrosion caused by boric acid leaks. These other inspection programs are described in the U.S. EPR FSAR Tier 2, Sections 5.2.4.1.8, "Code Cases," and 5.2.4.1.10, "Other Inspection Programs," respectively. The staff's evaluation of COL information incorporated by reference from the U.S. EPR FSAR is provided in Sections 5.2.4.4.8 and 5.2.4.4.10 of the staff's FSER on the U.S. EPR FSAR.

5.2.4.5 *Post Combined License Activities*

U.S. EPR FSAR Tier 2, Table 1.8.2 contains COL information items that the applicant is required to address. The following COL information in Table 5.2.4.1 of this report includes the proposed COL activities that the staff has evaluated in this report.

Table 5.2.4-1 Post Combined License Activities

Item No.	Description	COL FSAR Section	COL SER Section
5.2-3	The initial inservice inspection program for Class 1, 2, and 3 components shall incorporate the latest edition and addenda of the ASME Boiler and Pressure Vessel Code approved in 10 CFR 50.55a(b) on the date 12 months before initial fuel load.	5.2.4	5.2.4

5.2.4.6 *Conclusions*

The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR. The staff's review confirmed that the COL applicant addressed all of the required information relating to inservice inspection and testing of the RCPB, and there is no outstanding information expected to be addressed in the COL FSAR related to this section.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the U.S. EPR FSAR information incorporated by reference from the U.S. EPR regarding inservice inspection

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and testing of the RCPB will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update this report to reflect the final disposition of the U.S. EPR design certification application.

In addition, the staff concludes that the supplemental information the COL applicant provided as directed under U.S. EPR FSAR Tier 2, Section 5.2.4, meets the relevant guidelines in SRP Section 5.2.4 and RG 1.206, Section C.III.1, Chapter 5, C.I.5.2.4, and is thus acceptable. A COL applicant's conformance with these guidelines provides an acceptable basis for satisfying in part the requirements of GDC 32 and 10 CFR 50.55a. In addition, the staff concludes that the COL applicant's proposed resolution to COL Information Item 5.2-3 of the COL FSAR in Section 5.2.4 meets the relevant guidelines in SRP Section 5.2.4 and RG 1.206, Section C.III.1, Chapter 5, C.I.5.2.4, and is thus acceptable. The staff further concludes that the CCNPP Unit 3 PSI and ISI programs and implementation conform to the policy established in SECY-05-0197. Conformance with these guidelines and policy provides an acceptable basis for satisfying, in part, the requirements of GDC 32 and 10 CFR 50.55a. The staff concludes that information required in COL FSAR Section 5.2.4 meets the appropriate regulatory requirements.

5.2.5 Reactor Coolant Pressure Boundary Leakage Detection

The RCPB leakage detection systems are designed to detect and, to the extent practical, to identify the source of reactor coolant leakage.

The staff's review of COL FSAR Chapter 5 is coordinated closely with the staff's review of the U.S. EPR FSAR, Tier 2, Chapter 5. COL FSAR Section 5.2.5 incorporates by reference, with no departures or supplements, U.S. EPR FSAR, Tier 2, Section 5.2.5. The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant regarding reactor coolant pressure boundary leakage detection have been addressed in the COL application. The staff's review of this section of the COL FSAR identified that there are two outstanding issues to be addressed. A COL applicant that references the U.S. EPR design certification application and incorporate U.S. EPR FSAR, Tier 2, Section 5.2.5, is directed to provide supplemental information in the COL FSAR, as discussed below.

RG 1.45, Revision 1, May 2008, "Guidance on Monitoring and Response to Reactor Coolant System Leakage," Regulatory Position C.3, indicates that procedures for converting various indications to a common leakage equivalent should be available to the operators. In RAI 244, Question 05.02.05-6, the staff requested that the design certification applicant address Regulatory Position C.3 in the U.S. EPR FSAR. In a July 14, 2009, response to RAI 244, Question 05.02.05-6 relating to U.S. EPR FSAR Tier 2, Section 5.2.5, "Reactor Coolant Pressure Boundary Leakage Detection," to address the above regulatory position, the U.S. EPR design certification applicant (AREVA) indicated that the reactor coolant leakage detection procedures and alarm set points are to be developed by the COL applicant. Therefore, in RAI 166, Question 05.02.05-1, the staff requested that the COL applicant provide the following information regarding CCNPP Unit 3:

- Provide procedures to convert the instrument indications of various leakage detection methods (e.g., containment radioactivity monitors, containment sump level monitor, containment air cooler condensate flow rate monitor) into common leakage rate (gpm).

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- Specify RCPB leakage detection alarm setpoints and demonstrate that the setpoints are sufficiently low to provide an early warning for operator actions prior to reaching Technical Specification (TS) limits.

In an October 27, 2009, response to RAI 166, Question 05.02.05-1, the COL applicant promised to provide the requested procedures and alarm setponts. However, neither the procedures nor a commitment to provide the promised procedures are currently in the FSAR. The staff has insufficient information to make a determination whether the promised procedures will be consistent with the guidance in RG 1.45 Revision 1 Regulatory Position C.3.3 and has no information as to when the promised procedures will be available for NRC inspection.

Further, the COL applicant's response to RAI 166, Question 05.02.05-1 referred the staff to information in the U.S. EPR FSAR Tier 2, Section 5.2.5, which is incorporated by reference in the COL FSAR. The staff reviewed the U.S. EPR FSAR and did not find the information the COL applicant referenced regarding procedures for conversion and alarm setpoints in the U.S. EPR FSAR. The staff also notes that in its response to RAI 244 Question 05.02.05-6, AREVA directed the COL applicant to provide this information in the COL FSAR. Based upon the review above, the staff has determined that the COL applicant's response is not acceptable. As a result, the staff issued follow-up RAI 223, Question 05.02.5-3, requesting that the COL applicant address the procedures for conversion and alarm setpoints to the COL FSAR. **RAI 223, Question 05.02-05-3 is being tracked as an open item**.

Further, in a July 14, 2009, response to RAI 244, Question 05.02.05-7 issued in the staff's review of U.S. EPR FSAR Tier 2, Section 5.2.5, the U.S. EPR design certification applicant indicated that leakage detection procedures for prolonged low-level leakage are to be developed by the COL applicant. Therefore, the staff issued RAI 166, Question 05.02.05-2, in the staff's review of the COL FSAR, and requested that the COL applicant provide the following information:

> Operating experience at the Davis Besse Nuclear Power Plant indicates that prolonged low-level unidentified leakage inside containment could cause material degradation such that it could potentially compromise the integrity of a system leading to the gross rupture of the reactor coolant pressure boundary. The applicant is requested to provide operating procedures that specify operator actions in response to prolonged low level leakage conditions that exist above normal leakage rates and below the TS limits to provide operator sufficient time to take actions before the TS limit is reached. The procedures would include identifying, monitoring, trending, and repairing prolonged low-level leakage. The guidance about developing such procedures for ensuring effective management of leakage, including low-level leakage, is available in Regulatory Guide 1.45, Regulatory Position C.3.

