2.0 Site Characteristics

The U.S. EPR standard design is based on a set of conservatively established site characteristics. These characteristics represent more demanding site conditions than normally expected for most U.S. nuclear power plant sites. These site-related design basis parameters are provided in Table 2.1-1—U.S. EPR Site Design Envelope.

A COL applicant that references the U.S. EPR design certification will compare site-specific data to the design parameter data in Table 2.1-1. If the specific data for the site falls within the assumed design parameter data and characteristics in Table 2.1-1, then the U.S. EPR standard design is bounding for the site. For site-specific design parameter data or characteristics that are outside the bounds of the assumptions presented in Table 2.1-1, the COL applicant will confirm that the U.S. EPR design acceptably meets any additional requirements that may be imposed by the more limiting site-specific design parameter data or characteristic, and that the design maintains conformance to the design commitments and acceptance criteria described in this FSAR.

2.1 Geography and Demography

A COL applicant that references the U.S. EPR design certification will provide site-specific information related to site location and description, exclusion area authority and control, and population distribution.

2.1.1 Site Location and Description

The site location and description is site-specific and will be addressed by the COL applicant, including:

- Specific location by longitude and latitude, Universal Transverse Mercator (UTM) coordinates, and political subdivisions; the site's relative location with respect to natural and man-made features of the area such as highways, railways, and waterways; and local population distribution.

- A map of the site area of suitable scale (with explanatory text as necessary) showing relevant features such as the plant property lines, site and exclusion area boundaries (EAB), location and orientation of principal plant structures within the site area, and highways, railways and waterways that traverse or are adjacent to the site.

2.1.2 Exclusion Area Authority and Control

The authority for control of activities in the site exclusion area is site-specific and will be addressed by the COL applicant. This information will describe activities unrelated to plant operation that are permitted within the exclusion area.

2.1.3 Population Distribution

The distribution of the population in the site vicinity is site-specific and will be addressed by the COL applicant.

Table 2.1-1—U.S. EPR Site Design Envelope
Sheet 1 of 7

U.S. EPR Site Design Envelope	
Precipitation (Refer to Section 2.4)	
Rainfall rate	≤19.4 in/hr
Normal ground precipitation load	≤100 psf (100-year MRI)
Normal roof precipitation load	≤70 psf (100-year MRI)
48-hour PMWP liquid roof load	0 psf(1)
48-hour PMWP frozen ground load	≤43 psf (based on 55 inches)
48-hour PMWP frozen roof load	≤30 psf
Extreme winter precipitation roof load	≤100 psf (100-year MRI)
Seismology (Refer to Sections 2.5 & 3.7)	
Horizontal SSE Acceleration	0.3g Peak (CSDRS shapes – See Section 3.7)
Vertical SSE Acceleration	0.3g Peak (CSDRS shapes – See Section 3.7)
Fault Displacement Potential	No fault displacement is considered for safety-related SSC in U.S. EPR design certification.

Table 2.1-1—U.S. EPR Site Design Envelope
Sheet 2 of 7

U.S. EPR Site Design Envelope	
Soil (Refer to Section 2.5)	
Minimum Static Bearing Capacity	22 ksf in localized areas at the bottom of the Nuclear Island basemat and 15 ksf on average across the total area of the bottom of the Nuclear Island basemat.
Minimum Dynamic Bearing Capacity	34.56 ksf at the bottom of the Nuclear Island basemat.
Minimum Shear Wave Velocity (Low strain best estimate average value at bottom of basemat)	1000 fps
Liquefaction	None
Maximum Differential Settlement (across the basemat)	1/2 inch in 50 feet in any direction
Slope Failure Potential	No slope failure potential is considered in the design of safety-related SSC for U.S. EPR design certification.
Maximum Ground Water	3.3 ft below grade
Minimum Coefficient of Static Friction (representative of soil basemat interface)	0.7
Inventory of Radionuclides Which Could Potentially Seep Into the Groundwater	
See Table 2.1-2—Bounding Values for Component Radionuclide Inventory	

Table 2.1-1—U.S. EPR Site Design Envelope
Sheet 3 of 7

U.S. EPR Site Design Envelope	
Flood Level (Refer to Section 2.4)	
Maximum Flood (or Tsunami)	1 ft below grade
Wind (Refer to Section 3.3)	
Maximum Speed (Other than Tornado)	145 mph (Based on 3-second gust at 33 ft above ground level and factored for 50-yr mean recurrence interval)
Importance Factor	1.15 (Safety-related structures for 100-year mean recurrence interval.)
Tornado (Refer to Sections 3.3 and 3.5)	
Maximum Pressure and Rate of Drop	1.2 psi at 0.5 psi/s
Maximum Rotational Speed	184 mph
Maximum Translational Speed	46 mph
Maximum Wind Speed	230 mph
Radius of Maximum Rotational Speed	150 ft

