

# **FINAL SAFETY ANALYSIS REPORT**

## **CHAPTER 5**

### **REACTOR COOLANT SYSTEM AND CONNECTED SYSTEMS**

## **5.0 REACTOR COOLANT SYSTEM AND CONNECTED SYSTEMS**

This chapter of the U.S. EPR Final Safety Analysis Report (FSAR) is incorporated by reference with supplements as identified in the following sections.

**5.1 SUMMARY DESCRIPTION**

This section of the U.S. EPR FSAR is incorporated by reference.

## **5.2 INTEGRITY OF THE REACTOR COOLANT PRESSURE BOUNDARY**

This section of the U.S. EPR FSAR is incorporated by reference with the following supplemental information.

### **5.2.1 COMPLIANCE WITH CODES AND CODE CASES**

#### **5.2.1.1 Compliance with 10 CFR 50.55a**

No departures or supplements.

#### **5.2.1.2 Compliance with Applicable Code Cases**

The U.S. EPR FSAR includes the following COL Item in Section 5.2.1.2:

A COL applicant that references the U.S. EPR design certification will identify additional ASME code cases to be used.

This COL Item is addressed as follows:

No additional ASME code cases will be utilized.

### **5.2.2 OVERPRESSURE PROTECTION**

No departures or supplements.

### **5.2.3 REACTOR COOLANT PRESSURE BOUNDARY MATERIALS**

No departures or supplements.

### **5.2.4 INSERVICE INSPECTION AND TESTING OF THE RCPB**

The U.S. EPR FSAR includes the following COL Item in Section 5.2.4:

A COL applicant that references the U.S. EPR design certification will 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). The program will identify the applicable edition and addenda of the ASME Section XI, and will identify any additional relief requests and alternatives to Code requirements.

This COL Item is addressed as follows:

Preservice inspection and inservice inspection programs for the RCPB meet the requirements of 10 CFR 50.55a(g), and comply with ASME Boiler and Pressure Vessel Code, Section XI, 2004 (ASME, 2004) edition. This code is consistent with that established in U.S. EPR FSAR Section 5.2.4. No relief requests or alternatives are required. The implementation milestones for the site-specific ASME Section XI preservice and inservice inspection programs for the RCPB are identified in Table 13.4-1.

The initial inservice inspection program 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. Inservice examination of components and system pressure tests 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 listed in Regulatory Guide 1.147, that are incorporated by reference in 10 CFR 50.55a(b), subject to the limitations and modifications listed in 10 CFR 50.55a(b)).

Should relief requests be required, 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.

### **5.2.5 RCPB LEAKAGE DETECTION**

No departures or supplements.

### **5.2.6 REFERENCES**

{**ASME, 2004.** Rules for Inservice Inspection of Nuclear Power Plant Components, ASME Boiler and Pressure Vessel Code, Section XI, American Society of Mechanical Engineers, 2004.}

### **5.3 REACTOR VESSEL**

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements.

#### **5.3.1 REACTOR VESSEL MATERIALS**

No departures or supplements.

##### **5.3.1.1 Material Specifications**

No departures or supplements.

##### **5.3.1.2 Special Processes Used for Manufacturing and Fabrication**

No departures or supplements.

##### **5.3.1.3 Special Methods for Nondestructive Examination**

No departures or supplements.

##### **5.3.1.4 Special Controls for Ferritic and Austenitic Stainless Steels**

No departures or supplements.

##### **5.3.1.5 Fracture Toughness**

No departures or supplements.

##### **5.3.1.6 Material Surveillance**

The U.S. EPR FSAR includes the following COL Item in Section 5.3.1.6:

A COL applicant that references the U.S. EPR design certification will identify the implementation milestones for the material surveillance program.

This COL Item is addressed as follows:

The implementation milestones for the Reactor Vessel material surveillance program are provided in Table 13.4-1.

##### **5.3.1.7 Reactor Vessel Fasteners**

No departures or supplements.

#### **5.3.2 PRESSURE-TEMPERATURE LIMITS, PRESSURIZED THERMAL SHOCK, AND CHARPY UPPER-SHELF ENERGY DATA AND ANALYSES**

No departures or supplements.

##### **5.3.2.1 Pressure-Temperature Limit Curves**

The U.S. EPR FSAR includes the following COL Holder Item in Section 5.3.2.1:

A COL applicant that references the U.S. EPR design certification will provide a plant-specific pressure and temperature limits report (PTLR), consistent with an approved methodology.

