

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
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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, and 15	2250 psia	2250 psia
Total reactor flow rate	4.1, 4.4, 5.1	184 10 ⁶ lb/hr	139.4 10 ⁶ 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	4.1, 4.3, 4.4, 15.0	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
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Parameter or Feature	FSAR Chapter/ Section	U.S. EPR	Typical 4-Loop (Callaway Unit 1)
Rod cluster control assemblies	4.1, 4.3	89/none Ag-In-Cd (lower part) AISI 316L stainless steel 0.0185 in	53/none Ag-In-Cd Stainless steel with chrome plating 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	5.1	20.68 10 ⁶ lb/hr	15.92 10 ⁶ lb/hr
Reactor vessel	5.3	192 in 30.71 in 30.71 in 52	173 in 27.5 in 29 in 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 124,741 gpm	7,000 hp 100,200 gpm
Motor Horsepower			
Capacity			
Steam generators	5.4.2	85,681 ft ² 5980	55,000 ft ² 5626
Heat transfer area			
Number of U-tubes			

Table 1.3-1—U.S. EPR Comparison with Similar Facilities
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Parameter or Feature	FSAR Chapter/Section	U.S. EPR	Typical 4-Loop (Callaway Unit 1)
Residual heat removal	5.4.7		
Initiation pressure		≈376 psig	≈425 psig
Initiation/completion temperature		≈250°F (Note 2) [212°F (Note 3)]/131°F	≈350°F /140°F
Component cooling water design temperature		100.4°F	105°F
Cooldown time after initiation		7.7 hr	≈19.3 hr
Heat exchanger removal capacity		31.73 10 ⁶ Btu/hr (Train 1) 30.66 10 ⁶ Btu/hr (Train 2) 30.66 10 ⁶ Btu/hr (Train 3) 31.73 10 ⁶ Btu/hr (Train 4)	39.1 10 ⁶ Btu/hr
Pressurizer	5.4.10		
Heatup rate using heaters		180°F/hr	55°F/hr
Internal volume		2649 ft ³	1800 ft ³
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 ³	810 ft ³
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
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Parameter or Feature	FSAR Chapter/ Section	U.S. EPR	Typical 4-Loop (Callaway Unit 1)
Low head safety injection/ residual heat removal pumps	6.3		
Number		4	2
Design flow		2200 gpm	3800 gpm
Design head		480 ft	350 ft
New fuel storage racks center- to-center spacing	9.1.1	11.28 in (Note 4)	21
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/ maximum		160/480 gpm	75/120 gpm
Charging flow, minimum/ maximum		40/440 gpm	55/100 gpm

NOTES:

1. The fuel weight in pounds is derived by:

$$[(\text{nominal metric weight of the fuel assemblies})/0.88]*2.2046$$
 Where 0.88 is the mass of uranium in UO₂ and 2.2046 is the conversion factor from kilograms to pounds.
2. Trains 1 and 4.
3. Trains 2 and 3.
4. This value is typical for 92% minimum capacity factor, in conjunction with standard fuel rack design.