Table 2.1-1—U.S. EPR Site Design Envelope
Sheet 4 of 7

U.S. EPR Site Design Envelope			
Missile Spectra			6 in Schedule 40 pipe, 6.625 in diameter x 15 ft long, 287 lb, 34.5 in^2 impact area, impact velocity of 135 fps horizontal and 90 fps vertical.
			Automobile, 16.4 ft x 6.6 ft x 4.3 ft, 4000 lb, 4086.7 in^2 impact area, impact velocity of 135 fps horizontal and 90 fps vertical. (Automobile missile is considered at elevations up to 30.0 ft above grade elevation.)
			Solid steel sphere, 1 in diameter, 0.147 lb, 0.79 in^2 impact area, impact velocity of 26 fps horizontal and 17 fps vertical.
Temperature (Refer to Section 2.3)			
Air	0% Exceedance Values	Maximum	115°F Dry Bulb / 80°F Wet Bulb (coincident) 81°F Wet Bulb (non-coincident) UHS Design Only
		Minimum	-40°F
	1% Exceedance Values	Maximum	100°F dry bulb/77°F coincident wet bulb 80°F wet bulb (noncoincident) UHS Design Only
		Minimum	-10°F
UHS Meteorological Conditions			
Conditions resulting in Maximum Evaporation and Drift Loss of Water from the UHS (Section 2.3.1)			As presented in Table 2.1-3—Design Values for Maximum Evaporation and Drift Loss of Water from the UHS
Conditions resulting in Minimum Water Cooling in the UHS (Section 2.3.1)			As presented in Table 2.1-4—Design Values for Minimum Water Cooling in the UHS

Table 2.1-1—U.S. EPR Site Design Envelope
Sheet 5 of 7

U.S. EPR Site Design Envelope	
Potential for Water Freezing in the UHS Water Storage Facility (Sections 2.4.7 and 9.2.5)	As presented in Sections 2.4.7 and 9.2.5
UHS Design Parameters (Section 9.2.5)	
Maximum UHS Evaporative Water Loss	571 gpm
Maximum Drift Water Loss	≤0.005%
Design Cold (outlet) Water Temperature	≤95°F (max ESWS supply design limit)
Atmospheric Dispersion Factors (χ/Q) (Refer to Section 2.3)	
Maximum Annual Average (0.5 mile - limiting sector)	≤4.973E-06 s/m^3
Accident	
0-2 hr (EAB, 0.5 miles)	≤1E-03 s/m^3
0-2 hr (LPZ, 1.5 miles)	≤1.75E-04 s/m^3
2-8 hr (LPZ, 1.5 miles)	≤1.35E-04 s/m^3
8-24 hr (LPZ, 1.5 miles)	≤1.00E-04 s/m^3
1-4 day (LPZ, 1.5 miles)	≤5.40E-05 s/m^3
4-30 day (LPZ, 1.5 miles)	≤2.20E-05 s/m^3

Table 2.1-1—U.S. EPR Site Design Envelope
Sheet 6 of 7

U.S. EPR Site Design Envelope									
Main Control Room/Technical Support Center Intake Atmospheric Dispersion Factors for Onsite Accident Dose Analysis (χ/Q)									
Time Period	**Vent Stack Base**	**Releases via Safe-guard Building Canopy #1**	**Releases via Safe-guard Building Canopy #2**	**Equip-ment Hatch Releases via Material Lock**	**Depress-urization Shaft Releases**	**Main Steam Relief Train Silencer #1**	**Main Steam Relief Train Silencer #2**	**Main Steam Relief Train Silencer #3**	**Main Steam Relief Train Silencer #4**
0–2 hours (s/m^3)	1.93E-03	6.52E-03	1.66E-03	1.01E-03	4.45E-03	1.57E-03	1.99E-03	4.30E-03	3.28E-03
2–8 hours (s/m^3)	1.73E-03	5.68E-03	1.47E-03	8.97E-04	3.95E-03	1.36E-03	1.63E-03	3.71E-03	2.83E-03
8–24 hours (s/m^3)	6.74E-04	2.34E-03	6.28E-04	3.53E-04	1.70E-03	5.44E-04	6.47E-04	1.46E-03	1.12E-03
1–4 days (s/m^3)	5.12E-04	1.63E-03	4.19E-04	2.66E-04	1.11E-03	4.11E-04	4.93E-04	1.12E-03	8.57E-04
4–30 days (s/m^3)	4.72E-04	1.50E-03	3.81E-04	2.46E-04	1.00E-03	3.78E-04	4.52E-04	1.03E-03	7.86E-04

