CHAPTER 5

REACTOR COOLANT AND CONNECTING SYSTEMS

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ACRONYMS AND ABBREVIATIONS

ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
COL	Combined License
CPNPP	Comanche Peak Nuclear Power Plant
CS	containment spray
DCD	Design Control Document
EOL	end-of-life
ISI	inservice inspection
IST	inservice testing
PTLR	pressure and temperature limits report
PSI	preservice inspection
PST	preservice testing
RCPB	reactor coolant pressure boundary
RG	Regulatory Guide
RHR	residual heat removal
RT_{PTS}	reference pressurized thermal shock temperature
USE	upper shelf energy

5.0 REACTOR COOLANT AND CONNECTING SYSTEMS

5.1 SUMMARY DESCRIPTION

This section of the referenced Design Control Document (DCD) is incorporated by reference with no departures or supplements.

5.2 INTEGRITY OF REACTOR COOLANT PRESSURE BOUNDARY

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

5.2.1.1 Compliance with 10 CFR 50, Section 50.55a

STD COL 5.2(11) Replace the third sentence of the second paragraph in DCD Subsection 5.2.1.1 with the following.

The licensee uses ASME Code editions and addenda that is the same as those specified in the US-APWR DCD Table 5.2.1-1 and DCD Subsection 3.9.10, Reference 3.9-13.

5.2.1.2 Compliance with Applicable Code Cases

Replace the third paragraph in DCD Subsection 5.2.1.2 with the following.

STD COL 5.2(1)
STD COL 5.2(2)
STD COL 5.2(3) The licensee uses no Code Cases listed in Regulatory Guide (RG) 1.84 beyond those listed in the referenced DCD. The use of Code Cases including those listed in RG 1.147 is identified in the inservice inspection (ISI) program (Subsection 5.2.4 and Section 6.6). The use of Code Cases including those listed in RG 1.192 is identified in the inservice testing (IST) program (Subsection 3.9.6 and 5.2.4).

5.2.3.2.1 Chemistry with Reactor Coolant

STD COL 5.2(12) Replace the second sentence of the third paragraph with the following.

The reactor coolant chemistry control program is based on the latest effective version of the EPRI Water Chemistry Guidelines.

5.2.4.1 Inservice Inspection and Testing Program

STD COL 5.2(4) Replace the first sentence of the fourth paragraph in DCD Subsection 5.2.4.1 with the following.

The implementation milestones for the ISI program and the IST program are provided in Table 13.4-201.

Add the following text after the first sentence of the fifth paragraph in DCD Subsection 5.2.4.1.

The boric acid corrosion control program (BACCP) includes procedures for determining the principal locations where leakage may cause degradation of the primary pressure boundary by boric acid corrosion. Procedures for controlling leakage include provisions to detect and locate small leaks using on-line leakage monitoring and/or visual inspection. Leakage that is below allowable Technical Specification limits is detected by indication and trending of on-line leakage detection data gathered from containment sump level and flow monitoring, containment air cooler condensate flow rate monitoring, containment airborne particulate radioactivity monitoring, humidity, temperature, and pressure monitoring of the containment atmosphere, and observing gross leakage from changes in the reactor coolant inventory. If a trend indicates reactor coolant leakage, operators are trained to take action to identify possible leak locations.

In addition, the following visual inspections are routinely conducted in order to identify leakage.

- Visual inspection of accessible and observable components during system walkdowns (including walkdowns conducted early in the outage to ensure evidence of RCS leakage, such as boric acid deposits at the leakage sites, is not disturbed prior to engineering evaluation).

- Visual inspections during plant outages (including bare metal inspection of specific components that have higher risk of corrosion).

The BACCP also contains methods for conducting examinations, performing engineering evaluations to establish the impact on the reactor coolant pressure boundary when leakage is located, and establishing corrective actions to prevent recurrences of this type of corrosion.

5.2.4.1.1 Arrangement and Accessibility

STD COL 5.2(13) Replace the last paragraph with the following.

Class 1 component design is the same as the DCD design.

5.2.4.2 Preservice Inspection and Testing Program

STD COL 5.2(5) Replace the fourth sentence of the first paragraph in DCD Subsection 5.2.4.2 with the following.

The preservice inspection (PSI) program complies with the editions and addenda of American Society of Mechanical Engineers (ASME) Code Section XI incorporated by reference in Code of Federal Regulations, Title 10 (10 CFR) 50.55a(b) as applied to the construction of the component. The implementation milestones for the PSI and preservice testing (PST) program are provided in Table 13.4-201.