In an October 27, 2009, response to RAI 166, Question 05.02.05-2, the COL applicant promised to provide the requested procedures, but neither the procedures nor a commitment to provide the procedures are currently in the FSAR, and no commitment was made in the COL FSAR. The staff has insufficient information to make a determination whether the promised procedures will be consistent with the guidance in RG 1.45 Revision 1 Regulatory Position C.3 and has no information as to when the promised procedures will be available for NRC inspection. Additionally, the COL applicant, in responding to RAI 166, Question 05.02.05-2, referred the staff to U.S. EPR FSAR Tier 2, Section 5.2.5, to demonstrate conformance with RG 1.45,

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Revision 1. The staff reviewed the referenced section of the U.S. EPR FSAR AREVA's response to RAI 244, Question 05.02.05-7, in which AREVA directed a COL applicant referencing the U.S. EPR design certification application to provide such information in the COL FSAR, and determined that the COL applicant has not demonstrated conformance with Regulatory Position C.3 in the COL FSAR.

Based upon the review above, the staff has determined that the COL applicant's response is not acceptable. As a result, the staff issued follow-up RAI 223, Question 05.02.5-4, requesting that the COL applicant provide the requested procedures. **RAI 223, Question 05.02-05-4 is being tracked as an open item**.

COL FSAR Section 5.2.5, states that it incorporates by reference "with no departures or supplements" U.S. EPR FSAR Tier 2, Section 5.2.5. Based on the above review, the staff concludes that the COL applicant's determination of "no supplements" is not acceptable. The COL applicant needs to revise the FSAR to provide supplements addressing the above open items.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR Tier 2, Section 5.2.5 on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR regarding RCPB leakage detection will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update Section 5.2.5 of the SER for CCNPP Unit 3 to reflect the final disposition of the U.S. EPR design certification application.

5.3 Reactor Vessel

5.3.1 Reactor Vessel Materials

5.3.1.1 *Introduction*

This section addresses the reactor vessel in terms of material specifications, special processes used for manufacture and fabrication of components, special methods for nondestructive examination, special controls and special processes used for ferritic steels and austenitic stainless steels, fracture toughness, reactor vessel material surveillance program (RVSP), and reactor vessel fasteners.

5.3.1.2 *Summary of Application*

COL FSAR Section 5.3.1 incorporates by reference U.S. EPR FSAR, Tier 2, Section 5.3, with no departures.

COL Information Items

COL Information Item 5.3-1 in COL FSAR Section 5.3.1.6, "Material Surveillance," directs a COL applicant that references the U.S. EPR design certification to identify the implementation milestones for the material surveillance program.

The COL applicant indicated that the implementation milestones for the reactor vessel material surveillance program are provided in COL FSAR Table 13.4-1. Table 13.4-1 indicates that the reactor vessel material surveillance program will be implemented prior to initial fuel load.

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License Conditions: U.S. EPR FSAR Section 5.3.1.6, "Material Surveillance," requires that a COL applicant that references the U.S. EPR design certification will identify the implementation milestones for the material surveillance program. COL FSAR Table 13.4-1 states that the COL will include a license condition that requires the licensee to implement the reactor vessel material surveillance program identified in COL FSAR Table 13.4-1 prior to initial fuel load. COLA Part 10, "Inspections, Tests, Analyses, and Acceptance Criteria," Appendix A, Section 3, "Operational Programs," states that the NRC will use license conditions to ensure implementation for those operational programs whose implementation is not addressed in the regulations, and proposes the following license condition: (Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC) shall implement the programs or portions of programs identified in COL FSAR Table 13.4-1 on or before the associated milestones in COL FSAR Table 13.4-1. COLA Part 10, Appendix A, Section 6, "Operational Program Readiness," states that NRC inspection of operational programs will be the subject of a license condition in accordance with SECY-05-0197, and proposes the following license condition: (Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC) shall submit to the appropriate Director of the NRC, a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of NRC inspections of operational programs listed in the operational program COL FSAR Table 13.4-1. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the operational programs in the COL FSAR table have been fully implemented or the plant has been placed in commercial service, whichever comes first.

5.3.1.3 *Regulatory Basis*

The regulatory basis of the COL information incorporated by reference from the U.S. EPR FSAR is addressed in the staff's FSER on the U.S. EPR FSAR.

In addition, the relevant requirements of NRC regulations for the material surveillance program, and the associated acceptance criteria, are given in NUREG-0800, Section 5.3.1.

The applicable regulatory requirements for the material surveillance program are as follows:

1. 10 CFR Part 50, Appendix A, GDC 32, which requires the design to permit an appropriate material surveillance program for the reactor pressure vessel

2. 10 CFR Part 50, Appendix G, "Fracture Toughness Requirements," as it relates to materials testing and acceptance criteria for fracture toughness

3. 10 CFR Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements," as it relates to RVSP

5.3.1.4 *Technical Evaluation*

The staff reviewed COL FSAR Section 5.3.1 and checked the referenced design certification U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant regarding reactor vessel materials have been addressed in the COL application. The staff's review confirmed that the information contained in the COL application and incorporated by reference from the U.S. EPR FSAR addresses all of the required information relating to this section. U.S. EPR FSAR Tier 2, Section 5.3.1 is being reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR regarding the

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material surveillance program will be documented in the staff's SER on the U.S. EPR design certification application.

The staff reviewed COL FSAR Section 5.3 to determine whether it conforms to the guidance in RG 1.206, Section C.III.1, Chapter 5, C.I.5.3.1, "Reactor Vessel Materials." The subsections of RG 1.206, Section C.III.1, Chapter 5, C.I.5.3.1, related to "Material Specifications," "Special Processes Used for Manufacturing and Fabrication," "Special Methods for Nondestructive Examination," "Special Controls for Ferritic and Austenitic Stainless Steels," "Fracture Toughness," and "Reactor Vessel Fasteners," were all incorporated in the COL FSAR by reference with no departures or supplements from the U.S. EPR FSAR. These topic areas were previously reviewed and approved by the staff as part of the staff's review of the U.S. EPR FSAR, as documented in the staff's FSER related to the U.S. EPR design certification application. The U.S. EPR FSAR did not identify any COL information items for these topic areas.

