CONTENTS

Contents i

List of Figures ii

List of Tables iii

4 REACTOR 4-1

LIST OF FIGURES

No figures were included in this chapter.

LIST OF TABLES

No tables were included in this chapter.

4 REACTOR

This chapter of the FSAR typically contains a summary description of the reactor design, as well as a more detailed description of the fuel system design, nuclear design, thermal-hydraulic design, and reactor materials. It also presents a functional description of reactivity control systems.

4.1 Introduction

This chapter describes the mechanical components of the U.S. EPR and the Reactor Core including the reactor internals, control rod drive, and core support structural materials, fuel system design (fuel rods and assemblies), the nuclear design, and the thermal-hydraulic design. It provides an evaluation and the supporting information necessary to establish the capability of the reactor to perform its safety functions throughout its design lifetime under all normal operational modes, including transient, steady-state, and accident conditions. This chapter also includes information to support the accident analyses.

The staff reviewed the information in the U.S EPR FSAR Tier 2, Chapter 4 on Docket No. 52-020. The results of the staff's technical evaluation of the information related to the reactor incorporated by reference in the COL FSAR has been documented in the staff safety evaluation report (SER) on the design certification application for the U.S. EPR. The Safety SER on the U.S. EPR FSAR is not yet complete. **RAI 222, Question 01-5 is being tracked as an open item** as part of this Chapter. The staff will update Chapter 4 of this report to reflect the final disposition of the design certification application.

4.2 Summary of Application

Chapter 4 of the Calvert Cliffs Nuclear Power Plant (CCNPP), Unit 3 combined license (COL) Final Safety Analysis Report (FSAR), Revision 6 incorporates by reference, with no departures, U.S. EPR FSAR Tier 2, Chapter 4, "Reactor," Revision 1.

4.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in U.S. EPR FSAR Tier 2, Chapter 4 of the Final Safety Evaluation Report (FSER).

4.4 Technical Evaluation

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed COL FSAR Chapter 4 and checked the referenced U.S. EPR FSAR to ensure that the combination of the information incorporated by reference from the U.S. EPR FSAR and the information in the COL FSAR represents the complete scope of information relating to this review topic. Chapter 4 contains the following sections:

4.1 Summary Description

4.2 Fuel System Design

4.3 Nuclear Design

4.4 Thermal and Hydraulic Design

4.5 Reactor Materials

4.5.1 Control Rod Drive Structural Materials

4.5.2 Reactor Internal and Core Support Structure Materials

4.6 Functional Design of Reactivity Control System

The staff's review confirmed that the information contained in the COL application and the information incorporated by reference from the U.S. EPR FSAR addresses the required information relating to this Chapter.

U.S. EPR FSAR Tier 2, Chapter 4 is being reviewed by the staff under Docket No. 52-020. The staff's technical evaluation of the information incorporated by reference related to Chapter 4 will be documented in the safety evaluation report (SER) on the design certification application for the U.S. EPR design. Currently, there are unresolved requests for additional information associated with the U.S. EPR FSAR safety review.

The staff notes that a COL information item has been requested in an open item in Section 4.3 of the SER on the U.S. EPR FSAR Tier 2, Section 4.3, to address plant specific surveillance of the reactor internals in regard to fluence calculation methodology. The COL FSAR will need to address this COL information item once it is added to the U.S. EPR FSAR Tier 2, Section 4.3. In a letter dated March 12, 2010, the COL applicant stated that when the COL item is added to the U.S. EPR FSAR, the applicable parts of the COL application for CCNPP Unit 3 would be updated to address this additional requirement. The staff cannot make a final determination on the COL FSAR, Section 4.3, until this issue is addressed. The staff has issued a question requesting that the COL applicant address the requirements of the COL information item resulting from open items in the U.S. EPR FSAR review. **RAI 225, Question 04.03-1, is being tracked as an open item.**

The staff also notes that the COL application for the CCNPP Unit 3, Part 7, Item 1.2.6 includes an exemption on the use of M5™ advanced zirconium alloy fuel rod cladding. The staff issued RAI 226, Question 04.02-1 to track the evaluation of this exemption request, which is currently underway, in the review of the COL application. The staff cannot make a final determination on the COL FSAR, Section 4.2, until this issue is addressed. **RAI 226, Question 04.02-1 is being tracked as an open item.**

4.5 Post Combined License Activities

There are no post COL activities related to this chapter.

4.6 Conclusion

The staff reviewed the COL application and checked the referenced U.S. EPR FSAR. The staff's review confirmed that the COL applicant addressed the required information relating to the reactor with the exception of the three open items being tracked as discussed above. The COL applicant is expected to address the outstanding information in the COL FSAR related to this chapter.