STD COL 5.2(14) Add the following Subsection after DCD Subsection 5.2.5.8.

STD COL 5.2(15)

5.2.5.9 Operating Procedures

The operating procedures regarding conversion of the referenced leak detection instruments into a common leak rate and operator actions in response to prolonged leakage are included in system operating procedures in Subsection 13.5.2.1. A milestone schedule for implementation of the procedures is also included in Subsection 13.5.2.1.

The procedure guidance as described in RG 1.45, Revision 1 Regulatory Position C.3. is used to develop these and other procedures to identify, monitor, and respond to leakage. The essential elements of these procedures include the following:

Monitoring instrumentation as required by technical specification surveillance requirements including:

- Containment sump level
- Containment airborne particulate radioactivity

- Condensate flow rate from air coolers
- Equivalent leak rate conversion

Establishing alarm setpoints to provide operators an early warning signal so they can take corrective actions in response to leakage rates less than Technical Specification limits including:

- Facilitation of stepwise operator action levels
- Response to administrative limits
- Allowance for individual instrument sensitivity and response times,

Actions in response to unexpected leakage rates less than Technical Specification Limits including:

- A validated computer program consistent with procedures and technical data to perform water inventory balance calculations
- Action levels to provide Operators guidance based on escalating administrative leakage limits below that are below Technical Specification limits
- Leak rate determination
- System walk downs
- Limits on continued operation
- Contingency plans

Guidance to recognize and respond to a prolonged low-level leakage condition including:

- Trending that includes action requirements based on deviations from the mean
- Outage and maintenance practices
- Corrective Action Program practices

5.2.6 Combined License Information

Replace the content of DCD Subsection 5.2.6 with the following.

STD COL 5.2(1) ***5.2(1)*** *ASME Code Cases that are approved in Regulatory Guide 1.84*

This Combined License (COL) item is addressed in Subsection 5.2.1.2.

STD COL 5.2(2) ***5.2(2)** ASME Code Cases that are approved in Regulatory Guide 1.147*

This COL item is addressed in Subsection 5.2.1.2.

STD COL 5.2(3) ***5.2(3)** ASME Code Cases that are approved in Regulatory Guide 1.192*

This COL item is addressed in Subsection 5.2.1.2.

STD COL 5.2(4)
CP COL 5.2(4) ***5.2(4)** Inservice inspection and testing program for the Reactor Coolant Pressure Boundary (RCPB)*

This COL item is addressed in Subsection 5.2.4.1 and Table 13.4-201.

STD COL 5.2(5) ***5.2(5)** Preservice inspection and testing program for the RCPB*

This COL item is addressed in Subsection 5.2.4.2 and Table 13.4-201.

***5.2(6)** Deleted from the DCD.*

***5.2(7)** Deleted from the DCD.*

***5.2(8)** Deleted from the DCD.*

***5.2(9)** Deleted from the DCD.*

***5.2(10)** Deleted from the DCD.*

STD COL 5.2(11) ***5.2(11)** ASME Code Edition and Addenda*

This COL item is addressed in Subsection 5.2.1.1.

STD COL 5.2(12) ***5.2(12)** EPRI Primary Water Chemistry Guideline*

This COL item is addressed in Subsection 5.2.3.2.1.

STD COL 5.2(13) ***5.2(13)** ISI Accessibility*

This COL item is addressed in Subsection 5.2.4.1.1.

STD COL 5.2(14) ***5.2(14)** Procedure for conversation into common leakage rate*

This COL item is addressed in Subsection 5.2.5.9.

STD COL 5.2(15) ***5.2(15)** Procedure for operator response to prolonged low-level leakage*

This COL item is addressed in Subsection 5.2.5.9.

5.3 REACTOR VESSEL

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

5.3.1.6 Material Surveillance

STD COL 5.3(2) Replace the second paragraph with the following in DCD Subsection 5.3.1.6.

The reactor vessel material surveillance program is implemented as an operational program. As the reactor vessel materials do not begin to be affected by neutron fluence until the reactor begins critical operation, this program is implemented prior to initial criticality, as identified in Table 13.4-201.

5.3.1.6.1 Surveillance Capsules

STD SUP 5.3(1) Insert the following at the end of the second paragraph in DCD Subsection 5.3.1.6.1.

Test specimens are taken from material used for the reactor vessel beltline.

STD SUP 5.3(2) Insert the following after the first sentence in the fifth paragraph in DCD Subsection 5.3.1.6.1.

The capsules are sealed in an inert environment.

STD COL 5.3(3) Replace the last sentence in the fifth paragraph with the following in DCD Subsection 5.3.1.6.1.

