# 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

### 5.2.5.1 Detecting, Monitoring and Collecting Unidentified Leakage

No departures or supplements.

### 5.2.5.2 Detecting, Monitoring and Collecting Identified Leakage

No departures or supplements.

### 5.2.5.3 Detecting and Monitoring Intersystem Leakage

No departures or supplements.

### 5.2.5.4 Inspection and Testing Requirements

No departures or supplements.

### 5.2.5.5 Instrumentation Requirements

The U.S. EPR FSAR includes the following COL, Item in Section 5.2.5.5:

> A COL, applicant that references the U.S. EPR design certification will develop procedures in accordance with RG 1.45, Revision 1.

This COL Item is addressed as follows:

Operating and emergency operating procedures will conform to the guidance of RG 1.45, Revision 1, including adjustment of leakage rate alarm setpoints as specified in Regulatory Position C.3.2. The procedures will also provide conversion of instrument indications of various leakage detection instruments into a common leak rate and procedures that specify operator actions in response to leakage rates less than the limits set forth in the plant technical specifications.

Operating and emergency procedures will be developed in accordance with the schedule provided in Section 13.5.2.1.5.

## 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.

##### 5.3.1.6.1 Fluence Monitoring

No departures or supplements.

##### 5.3.1.6.2 Plant Specific Monitoring

The U.S. EPR FSAR includes the following COL Item in Section 5.3.1.6.2:

> A COL Applicant that references the U. S. EPR design certification will provide plant specific surveillance capsule data to benchmark BAW-2241 P-A and demonstrate applicability to the specific plant.

This COL Item is addressed as follows:

Plant specific surveillance capsule data will be provided to benchmark BAW-2241 P-A and demonstrate its applicability to the plant.

#### 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 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 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, Revision 1(AREVA, 2009), prior to initial fuel load.

#### 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 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 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.}