The remaining topic area, RVSP, has a COL information item that must be addressed by a COL applicant. The U.S. EPR FSAR Tier 2, Section 5.3.1.6, "Material Surveillance," requires a COL applicant referencing the U.S. EPR design certification, to address a COL information item regarding the remaining topic area, RVSP. COL Information Item 5.3-1 directs a COL applicant that references the U.S. EPR design certification to identify the implementation milestones for the material surveillance program.

10 CFR Part 50, Appendix G specifies the fracture toughness requirements for ferritic materials of the pressure-retaining components of the reactor coolant pressure boundary. The reactor vessel beltline materials must have a Charpy Upper Shelf Energy (USE) in the transverse direction for base material and along the weld for weld material, of no less than 101.7 Nm (75 ft-lbs) initially, and must maintain Charpy USE throughout the life of the vessel of no less than 67.8 Nm (50 ft-lbs). The fracture toughness tests required by ASME B&PV Code and by 10 CFR Part 50, Appendix G provide reasonable assurance that adequate safety margins against the possibility of non-ductile behavior or rapidly propagating fracture can be established for all pressure-retaining components of the reactor coolant boundary. 10 CFR Part 50, Appendix H presents the requirements for an RVSP to monitor the changes in the fracture toughness properties of the materials in the reactor vessel beltline region resulting from exposure to neutron irradiation and the thermal environment.

Pursuant to 10 CFR 52.79(a)(13), a COL applicant must propose an RVSP that meets 10 CFR Part 50, Appendix H. The COL application should fully describe this program as defined in SECY-05-0197. In addition, as discussed in SECY-05-0197, the COL applicant should provide implementation and readiness milestones for this program. The COL Applicant addresses implementation milestones for the RVSP in Part 10 of the Calvert Cliffs COL application (COLA). As discussed in COLA Part 10, Sections 3 and 6, the COL applicant proposes license conditions for operational programs implementation and readiness, respectively. In Section 3 of COLA Part 10, the COL applicant refers to FSAR Table 13.4-1 in which the COL applicant identified the RVSP as implemented in accordance with a milestone to be identified in a license condition. In Section 6 of COLA Part 10, which applies to all operational programs, the COL applicant proposes a license condition for operational program readiness which would require that the licensee submit to the appropriate Director of the NRC, a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of NRC inspections of operational programs. The COL applicant's proposed license

conditions are consistent with the policy and guidance established in SECY-05-0197, and are thus acceptable.

RG 1.206 Section C.I.5.3.1.6, "Material Surveillance," provides guidelines for fully describing a material surveillance program. Specifically, this section states that the RVSP and its implementation must be described in sufficient detail to ensure that the program meets the requirements of 10 CFR Part 50, Appendix H. In addition, the COL application should describe the method for calculating neutron fluence for the reactor vessel beltline and the surveillance capsules. RG 1.206 lists some of the topics that should be addressed in the description of the RVSP:

- Basis for the selection of material in the program
- Number and type of specimens in each capsule
- Number of capsules and proposed withdrawal schedule in compliance with the edition of American Society for Testing and Materials' document ASTM E-185, "Standard Practice for Design of Surveillance Programs for Light-Water Moderated Nuclear Power Reactor Vessels," Annual Book of ASTM Standards, Part 30, referenced in 10 CFR Part 50, Appendix H
- Neutron flux and fluence calculations for vessel wall and surveillance specimens
- Projected radiation embrittlement on vessel wall
- Location of capsules, method of attachment, and provisions to ensure that capsules are retained in position throughout the vessel lifetime

U.S. EPR FSAR Tier 2, Section 5.3.1.6, "Material Surveillance," addresses the description of the RVSP. The U.S. EPR FSAR states that the limiting reactor pressure vessel beltline material is predicted to be Weld #2. The prediction uses the maximum initial reference nil ductility temperature (RT_{NDT}) values, maximum nickel and copper contents allowed in the RPV and a fluence of 60 effective full power years (EFPYs). The U.S. EPR FSAR also addresses the number and type of specimens by meeting the ASTM E-185 requirements and describing four capsules, along with their proposed withdrawal schedule. Each capsule contains 12 tensile specimens, 96 Charpy V-notch specimens, and 30 compact tension specimens.

The U.S. EPR FSAR states that the neutron fluence assessments of the U.S. EPR reactor vessel are conducted in accordance with the guidelines that are specified in RG 1.190, ''Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence.'' The vessel fracture toughness data is given in U.S. EPR FSAR Tier 2, Table 5.3-4, "60 EFPY RPV Fluence, Upper Shelf Energy, ART, and RT_{NDT} Projections." The end-of-life RT_{NDT} and upper shelf energy projections were estimated using RG 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," for the end-of-life neutron fluence at the one-quarter thickness and inner-diameter reactor vessel locations. RG 1.99 is the approved method for estimating the expected effects of radiation on vessel wall materials.

In its review of COL FSAR Section 5.3.1.6, the staff noted that the COL information incorporated by reference from U.S. EPR FSAR, Tier 2, Section 5.3.1, in addition to the RVSP program implementation information provided in the COL FSAR and COLA Part 10, meets the minimum guidelines in RG 1.206 for a description of the RVSP and its implementation, but a more

detailed description of the RSVP was needed. Specifically, the staff determined that the COL FSAR must contain more detailed information about the location of the capsules and their associated lead factors is needed prior to COL issuance. Also, the staff determined that before the vessel is fabricated, the COL FSAR must contain a description of the process for preparing the capsule specimens and must confirm that the materials selected for the capsules are samples of the same materials used in the fabrication of the reactor vessel. The COL applicant can provide the staff with other information about the capsule environment after the reactor vessel has been procured.

As part of the staff's review of COL FSAR Section 5.3.1.6, the staff issued RAI 38, Question 05.03.01-1, which requested that the COL applicant provide additional information about the CCNPP Unit 3 RVSP, including location of capsules, lead factors, capsule environment and capsule preparation. In a January 8, 2009, response to RAI 38, Question 05.03.01-1, the COL applicant stated that the design certification applicant, AREVA, in response to RAI 64, Question 05.03.01-5, issued as part of the staff's review of the U.S. EPR FSAR, addressed these questions. The staff reviewed AREVA's response to U.S. EPR FSAR RAI 64, Question 05.03.01-5, which provides information such as capsule locations, lead factors, capsule environment and capsule preparation, and determined that the COL applicant's reference to AREVA's response to U.S. EPR FSAR RAI 64, Question 05.03.01-5, fully answers the questions the staff issued to the COL applicant in RAI 38, Question 05.03.01-1. The staff confirmed that Revision 1 of the U.S. EPR FSAR, dated May 29, 2009, contains the changes committed to in AREVA's October 22, 2008, response to RAI 64, Question 05.03.01-5. Accordingly, the staff determines that the COL applicant has adequately addressed this issue and, therefore, the staff considers RAI 38, Question 05.03.01-1 resolved.