These lead factors and the capsule orientation are shown in DCD Figure 5.3-1.

STD COL 5.3(2) Replace the last sentence in the sixth paragraph with the following in DCD Subsection 5.3.1.6.1.

The recommended general capsule withdrawal schedule is applied and the use of the standby surveillance capsules is incorporated by updating the surveillance

program once sufficient data are retrieved to determine the withdrawal schedule for these capsules.

STD COL 5.3(2) Replace the last paragraph with the following in DCD Subsection 5.3.1.6.1.

Accelerated irradiation capsules as defined in American Society for Testing and Materials (ASTM) E-185 (Ref. 5.3-24) and integrated surveillance program for multiple reactors at a single site, are not applicable.

5.3.1.6.3 Predicted Effects of Radiation on Beltline Region Materials

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STD COL 5.3(2) Add the following text after the last paragraph in DCD Subsection 5.3.1.6.3.

A summary technical report, including test results, is submitted as specified in 10 CFR 50.4, for the contents of each capsule withdrawn, within one year of the date of capsule withdrawal unless an extension is granted by the Director, Office of Nuclear Reactor Regulation.

The report includes the data required by ASTM E-185-82, as specified in paragraph III.B.1 of 10 CFR 50, Appendix H, and includes the results of the fracture toughness tests conducted on the beltline materials in the irradiated and unirradiated conditions.

If the test results indicate a change in the Technical Specifications, either in the pressure-temperature limits or in the operating procedures, the expected date for submittal of the revised Technical Specifications is provided with the report.

5.3.2.1 Limit Curves

STD COL 5.3(1) Replace the last sentence in the second paragraph with the following in DCD Subsection 5.3.2.1.

The generic pressure and temperature limits reports (PTLR) for the US-APWR reactor vessel will be applied.

The COL Holder will update the P/T limits prior to fuel loading using the PTLR methodologies approved in the US-APWR DCD and the plant specific material

properties and inform the NRC of the updated P/T limits as required by the Technical Specifications.

5.3.2.2 Operating Procedures

STD COL 5.3(1) Replace the first sentence in the last paragraph with the following in DCD Subsection 5.3.2.2.

Operating procedures will be developed in accordance with Section 13.5, such that the plant-specific pressure-temperature limit curves are not exceeded and Technical Specification requirements are satisfied.

5.3.2.3 Pressurized Thermal Shock

STD COL 5.3(4) Replace the last paragraph with the following in DCD Subsection 5.3.2.3.

Reference pressurized thermal shock temperature (RT_{PTS}) values are calculated based on the material property requirements detailed in DCD Subsection 5.3.1.5, and the results are as shown in DCD Table 5.3-4.

5.3.2.4 Upper Shelf Energy

STD COL 5.3(4) Replace the last paragraph with the following in DCD Subsection 5.3.2.4.

The upper shelf energy (USE) at end-of-life (EOL) is calculated based on material property requirements detailed in DCD Subsection 5.3.1.5, and the results are as shown in DCD Table 5.3-4.

5.3.3.7 Inservice Surveillance

STD COL 5.3(5) Replace the fourth and fifth sentences in the first paragraph of DCD Subsection 5.3.3.7 with the following.

The detailed list of inservice and preservice inspections is shown in DCD Tables 5.3-2 and 5.3-3.

5.3.4 Combined License Information

Replace the content of DCD Subsection 5.3.4 with the following.

STD COL 5.3(1) ***COL 5.3(1)*** *Pressure-Temperature Limit Curves*

This COL item is addressed in Subsections 5.3.2.1 and 5.3.2.2.

STD COL 5.3(2) ***COL 5.3(2)*** *Reactor Vessel Material Surveillance Program*

This COL item is addressed in Subsection 5.3.1.6.

STD COL 5.3(3) ***COL 5.3(3)*** *Surveillance Capsule Orientation and Lead Factors*

This COL item is addressed in Subsection 5.3.1.6.1.

STD COL 5.3(4) ***COL 5.3(4)*** *Reactor Vessel Material Properties Verification*

The material property verification portion of this COL item is addressed in DCD Subsection 5.3.1.1. Other portions of this COL item are addressed in Subsections 5.3.2.3 and 5.3.2.4.

STD COL 5.3(5) ***COL 5.3(5)*** *Preservice and Inservice Inspection*

This COL item is addressed in Subsection 5.3.3.7.

5.4 REACTOR COOLANT SYSTEM COMPONENT AND SUBSYSTEM DESIGN

This section of the referenced DCD is incorporated by reference with no departures or supplements.