

### **1.3 Comparisons with Similar Facility Designs**

A comparison of the major U.S. EPR design features and nominal parameters with a typical four-loop pressurized water reactor (PWR) is provided in Table 1.3-1—U.S. EPR Comparison with Similar Facilities. Design parameter values for design certification are delineated in the sections referenced. The values provided in Table 1.3-1 for the reference U.S. EPR and a four-loop plant are typical. The four-loop plant parameters are represented by Callaway Unit 1.

**Table 1.3-1—U.S. EPR Comparison with Similar Facilities**  
**Sheet 1 of 4**

| Parameter or Feature                   | FSAR Chapter/Section               | U.S. EPR                    | Typical 4-Loop (Callaway Unit 1)                |
|--|------------------------------------|-----------------------------|---|
| Plant design objective                 | 1.1                                | 60 years                    | 40 years  |
| Rated NSSS thermal power output        | 1.2, 10.1                          | 4614 MWt                    | 3579 MWt  |
| Reactor core thermal power             | 1.2, 4.1, 4.3, 4.4, 5.0, 5.1, 15.0 | 4590 MWt                    | 3565 MWt  |
| Net electrical output                  | 1.1                                | 1600 MWe                    | 1233 MWe  |
| Reactor operating pressure             | 4.5, 6, 11, and 15                 | 2250 psia                   | 2250 psia                                       |
| Total reactor flow rate                | 4.4                                | 184 x 10 <sup>6</sup> lb/hr | 139.4 x 10 <sup>6</sup> lb/hr                   |
| Reactor coolant temperatures,          | 4.1, 4.4, 5.1                      |                             |   |
| Core outlet                            |                                    | 626°F                       | 623.7°F   |
| Vessel outlet                          |                                    | 625°F                       | 620°F   |
| Core average                           |                                    | 597°F                       | 592.2°F   |
| Vessel average                         |                                    | 594°F                       | 588.4°F   |
| Core inlet                             |                                    | 563°F                       | 556.8°F   |
| Vessel inlet                           |                                    | 563°F                       | 556.8°F   |
| Average linear power                   | 4.1, 4.3, 4.4                      | 5.22 kW/ft                  | 5.69 kW/ft                                      |
| Peak linear power for normal operation | 4.1, 4.3, 4.4                      | 13.6 kW/ft                  | 14.22 kW/ft                                     |
| Heat flux hot channel factor, FQ       | 4.3                                | 2.6                         | 2.50  |
| Fuel assembly array                    | 4.1, 4.3                           | 17 x 17                     | 17 x 17   |
| Number of fuel assemblies              | 4.1, 4.3                           | 241                         | 193   |
| Uranium dioxide rods per assembly      | 4.1, 4.3                           | 265                         | 264   |
| Nominal fuel weight as uranium dioxide | 4.1, 4.3                           | ≈324,000 lb (Note 1)        | 204,280 lb                                      |
| Number of grids per assembly           | 4.1, 4.3                           | 10                          | 6 (Zirc-mix), 3 (Zirc-IFM), 2 (Inconel-non mix) |

**Table 1.3-1—U.S. EPR Comparison with Similar Facilities**  
**Sheet 2 of 4**

| <b>Parameter or Feature</b>           | <b>FSAR Chapter/ Section</b> | <b>U.S. EPR</b>  | <b>Typical 4-Loop (Callaway Unit 1)</b>   |
|---------------------------------------|------------------------------|--|---|
| Rod cluster control assemblies        | 4.1, 4.3                     | 89/none<br><br>Ag-In-Cd (lower part)<br>AISI 316L stainless steel<br><br>0.0185 in | 53/none<br><br>Ag-In-Cd<br>Stainless steel with chrome plating<br>0.0185 in with 0.00075 in plating |
| Number of full/part length assemblies |                              |  |   |
| Absorber material                     |                              |  |   |
| Clad material                         |                              |  |   |
| Clad thickness                        |                              |  |   |
| Equivalent core diameter              | 4.1, 4.3                     | 148.3 in   | 132.7 in  |
| Active fuel length                    | 4.1, 4.3                     | 165.35 in  | 143.7 in  |
| Number of coolant loops               | 1.2, 5                       | 4  | 4   |
| Total steam flow                      | 10.3                         | 20.68 x 10 <sup>6</sup> lb/hr  | 15.92 x 10 <sup>6</sup> lb/hr   |
| Reactor vessel                        | 5.3, 5.4                     | 192 in<br>30.71 in<br>30.71 in<br>52   | 173 in<br>27.5 in<br>29 in<br>54  |
| Inside diameter                       |                              |  |   |
| Inlet nozzle inside diameter          |                              |  |   |
| Outlet nozzle inside diameter         |                              |  |   |
| Number of reactor closure head studs  |                              |  |   |
| Reactor coolant pumps                 | 5.4.1                        | 11,801 hp<br>124,741 gpm   | 7,000 hp<br>100,200 gpm   |
| Motor Horsepower                      |                              |  |   |
| Capacity                              |                              |  |   |
| Steam generators                      | 5.4.2                        | 85,681 ft <sup>2</sup><br>5980   | 55,000 ft <sup>2</sup><br>5626  |
| Heat transfer area                    |                              |  |   |
| Number of U-tubes                     |                              |  |   |