COL FSAR Section 5.3.1.6 states that additional information about the implementation of the CCNPP Unit 3 RVSP is provided in COL FSAR Section 5.3.1.6, in COL Table 13.4-1. This table describes the implementation of the RVSP with a license condition prior to initial fuel load. In addition, COLA Part 10, Appendix A, Item 6, "Operational Program Readiness" states that the licensee will submit to the NRC a schedule, no later than 12 months after issuance of the COL, that supports the planning for and conduct of NRC inspections of operational programs (including the RVSP). The COL applicant's proposed license conditions are consistent with the policy and guidance established in SECY-05-0197, and are thus acceptable.

NRC Generic Letter 92-01, "Reactor Vessel Structural Integrity"

Generic Letter (GL) 92-01 addressed NRC concerns regarding compliance with the requirements of 10 CFR Part 50, Appendices G and H, which address fracture toughness requirements and RVSP requirements, respectively. Specifically, the NRC had concerns about Charpy upper shelf energy predictions for end-of-life for the limiting beltline weld and the plate or forging, reactor vessels constructed to an ASME Code earlier than the Summer 1972 Addenda of the 1971 Edition, and use of RG 1.99, Revision 2, to estimate the embrittlement of the materials in the reactor vessel beltline. In addition, the NRC was concerned about RVSP compliance with ASTM E-185, which requires that the licensee take sample specimens from actual material used in fabricating the beltline of the reactor vessel.

GL 92-01 is appropriately addressed by U.S. EPR FSAR Tier 2, Section 5.3-1 which is incorporated by reference with no departures in COL FSAR Section 5.3.1.6. U.S. EPR FSAR Tier 2, Table 5.3-3, "Maximum Limits for RPV and Appurtenances Material Composition," which is incorporated by reference with no departures in COL FSAR Section 5.3, shows the

maximum limits for copper, nickel, and phosphorous content to reduce the sensitivity of the ferritic materials of the reactor vessel beltline to irradiation embrittlement in service. The U.S. EPR FSAR Tier 2, Section 5.3.1.6, states that the RVSP conforms to ASTM E-185-82.

In RAI 38, Question 05.03.01-1, the staff requested that the COL applicant describe the process for preparing the capsule specimens. Since there is only one opportunity (during vessel fabrication) to take the appropriate sample specimens from the actual material used in fabricating the beltline of the reactor vessel, the staff has emphasized this requirement in this RAI, and requested that the COL applicant's description confirm that the materials selected for the capsules are samples of the same materials used in the fabrication of the RV. In a January 8, 2009, response to RAI 38, Question 05.03.01-1, the COL applicant identified the general location of the capsules, their method of attachment, and the provisions to ensure that capsules are retained in position throughout the vessel lifetime. The COL applicant also referenced U.S. EPR FSAR, Tier 2, Section 5.3.1.6, which states that the capsules are located in guide baskets bolted to the outside of the core barrel and positioned directly opposite the center portion of the core. The U.S. EPR FSAR also states that end-of-life RT_{NDT} and upper shelf energy projections were estimated using RG 1.99, Revision 2. The construction of the reactor vessel to an ASME Code earlier than the Summer 1972 Addenda of the 1971 Edition is not a concern for new reactors, including CCNPP Unit 3. Because the COL applicant identified the location of the capsules and provisions to ensure that the capsules are retained throughout the lifetime of the reactor vessel, and appropriately referenced U.S. EPR FSAR, Tier 2, Section 5.3.1.6, which provides more specific information about the location and manner of affixing the capsules to the vessel, the staff considers these issues resolved.

The staff concludes that by referencing the U.S. EPR FSAR, providing additional information on the location of the capsules, the method that will be used to attach them, and the provisions that will ensure that the capsules remain in position throughout the lifetime of the reactor vessel, the COL applicant has met the intent of GL 92-01. The COL applicant will continue to meet the intent of the GL in the future by providing the summary test reports of the removed capsules to the NRC as required by 10 CFR Part 50, Appendix H.

The staff's review determined that the COL applicant appropriately incorporates by reference U.S. EPR FSAR Tier 2, Section 5.3, and adequately addresses the COL information item on the RVSP.

5.3.1.5 *Post Combined License Activities*

There are no post-COL activities for this section.

5.3.1.6 *Conclusions*

The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR. The staff's review confirmed that the COL applicant addressed all of the required information relating to reactor vessel materials. In addition, the staff concludes that the COL applicant's proposed resolution to the COL information item in COL FSAR Section 5.3.1.6 meets the relevant guidelines of SRP Section 5.3.1, RG 1.206 Section CIII.1 Chapter 5, C.I.5.3.1, C.III.4, and C.IV.4, and is thus acceptable. Conformance with these guidelines provides an acceptable basis for satisfying, in part, the requirements of 10 CFR Part 50, Appendices G and H and GDC 32 of Appendix A.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR regarding reactor vessel materials will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update this report to reflect the final disposition of the U.S. EPR design certification application.

5.3.2 Pressure-Temperature Limits

5.3.2.1 *Introduction*

Pressure-temperature limits are required as a means of protecting the reactor vessel during startup and shut down to minimize the possibility of fast fracture. The methods outlined in ASME Code, Section XI, Appendix G are employed in the analysis of protection against nonductile failure. Beltline material properties degrade with radiation exposure, and this degradation is measured in terms of the adjusted reference temperature (ART), which includes RT_{NDT} shifts, initial RT_{NDT}, and margin.

5.3.2.2 *Summary of Application*

COL FSAR Section 5.3.2 incorporates by reference U.S. EPR FSAR Tier 2, Section 5.3.2, with no departures.

COL Information Items

COL Information Item 5.3-2, in COL FSAR Section 5.3.2.1, "Pressure-Temperature Limit Curves," directs a COL applicant that references the U.S. EPR design certification to provide a plant-specific pressure and temperature limits report (PTLR), consistent with an approved methodology.

In COL FSAR, Section 5.3.2.1, the COL applicant addressed the COL information item by stating that a plant-specific pressure and temperature limits report will be provided in accordance with CCNPP Unit 3 Technical Specification (Part 4 of the COL application), Section 5.6.4. The plant-specific PTLR will be based on the methodology provided in ANP 10283P (AREVA, 2007). ANP-10283 was submitted to the NRC for review and approval in December 2007.

