

## 4.0 REACTOR

### 4.1 Introduction

This chapter describes the mechanical components of the Economic Simplified Boiling-Water Reactor (ESBWR) 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.

### 4.2 Summary of Application

Chapter 4 of the North Anna 3 combined license (COL) Final Safety Analysis Report (FSAR), Revision 1 incorporates by reference, with no departures, Chapter 4, "Reactor," of the ESBWR Design Control Document (DCD), Revision 5. In addition, in the FSAR Chapter 4, the applicant provided the following information to address COL items.

#### COL Items

- STD COL 4.3-1-A Variances from Certified Design
- STD COL 4A-1-A Variances from Certified Design

For both items, the applicant stated that there are no changes from the referenced certified design.

### 4.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in Chapter 4 of the Final Safety Evaluation Report (FSER) related to the ESBWR DCD.

### 4.4 Technical Evaluation

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed Chapter 4 of the North Anna 3 COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the information in the COL represent the complete scope of information relating to this review topic.<sup>1</sup> 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

---

<sup>1</sup> See Section 1.2.2, "Finality of Referenced NRC Approvals," for a discussion on the staff's review related to verification of the scope of information to be included within a COL application that references a design certification.

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 application and incorporated by reference addresses the required information relating to this Chapter.

Chapter 4 of the ESBWR DCD is being reviewed by the staff under Docket No. 52-010. The NRC 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 ESBWR design.

The staff reviewed the information contained in the COL FSAR and concluded that the applicant's resolutions to the COL items are within the scope of the design certification (DC), and are thus, acceptable.

**4.5 Post Combined License Activities**

There are no post COL activities related to this chapter.

**4.6 Conclusion**

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the reactor and there is no outstanding information expected to be addressed in the COL FSAR related to this chapter.

The Staff is reviewing the information in DCD Chapter 4 on Docket No. 52-010. The results of the NRC staff's technical evaluation of the information related to "Reactor," incorporated by reference in the North Anna 3 COL FSAR will be documented in the staff SER on the DC application for the ESBWR. The SER on the ESBWR is not yet complete, and this is being tracked as part of **Open Item 1-1**. The staff will update Chapter 4 of this SER to reflect the final disposition of the design certification application.