**Table 1.3-1—U.S. EPR Comparison with Similar Facilities**  
**Sheet 3 of 4**

| <b>Parameter or Feature</b>                | <b>FSAR Chapter/ Section</b> | <b>U.S. EPR</b>  | <b>Typical 4-Loop (Callaway Unit 1)</b> |
|--|------------------------------|--|---|
| Residual heat removal                      | 5.4.7, 9.2.2                 |  |   |
| Initiation pressure                        |                              | ≈376 psig  | ≈425 psig                               |
| Initiation/completion temperature          |                              | ≈250°F (Note 2)<br>212°F (Note 3)/131°F  | ≈350°F /140°F                           |
| Component cooling water design temperature |                              | 100.4°F  | 105°F                                   |
| Cooldown time after initiation             |                              | 9.7 hr   | ≈19.3 hr                                |
| Heat exchanger removal capacity            |                              | 31.73 x 10 <sup>6</sup> Btu/hr (Train 1)<br>30.66 x 10 <sup>6</sup> Btu/hr (Train 2)<br>30.66 x 10 <sup>6</sup> Btu/hr (Train 3)<br>31.73 x 10 <sup>6</sup> Btu/hr (Train 4) | 39.1 x 10 <sup>6</sup> Btu/hr           |
| Pressurizer                                | 5.4.10                       |  |   |
| Heatup rate using heaters                  |                              | 180°F/hr   | 55°F/hr                                 |
| Internal volume                            |                              | 2649 ft <sup>3</sup>   | 1800 ft <sup>3</sup>                    |
| Pressurizer safety relief valves           | 5.4.11                       |  |   |
| Number                                     |                              | 3  | 3                                       |
| Maximum relieving capacity                 |                              | 793,680 lb/hr  | 420,000 lb/hr                           |
| Accumulators                               | 6.3                          |  |   |
| Number                                     |                              | 4  | 4                                       |
| Operating pressure, minimum                |                              | 638 psig   | 600 psig                                |
| Minimum operating water volume, each       |                              | 1236 ft <sup>3</sup>   | 810 ft <sup>3</sup>                     |
| Medium head safety injection pumps         | 6.3                          |  |   |
| Number                                     |                              | 4  | 2                                       |
| Design flow                                |                              | 600 gpm  | 425 gpm                                 |
| Design head                                |                              | 2260 ft  | 2680 ft                                 |

**Table 1.3-1—U.S. EPR Comparison with Similar Facilities  
Sheet 4 of 4**

| Parameter or Feature                                      | FSAR Chapter/ Section | U.S. EPR    | Typical 4-Loop (Callaway Unit 1) |
|---|-----------------------|-------------|----------------------------------|
| Low head safety injection/<br>residual heat removal pumps | 6.3                   |             |                                  |
| Number  |                       | 4           | 2                                |
| Design flow   |                       | 2200 gpm    | 3800 gpm                         |
| Design head   |                       | 480 ft      | 350 ft                           |
| Chemical and volume control                               | 9.3.4                 |             |                                  |
| Number of centrifugal pumps                               |                       | 2           | 2                                |
| Design flow   |                       | 176 gpm     | 150 gpm                          |
| Design head   |                       | 5938 ft     | 5800 ft                          |
| Total seal water supply flow rate, nominal                |                       | 32 gpm      | 32 gpm                           |
| Total seal water return flow rate, nominal                |                       | ≈13 gpm     | 12 gpm                           |
| Letdown flow, normal/<br>maximum                          |                       | 160/480 gpm | 75/120 gpm                       |
| Charging flow, minimum/<br>maximum                        |                       | 40/440 gpm  | 55/100 gpm                       |

**Notes:**

1. The fuel weight in pounds is derived by:  

$$[(\text{nominal metric weight of the fuel assemblies})/0.88] \times 2.2046$$
 Where 0.88 is the mass of uranium in UO<sub>2</sub> and 2.2046 is the conversion factor from kilograms to pounds.
2. Trains 1 and 4.
3. Trains 2 and 3.