Technical Specifications

The Technical Specifications associated with COL FSAR Section 5.3.2 are given in COLA Part 4, "Technical Specification and Bases," which incorporates U.S. EPR FSAR Tier 2, Chapter 16, Section 5.6.4, "Reactor Coolant System (RCS) Pressure and Temperature Limits Report (PTLR)," by reference, with no departures.

5.3.2.3 *Regulatory Basis*

The regulatory basis of the COL information incorporated by reference from the U.S. EPR FSAR is addressed within the staff's FSER on the U.S. EPR FSAR.

In addition, the relevant requirements of NRC regulations for COL Information Item 5.3-2 and the associated acceptance criteria are given in NUREG-0800, Section 5.3.2 and in 10 CFR Part 50, Appendix G, as it relates to fracture toughness requirements.

[redacted]

5.3.2.4 *Technical Evaluation*

The staff reviewed COL FSAR Section 5.3.2 and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant regarding pressure temperature limits have been addressed in the COL application. The staff's review confirmed that the information contained in the COL application and incorporated by reference from the U.S. EPR FSAR addresses the required information relating to this section. U.S. EPR FSAR Tier 2, Section 5.3.2 is being reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR related to the pressure-temperature (PT) limits, pressurized thermal shock, and Charpy upper-shelf energy data and analyses will be documented in the staff's SER on the U.S. EPR design certification application.

COL Information Items

COL Information Item 5.3-2, in COL FSAR Section 5.3.2, "Pressure-Temperature Limits, Pressurized Thermal Shock, and Charpy Uppershelf Energy Data and Analyses," directs a COL applicant that references the U.S. EPR design certification to provide a plant-specific PTLR consistent with an approved methodology.

To address this COL information Item, COL FSAR Section 5.3.2.1 states that a plant-specific PTLR will be provided in accordance with CCNPP Unit 3 Technical Specification 5.6.4, "Reactor Coolant System Pressure and Temperature Limits Report," and will be based on the methodology provided in ANP-10283P (AREVA, 2007).

In a letter dated April 30, 2009, AREVA submitted a revised technical report, ANP-10283P, Revision 1, to the NRC. The revised technical report contains bounding pressure-temperature (P-T) limit curves based on bounding material properties in the design specifications, and a generic pressure-temperature limits report (PTLR). The staff notes that using a PLTR (reference: NRC Generic Letter 96-03) requires a licensee to inform the staff of any subsequent changes to the P-T limits with no NRC approval necessary when there are no changes to the approved PTLR methodology. This approach is consistent with the approach used for all operating reactors using PTLRs.

In RAI 186, Question 05.03.02-2, the staff requested that the COL applicant confirm the use of the generic PTLR for the U.S. EPR design (provided by AREVA in Technical Report ANP-10283P, Revision 1) and that the COL FSAR Section 5.3.2.1, be revised to provide a commitment to submit plant-specific P-T limits using an approved methodology. In an October 30, 2009, response to RAI 186, Question 05.03.02-2, the COL applicant confirmed the use of the generic PTLR (technical report ANP-10283P, Revision 1) and proposed to update COL FSAR Sections 5.3.2.1 and 5.3.4 accordingly. The COL applicant also proposed revising COL FSAR Section 5.3.2 to indicate that the plant-specific P-T limits will be provided prior to fuel load. The staff finds that the COL applicant's response is in accordance with the guidelines of GL 96-03, and is therefore acceptable. **RAI 186, Question 05.03.02-2 is being tracked as a confirmatory item**.

Except for the confirmatory item identified above, the staff concludes that the information provided in COL FSAR Section 5.3.2.1 and the COL applicant's October 30, 2009, response to RAI 186, Question 05.03.02-2, meets the appropriate regulatory requirements.

[redacted]

[redacted]

5.3.2.5 *Post Combined License Activities*

The COL holder will provide plant-specific P-T limits using actual vessel material properties to the NRC prior to fuel load.

5.3.2.6 *Conclusions*

The staff reviewed the COL application and checked the referenced U.S. EPR FSAR. The staff's review confirmed that the COL applicant addressed all of the required information relating to P-T limits and, with the exception of the confirmatory item discussed above, there is no outstanding information expected to be addressed in the COL FSAR related to P-T limits.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR regarding the P-T limits will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update this report to reflect the final disposition of the U.S. EPR design certification application.

Except for the confirmatory item identified above, the staff concludes that the COL applicant's proposed resolution to COL Information Item 5.3-2 will meet the relevant guidelines of SRP Section 5.3.2, and RG 1.206 Section CIII.1, Chapter 5, C.I.5.3.2. Conformance with these guidelines provides an acceptable basis for satisfying, in part, the requirements of 10 CFR Part 50, Appendix G.

5.3.3 Reactor Vessel Integrity (addressed in SRP Section 5.3.2, "Pressure-Temperature Limits, Upper-Shelf Energy, Pressurized Thermal Shock" and SRP Section 5.3.3 "Reactor Vessel Integrity")

5.3.3.1 *Introduction*

COL FSAR Section 5.3.3 describes the reactor vessel integrity. The reactor vessel (RV) is the reactor coolant pressure boundary used to support and enclose the reactor core. It provides flow direction with the reactor internals through the core and maintains a volume of coolant around the core. The RV is fabricated by welding together the lower head, the transition ring, the lower shell, and the upper shell. The upper shell contains the penetrations from the inlet and outlet nozzles and direct vessel injection nozzles.

As part of RV integrity, this section of the staff's SER also addresses the issue of pressurized thermal shock (PTS). PTS events are transients in a pressurized water RV that can cause severe overcooling of the RV wall, followed by immediate repressurization. The thermal stresses, caused when the inside surface of the RV cools rapidly, combined with high-pressure stresses, will increase the potential for fracture if a flaw is present in a low-toughness material. The materials most susceptible to PTS are those in the RV beltline where neutron radiation causes embrittlement over time. To protect against PTS events, the COL applicant has to provide the plant-specific RT_{PTS} values using the requirements of 10 CFR 50.61.

5.3.3.2 *Summary of Application*

COL FSAR Section 5.3.3 incorporates by reference U.S. EPR FSAR Tier 2, Section 5.3.3, with no departures.

[redacted]

[redacted]

COL Information Items

COL Information Item 5.3-3 in Section 5.3.2.3, "Pressurized Thermal Shock," directs a COL applicant that references the U.S. EPR design certification to provide plant-specific RT_{PTS} values in accordance with 10 CFR 50.61 for vessel beltline materials.

