## 10.4.6 Condensate Polishing System

The condensate cleanup function is performed by the condensate polishing system (CPS) that is part of the condensate system. The CPS is designed to maintain the required purity of feedwater for the steam generators by filtration to remove corrosion products and by ion exchange to remove condenser leakage impurities.

### 10.4.6.1 Design Bases

The CPS performs no safety-related function and therefore has no nuclear safety-related design basis.

The condensate polishing system is designed to meet the following functional criteria:

- Remove impurities from the condensate.
- Reduce startup time (but can be used any time).
- Have a design capacity one-third of valves wide open (VWO) condensate flow.
- Operate at rated capacity with one train (demineralizer vessel and resin trap) out of service.

### 10.4.6.2 System Description

#### 10.4.6.2.1 General Description

The CPS is non-safety related and is located in the Turbine Building. A flow diagram of the condensate polishing system is provided in Figure 10.4.6-1—Condensate Polishing System Flow Diagram.

The CPS is located in a parallel piping arrangement with the gland steam condenser, and has a one-third VWO capacity.

#### 10.4.6.2.2 Component Description

Table 3.2.2-1 provides the seismic design and other design classifications for components in the CPS. Section 3.2 describes how the guidance of RG 1.26 and RG 1.29 is implemented for the U.S. EPR.

CPS materials are compatible with condensate at the expected conditions. The CPS is constructed of carbon steel materials. Piping and fitting materials are ASTM A-106 Grade B piping and ASTM A-234 Grade WPB pipe fittings (elbows, tees, reducers, etc.). If resistance to flow accelerated corrosion (FAC) is required, piping and fittings will be constructed of carbon steel containing a minimum of 0.1 percent chromium. Polisher vessels are constructed of carbon steel with a protective interior lining, coating or cladding.

#### Condensate Polisher

The condensate polisher consists of at least four trains of deep mixed bed demineralizers with downstream resin traps. Spent polisher resin is replaced or regenerated offsite. The number and size of the ion exchangers allow functional requirements to be met while permitting replacement of resin in one ion exchanger at a time.

#### Resin Trap

Resin traps are installed downstream of each ion exchanger to remove resin fines.

#### Spent Resin Tank

The spent resin tank is used for storage of exhausted or spent resin prior to shipping offsite for regeneration or disposal.

#### Resin Addition Equipment

Equipment is provided to replace the ion exchange resin.

### 10.4.6.3 System Operation

The CPS cleans up the condensate during startup to meet condensate and feedwater system water chemistry specifications as described in Section 10.3.5. The condensate is recirculated to the hotwell during startup until the desired water quality is attained. Condensate and feedwater system operation is described in Section 10.4.7.

During power operation, the condensate polishers are used only when abnormal secondary cycle conditions exist. This allows continuous operation of the plant with condenser tube leakage until repairs can be made. Flow through the condensate polisher is controlled by the condensate polisher bypass valve.

Exhausted or spent resin is removed from the polisher vessel and replaced with new or regenerated resin. Resin replacement requires the polisher vessel to be out of service. The standby vessel is placed in service when another vessel needs to be removed from service. Spent resin may be transferred directly to a truck or the spent resin storage tank until it can be removed offsite. Spent resin will normally be nonradioactive and not require any special packaging prior to disposal. In the event the resin becomes contaminated with radioactive material, shielding is provided, if required. Spent resins are shipped offsite per the Process Control Program (PCP). Information about the PCP can be found in Section 11.4.3. Radiation monitors associated with the steam generator blowdown system, main steam system and Vent System for Air Removal System vent are used to detect secondary side radioactive contamination (refer to Section 11.5, Table 11.5-1, Monitors R-46 through R-49 (Steam Generator BLowdown System), and R-3 (Vent System for Air Removal)).

### 10.4.6.4 Safety Evaluation

The condensate polishing system has no safety-related function and is not required to function during or after an accident.

The design of the CPS satisfies GDC 14, as it relates to maintaining water quality to avoid corrosion-induced failure of the reactor pressure boundary.

- The CPS functions to remove corrosion products and impurities from the condensate. The secondary water chemistry program is based on the EPRI PWR Secondary Water Chemistry Guidelines (Reference 1). The program description and associated chemistry control parameters is provided in Section 10.3.5.

### 10.4.6.5 Inspection and Testing Requirements

The CPS components are inspected and tested as part of the initial plant startup. Refer to Section 14.2 (test abstracts #066 and #071) for initial plant startup test program. The system operating parameters are monitored during power operation.

### 10.4.6.6 Instrumentation Requirements

Instrumentation is provided to measure the pressure drop and outlet conductivity from each resin demineralizer to monitor performance. Should the pressure drop or outlet conductivity become too high, the train is removed from service for resin replacement or regeneration and the spare train is placed in service, if required.

Condensate system sampling points are shown on Figure 10.4.7-1—Condensate and Feedwater System, and described in Section 9.3.2.

### 10.4.6.7 References

1. EPRI Report 1008224, "Pressurized Water Reactor Secondary Water Chemistry Guidelines," Electric Power Research Institute, Revision 6, December 2004.

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