This COL Holder Item is addressed as follows:

A plant-specific PTLR will be provided in accordance with {BBNPP} Technical Specification 5.6.4, "Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)," and will be based on the methodology provided in ANP-10283P (AREVA, 2007).

#### **5.3.2.2 Operating Procedures**

No departures or supplements.

#### **5.3.2.3 Pressurized Thermal Shock**

The U.S. EPR FSAR includes the following COL Holder Item in Section 5.3.2.3:

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.

This COL Holder Item is addressed as follows:

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 one year of acceptance of the reactor vessel by the licensee.

#### **5.3.2.4 Upper-Shelf Energy**

No departures or supplements.

### **5.3.3 REACTOR VESSEL INTEGRITY**

No departures or supplements.

### **5.3.4 REFERENCES**

{AREVA, 2009. Reactor Coolant System (RCS) Pressure and Temperature Limits Report (PTLR), ANP-10283P, Revision 1, AREVA NP, 2009.}

## **5.4 COMPONENT AND SUBSYSTEM DESIGN**

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements.

### **5.4.1 REACTOR COOLANT PUMPS**

No departures of supplements

### **5.4.2 STEAM GENERATORS (PWR)**

No departures or supplements.

#### **5.4.2.1 Design Bases**

No departures or supplements.

#### **5.4.2.2 Design Description**

No departures or supplements.

#### **5.4.2.3 Design Evaluation**

No departures or supplements.

#### **5.4.2.4 Steam Generator Materials**

No departures or supplements.

#### **5.4.2.5 Steam Generator Program**

No departures or supplements.

##### **5.4.2.5.1 Steam Generator Design**

No departures or supplements.

##### **5.4.2.5.2 Steam Generator Program Elements**

No departures or supplements.

###### **5.4.2.5.2.1 Degradation Assessment**

No departures or supplements.

###### **5.4.2.5.2.2 Tube Inspection**

The U.S. EPR FSAR includes the following COL Item in Section 5.4.2.5.2.2:

A COL applicant that references the U.S. EPR design certification will identify the edition and addenda of ASME Section XI applicable to the site-specific SG inspection program.

This COL item is addressed as follows:

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) 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 listed in Regulatory Guide 1.147, that are incorporated by reference in 10 CFR 50.55a(b), subject to the limitations and modifications listed 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.

#### **5.4.2.5.2.3 Tube Integrity Assessment**

No departures or supplements.

#### **5.4.2.5.2.4 SG Tube Plugging**

No departures or supplements.

#### **5.4.2.5.2.5 Primary-to-Secondary Leak Monitoring**

No departures or supplements.

#### **5.4.2.5.2.6 Maintenance of SG Secondary Side Integrity**

No departures or supplements.

#### **5.4.2.5.2.7 Secondary Side Water Chemistry**

No departures or supplements.

#### **5.4.2.5.2.8 Primary Side Water Chemistry**

No departures or supplements.

#### **5.4.2.5.2.9 Foreign Material Exclusion**

No departures or supplements.

#### **5.4.2.5.2.10 Contractor Oversight**

No departures or supplements.

#### **5.4.2.5.2.11 Self Assessment**

No departures or supplements.

#### **5.4.2.5.3 Reporting**

No departures or supplements.

### **5.4.3 REACTOR COOLANT PIPING**

No departures or supplements.

**5.4.4 NOT USED IN U.S. EPR DESIGN**

No departures or supplements.

**5.4.5 NOT USED IN U.S. EPR DESIGN**

No departures or supplements.

**5.4.6 NOT USED IN U.S. EPR DESIGN**

No departures or supplements.

**5.4.7 RESIDUAL HEAT REMOVAL SYSTEM**

No departures or supplements.

**5.4.8 NOT USED IN U.S. EPR DESIGN**

No departures or supplements.

**5.4.9 NOT USED IN U.S. EPR DESIGN**

No departures or supplements.

**5.4.10 PRESSURIZER**

No departures or supplements.

**5.4.11 PRESSURIZER RELIEF TANK**

No departures or supplements.

**5.4.12 REACTOR COOLANT SYSTEM HIGH POINT VENTS**

No departures or supplements.

**5.4.13 SAFETY AND RELIEF VALVES**

No departures or supplements.

**5.4.14 COMPONENT SUPPORTS**

No departures or supplements.

**5.4.15 REFERENCES**

{**ASME, 2004.** Rules for Inservice Inspection of Nuclear Power Plant Components, ASME Boiler and Pressure Vessel Code, Section XI, American Society of Mechanical Engineers, 2004.}