In COL FSAR Section 5.3.2.3, the COL applicant addressed this COL information item by stating that the plant specific RT_{PTS} values for vessel beltline materials will be determined in accordance with 10 CFR 50.61 and provided to the NRC within 1 year of acceptance of the reactor vessel by the licensee.

5.3.3.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference from the U.S. EPR FSAR is addressed within the staff's FSER on the U.S. EPR design certification FSAR. However, COL applicants of pressurized water reactors are required to have the reference temperature, RT_{PTS}, evaluated for the end-of-life (EOL) fluence for each of the RV beltline materials in accordance with requirements of 10 CFR 50.61.

5.3.3.4 *Technical Evaluation*

The staff reviewed COL FSAR Section 5.3.3 and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant regarding reactor vessel integrity, PTLs, upper-shelf energy, and PTS have been addressed in the COL application. The staff's review confirmed that the information contained in the COL FSAR and incorporated by reference from the U.S. EPR FSAR addresses all of the required information relating to this section. U.S. EPR FSAR Tier 2, Section 5.3.3 is being reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR related to pressurized thermal shock and reactor vessel integrity, will be documented in the staff's SER on the U.S. EPR design certification application.

COL Information Item 5.3-3 states that a COL applicant that references the U.S. EPR design certification will provide plant-specific RT_{PTS} values in accordance with 10 CFR 50.61 for vessel beltline materials. The staff notes that the bounding RT_{PTS} values meet the screening criteria of 10 CFR 50.61. To address this COL item, COL FSAR Section 5.3.3 states that the plant-specific RT_{PTS} values for vessel beltline materials will be determined in accordance with 10 CFR 50.61 and provided to the NRC within 1 year of acceptance of the reactor vessel by the licensee. This commitment is also provided as a license condition in COLA Part 10 (ITAAC), Section 2. The staff finds that the COL applicant's response to COL Information Item 5.3-3 is acceptable because it meets the implementation requirements of 10 CFR 50.61. In addition, this will allow ample time for the staff to review the acceptability of the plant-specific RT_{PTS} values. The staff also confirmed that the proposed license condition has been added to Part 10 of the COLA. The COL applicant's proposed license condition is consistent with the policy and guidance established in SECY-05-0197, and is thus acceptable. On the basis, the staff finds that the actions proposed by the COL applicant meet the requirements of 10 CFR 50.61, and are therefore acceptable.

[redacted]

[redacted]

5.3.3.5 *Post Combined License Activities*

Upon receipt of the plant specific RT_{PTS} values, the staff will evaluate them using the 10 CFR 50.61 criteria for acceptance of the RV prior to fuel load.

Proposed License Conditions:

- The plant-specific PTS evaluation will be submitted to the NRC within 1 year of acceptance of the reactor vessel by the licensee

5.3.3.6 *Conclusions*

The staff reviewed the application and checked the referenced sections of the U.S. EPR FSAR. The staff's review confirmed that the COL applicant addressed all of the required information relating to RV integrity.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR related to the RV Integrity will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update this SER to reflect the final disposition of the U.S. EPR design certification application.

5.4 Component and Subsystem Design

5.4.1 Reactor Coolant Pumps

COL FSAR Section 5.4.1 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Section 5.4.1, "Reactor Coolant Pumps. The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR to ensure that all information required to be provided by the COL applicant regarding reactor coolant pumps has been addressed in the COL application. The staff's review confirmed that all required information has been addressed in this section of the COL FSAR.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR Tier 2, Section 5.4.3 on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR regarding reactor coolant pumps will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update Section 5.4.1 of this report to reflect the final disposition of the U.S. EPR design certification application.

5.4.2 Steam Generators (PWR)

5.4.2.1 *Introduction*

The steam generators transfer heat from the reactor core to the secondary system to produce the steam required for turbine operation.

[redacted]

[redacted]

5.4.2.2 *Summary of Application*

COL FSAR Section 5.4.2 incorporates by reference U.S. EPR FSAR Tier 2, Section 5.4.2, with no departures.

COL Information Items

COL Information Item 5.4-1, in COL FSAR Section 5.4.2.5.2.2, "Tube Inspection," directs a COL applicant that references the U.S. EPR design certification to identify the edition and addenda of ASME Section XI applicable to the site-specific SG inspection program.

In COL FSAR Section 5.4.2.5.2.2, "Tube Inspection," the COL applicant provided information that is expected to be standard for all COL applicants that reference the U.S. EPR FSAR to address this COL information item.

Technical Specifications

The Technical Specifications for this area of review are incorporated by reference from U.S. EPR FSAR Tier 2, Chapter 16, "Technical Specifications." These detailed inspection and reporting requirements are provided in technical specifications (TS) Sections 1.1, "Definitions"; 3.4.12, "RCS Operational Leakage"; 3.4.16, "Steam Generator Tube Integrity"; 5.5.8, "Steam Generator Program"; 5.6.7, "Steam Generator Tube Inspection Report"; and in the associated Bases sections of the TS. In Part 4 of the COL FSAR, the COL applicant states that the plant-specific TS for the COL FSAR will be provided after the staff's FSER for the U.S. EPR design certification application is issued.

5.4.2.3 *Regulatory Basis*

The regulatory basis of the COL information incorporated by reference from the U.S. EPR FSAR is addressed within the staff's FSER on the U.S. EPR FSAR.

In addition, the relevant requirements of NRC regulations for the supplemental information provided for this area of review, and the associated acceptance criteria, are given in NUREG-0800, Section 5.4.2.2.

The applicable regulatory requirements for acceptance of the COL information item are:

- 10 CFR 50.55a as they relate to acceptable Code editions for inservice inspection of steam generator tubes.
- 10 CFR 52.79(d), "Contents of Applications; Technical Information in Final Safety Analysis Report."

5.4.2.4 *Technical Evaluation*

The staff reviewed COL FSAR Section 5.4.2 and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant regarding steam generators for PWRs have been addressed in the COL application. The staff's review confirmed that the information contained in the COL application and incorporated by reference from the U.S. EPR FSAR addresses all of the required information relating to this section. U.S. EPR FSAR Tier 2,

[redacted]

[redacted]

Section 5.4.2 is being reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR regarding the steam generator will be documented in the staff's SER on the U.S. EPR design certification application.

The staff reviewed COL FSAR Section 5.4.2 and the referenced section of the U.S. EPR FSAR to ensure that the information contained in the COL FSAR satisfies the requirements of 10 CFR 52.79(d), "Contents of Applications; Technical Information in Final Safety Analysis Report," and that any supplemental information to be provided by the COL applicant has been addressed in the COL application.

Initially, it was not clear to the staff how the Steam Generator Program was included as an operational program and how the COL applicant would ensure all tubes are inspected before being placed into service, in conformance with the guidance in SRP Section 5.4.2.2. Therefore, the staff requested clarification through RAI 40, Questions 05.04.02.02-1 and 05.04.02.02-2. In a January 8, 2009, response to RAI 40, Questions 05.04.02.02-1 and 05.04.02.02-2, the COL applicant stated that COL FSAR Table 13.4-1 will be updated to include a reference to COL FSAR Section 5.4.2.5 for the preservice inspection program. The COL applicant subsequently revised the COL FSAR in Revision 5 by including a reference to COL FSAR Section 5.4.2.5 under the Inservice Inspection Program section of COL FSAR Table 13.4-1. Therefore, the staff considers RAI 40, Question 05.04.02.02-1 closed. However, in response to RAI 40, Question 05.04.02.02-2, the COL applicant added a reference to COL FSAR Section 5.4.2.5 under the Preservice Testing Program of COL FSAR Table 13.4-1 rather than the Preservice Inspection Program. Therefore, in a follow-up RAI 227, Question 05.04.02.02-13, the staff requested that the applicant modify COL FSAR Table 13.4-1 to reference COL FSAR Section 5.4.2.5 under "Preservice Inspection Program." **RAI 227, Question 05.04.02.02-13 is being tracked as an open item**.

COL Information Items

COL Information Item 5.4-1 directs a COL applicant that references the U.S. EPR design certification to identify the edition and addenda of ASME Section XI applicable to the site-specific SG inspection program.

The COL applicant addressed this information in COL FSAR Section 5.4.2.5.2.2. The staff reviewed the information the COL applicant provided to address COL Information Item 5.4-1 to determine whether it was consistent with the requirements of 10 CFR 50.55a as it relates to inspection of steam generator tubing (as part of the reactor coolant pressure boundary) and with the Code edition identified in U.S. EPR FSAR Tier 2, Section 5.4.2 and COL FSAR Section 5.2.4.

The staff found that there was an inconsistency in the COL applicant's use of the term "initial" in COL FSAR Section 5.4.2.5.2.2. In addition, the staff identified a potential discrepancy in the COL applicant's statements about the need for relief requests. Therefore, in RAI 40, Questions 05.04.02.02-11 and 05.04.02.02-12, the staff requested that the COL applicant provide additional information to clarify the wording related to initial inspections, preservice inspections, and the potential for relief requests. In a January 8, 2009, response to RAI 40, Questions 05.04.02.02-11 and 05.04.02.02-12, the COL applicant stated they would revise the COL FSAR to address these issues. In COL FSAR Revision 5, the COL applicant provided the following revised Section 5.4.2.5.2.2 to address COL Information Item 5.4-1:

[redacted]

[redacted]

> The Steam Generator Program tube inspections for preservice inspection and the initial inservice inspection interval will comply with ASME Boiler and Pressure Vessel Code, Section XI, 2004 edition (ASME, 2004). This code is consistent with that established in U.S. EPR FSAR Section 5.4.2. No relief requests or alternatives are required for use of the 2004 Edition of ASME Section XI.
>
> The Steam Generator Program tube inspections for the initial inservice inspection interval shall incorporate the latest edition and addenda of the ASME Boiler and Pressure Vessel Code approved in 10 CFR 50.55a(b) (CFR, 2008) on the date 12 months before initial fuel load. Inservice inspections conducted during successive 120-month inspection intervals must comply with the requirements of the latest edition and addenda of the Code incorporated by reference in 10 CFR 50.55a(b) 12 months before the start of the 120-month inspection interval (or the optional ASME Code Cases given in Regulatory Guide 1.147 (NRC, 2007), that are incorporated by reference in 10 CFR 50.55a(b), subject to the limitations and modifications given in 10 CFR 50.55a(b).
>
> Should relief requests be required due to the use of code additions/addenda later than the 2004 edition, they will be developed through the regulatory process and submitted to the NRC for approval in accordance with 10 CFR 50.55a(g)(5). The relief requests shall include appropriate justifications and proposed alternative inspection methods.

COL FSAR Section 5.4.2.5.2.2, as shown above, is acceptable, because it refers to the same Code edition (2004) as the corresponding section of the U.S. EPR FSAR (i.e., U.S. EPR FSAR Tier 2, Section 5.4.2) and COL FSAR Section 5.2.4, "Inservice Inspection and Testing of the Reactor Coolant Pressure Boundary." The 2004 edition of the Code is acceptable for inservice inspection, because it is incorporated by reference into NRC regulations [10 CFR 50.55a(b)]. The information regarding the inspection program following issuance of a COL is acceptable, because it complies with the inservice examination requirements in 10 CFR 50.55a(g) for both the initial inspection interval and subsequent intervals. Therefore, the staff considers RAI 40, Questions 05.04.02.02-11 and 05.04.02.02-12 resolved.

Technical Specifications

Review of the information incorporated by reference included the TS and Bases sections related to steam generator tube integrity given above in "Summary of Application." In RAI 40, Questions 05.04.02.02-3 through 05.04.02.02-10, the staff requested that the COL applicant provide additional information about the TS and Bases to ensure consistency with the U.S. EPR FSAR and the standard technical specifications (STS). In a January 8, 2009, response to RAI 40, Questions 05.04.02.02-3 through 05.04.02.02-10, the COL applicant proposed changes that will be incorporated into the CCNPP Unit 3 TS after these changes are made in the U.S. EPR FSAR. The method the COL applicant proposes for making the necessary changes in the COL FSAR is acceptable, because this method will ensure that the COL FSAR TS conform to the U.S. EPR FSAR and STS. In Part 4 of the COL FSAR, Revision 5, the COL applicant states that the plant-specific TS will be provided after the final staff SER for the U.S. EPR design certification application is issued. The staff is tracking the COL applicant's commitment to revise the TS in the manner described. **RAI 40, Question 05.04.02.02-1 is being tracked as a confirmatory item**.

[redacted]

[redacted]

5.4.2.5 *Post Combined License Activities*

There are no post COL activities related to this section.

5.4.2.6 *Conclusions*

The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR. The staff's review confirmed that except for the open and confirmatory item discussed above, the COL applicant addressed all of the required information relating to the steam generator.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR regarding the steam generator will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update this report to reflect the final disposition of the U.S. EPR design certification application.

The staff concludes that the COL applicant's proposed method for addressing COL Information Item 5.4-1 is an acceptable means of conforming the COL FSAR TS to the corresponding information on STS in the U.S. EPR design certification application and meets the relevant guidelines of 10 CFR 50.55a as they relate to acceptable Code editions for inservice inspection of steam generator tubes. Except for the confirmatory item identified above, the staff concludes that the COL applicant's proposed resolution to COL Information Item 5.4-1 will meet the relevant guidelines of SRP Section 5.4.2.2 and provides an acceptable basis for satisfying, in part, the requirements of 10 CFR 50.55a and 10 CFR 52.79(d).

5.4.3 Reactor Coolant Piping

COL FSAR Section 5.4.3 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Section 5.4.3. The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant have been addressed in the COL application. The staff's review confirmed that all information required to be provided by the COL applicant has been addressed in the COL application.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR Tier 2, Section 5.4.3 on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR regarding the reactor coolant piping will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update Section 5.4.3 of this report to reflect the final disposition of the U.S. EPR design certification application.

5.4.4 Main Steamline Flow Restrictors (Not used in EPR Design)

5.4.5 Main Steam Isolation System (Not used in EPR Design)

5.4.6 Reactor Core Isolation Cooling System (Not used in EPR Design)

[redacted]

5.4.7 Residual Heat Removal

COL FSAR Section 5.4.7 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Section 5.4.7. The staff reviewed the COL application and checked the referenced section of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant relating to residual heat removal have been addressed in the COL application, with the exception of one item. The staff's review confirmed that there was one outstanding open item related to the corresponding subsection of the U.S. EPR FSAR relating to the evaluation of low head safety injection (LHSI) net positive suction head (NPSH) during design basis accidents (DBAs).

Summary of Open Item Regarding Evaluation of LHSI NPSH during DBAs in the U.S. EPR FSAR

- In RAI 212, Question 06.03-6, issued as part of the staff's review of the U.S. EPR design certification application, the staff requested that AREVA provide the evaluation of LHSI NPSH during design basis accidents DBAs which should include the consideration of IRWST water temperature, suction sump screen blockage, and uncertainty in hydraulic resistances. The evaluation should demonstrate that there is sufficient NPSH during DBAs. The staff is currently reviewing AREVA's response to this RAI, which will be addressed in the staff's SER of Section 6.3 of the U.S. EPR FSAR.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR Tier 2, Section 5.4.7 on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR regarding the residual heat removal system will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update Section 5.4.7 of this report to reflect the final disposition of the U.S. EPR design certification application.

5.4.8 Reactor Core Isolation Cooling System (Not Used in U.S. EPR Design)

5.4.9 Main Steam Lines & Feedwater Piping (Not Used in U.S. EPR Design)

5.4.10 Pressurizer

COL FSAR Section 5.4.10 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Section 5.4.10. The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant have been addressed in the COL application. The staff's review confirmed that all information required to be provided by the COL applicant has been addressed in the COL application.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR Tier 2, Section 5.4.10 on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR regarding the pressurizer will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update Section 5.4.10 of this report to reflect the final disposition of the design U.S. EPR certification application.

5.4.11 Pressurizer Relief Tank

COL FSAR Section 5.4.11 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Section 5.4.11. The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant regarding the pressurized relief tank have been addressed in the COL application. The staff's review confirmed that all information required to be provided by the COL applicant has been addressed in the COL application.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR Tier 2, Section 5.4.11 on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR regarding the pressurizer relief tank will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update Section 5.4.11 of this report to reflect the final disposition of the U.S. EPR design certification application.

5.4.12 Reactor Coolant System High Point Vents

COL FSAR Section 5.4.12 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Section 5.4.12. The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant relating to reactor coolant system high point vents have been addressed in the COL application, with the exception of one item. The staff's review confirmed that there was one outstanding open item related to the corresponding subsection of the U.S. EPR FSAR relating to the chemical and volume control system (CVCS).

Summary of Open Item Regarding the CVCS in the U.S. EPR FSAR

- In RAI 342, Question 05.04.12-5, issued as part of the staff's review of the U.S. EPR design certification application, the staff requested that AREVA address the following issues:
    - Confirmation that the CVCS can provide adequate makeup if the high point vent system fails open
    - Confirmation that this failure would not be classified as a LOCA
    - Identify the makeup system that complies with GDC 33 or provide justification that GDC 33 is not applicable

RAI 342, Question 05.04.12-5 is being tracked in the staff's review of the U.S. EPR design certification application as an open item. The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR Tier 2, Section 5.4.12 on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR regarding the reactor coolant system high point vents will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update Section 5.4.12 of this report to reflect the final disposition of the U.S. EPR design certification application.

[redacted]

5.4.13 Safety and Relief Valves

COL FSAR Section 5.4.13 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Section 5.4.13. The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant regarding safety and relief valves have been addressed in the COL application. The staff's review confirmed that all information required to be provided by the COL applicant has been addressed in this section of the COL application.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR Tier 2, Section 5.4.13 on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR FSAR regarding the safety and relief valves will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update Section 5.4.13 of this report to reflect the final disposition of the U.S. EPR design certification application.

5.4.14 Component Supports

COL FSAR Section 5.4.14 incorporates by reference, with no departures or supplements, U.S. EPR FSAR Tier 2, Section 5.4.14. The staff reviewed the COL application and checked the referenced sections of the U.S. EPR FSAR to ensure that all COL information items, interface items, and supplemental information required to be provided by the COL applicant regarding component supports have been addressed in the COL application. The staff's review confirmed that all information required to be provided by the COL applicant has been addressed in this section of the COL application.

The staff is reviewing the COL information incorporated by reference from the U.S. EPR FSAR Tier 2, Section 5.4.14 on Docket No. 52-020. The results of the staff's technical evaluation of the COL information incorporated by reference from the U.S. EPR regarding component supports will be documented in the staff's SER on the U.S. EPR design certification application. The staff will update Section 5.4.14 of this report to reflect the final disposition of the U.S. EPR design certification application.

[redacted]

March 30, 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 5, "REACTOR COOLANT SYSTEM AND CONNECTED SYSTEMS"

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) application 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 ML090900191, with Open Items for Chapter 5, "Reactor Coolant System And Connected Systems," 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 you 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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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
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/

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Docket No. 52-016

Enclosure:
As stated

cc: See next page

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MEMO: ML100600986
SER: ML090900191

NRO-002

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DATE	3/29/10	3/29/10	3/29/10	3 /30/10
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DATE	3/30/10	3/30/10	3/23/10	3/30/10

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