Table 2.1-1—U.S. EPR Site Design Envelope
Sheet 7 of 7

U.S. EPR Site Design Envelope									
Main Control Room/Technical Support Center Unfiltered Inleakage Atmospheric Dispersion Factors for Onsite Accident Dose Analysis (χ/Q)									
Time Period	**Vent Stack Base**	**Releases via Safe-guard Building Canopy #1**	**Releases via Safe-guard Building Canopy #2**	**Equip-ment Hatch Releases via Material Lock**	**Depress-urization Shaft Releases**	**Main Steam Relief Train Silencer #1**	**Main Steam Relief Train Silencer #2**	**Main Steam Relief Train Silencer #3**	**Main Steam Relief Train Silencer #4**
0–2 hours (s/m^3)	4.30E-03	1.67E-02	3.03E-03	1.65E-03	7.52E-03	1.93E-03	2.43E-03	1.76E-02	8.65E-03
2–8 hours (s/m^3)	3.71E-03	1.47E-02	2.68E-03	1.47E-03	6.67E-03	1.66E-03	2.12E-03	1.48E-02	7.21E-03
8–24 hours (s/m^3)	1.46E-03	5.96E-03	1.15E-03	5.74E-04	2.88E-03	6.69E-04	8.28E-04	5.88E-03	2.96E-03
1–4 days (s/m^3)	1.12E-03	4.28E-03	7.59E-04	4.37E-04	1.89E-03	5.02E-04	6.38E-04	4.55E-03	2.22E-03
4–30 days (s/m^3)	1.03E-03	3.89E-03	6.89E-04	4.00E-04	1.71E-03	4.65E-04	5.85E-04	4.16E-03	2.06E-03

(1) The maximum 48-hour PMWP liquid of 32 inches is based on data obtained from National Oceanic and Atmospheric Administration Hydrometeorological Report No. 53 “Seasonal Variation of 10-square-mile Probable Maximum Precipitation Estimates, United States East of the 105th Meridian” for the three winter months – December through February. However, the effect of rainfall events on roof loads is negligible, due to the lack of parapets.

Table 2.1-2—Bounding Values for Component Radionuclide Inventory

Nuclide	Activity (μCi/g)	Nuclide	Activity (μCi/g)
Br-83	3.2E-02	Y-91m	5.2E-04
Br-84	1.7E-02	Y-91	8.1E-05
Br-85	2.0E-03	Y-92	1.4E-04
I-129	4.6E-08	Y-93	6.5E-05
I-130	5.0E-02	Zr-95	9.3E-05
I-131	7.4E-01	Nb-95	9.3E-05
I-132	3.7E-01	Mo-99	1.1E-01
I-133	1.3E+00	Tc-99m	4.6E-02
I-134	2.4E-01	Ru-103	7.7E-05
I-135	7.9E-01	Ru-106	2.7E-05
Cs-134	1.7E-01	Rh-103m	6.8E-05
Cs-136	5.3E-02	Rh-106	2.7E-05
Cs-137	1.1E-01	Ag-110m	2.0E-07
Cs-138	2.2E-01	Te-127m	4.4E-04
Cr-51	2.0E-03	Te-129m	1.5E-03
Mn-54	1.0E-03	Te-129	2.4E-03
Fe-55	7.6E-04	Te-131m	3.7E-03
Fe-59	1.9E-04	Te-131	2.6E-03
Co-58	2.9E-03	Te-132	4.1E-02
Co-60	3.4E-04	Te-134	6.7E-03
Na-24	3.7E-02	Ba-137m	1.0E-01
Zn-65	3.2E-04	Ba-140	6.2E-04
W-187	1.8E-03	La-140	1.6E-04
Rb-88	1.0E+00	Ce-141	8.9E-05
Rb-89	4.7E-02	Ce-143	7.6E-05
Sr-89	6.3E-04	Ce-144	6.9E-05
Sr-90	3.3E-05	Pr-143	8.8E-05
Sr-91	1.0E-03	Pr-144	6.9E-05
Sr-92	1.7E-04	Np-239	8.7E-04
Y-90	7.7E-06	H-3	1.0E+00

Table 2.1-3—Design Values for Maximum Evaporation and Drift Loss of Water from the UHS[1]

Time (hr)	Wet Bulb Temp (°F)	Dry Bulb Temp (°F)	Time (hr)	Wet Bulb Temp (°F)	Dry Bulb Temp (°F)	Time (hr)	Wet Bulb Temp (°F)	Dry Bulb Temp (°F)
1	69.87	84	25	70.49	86	49	74.14	91
2	68.69	82	26	71.03	86	50	72.99	87
3	66.82	78	27	71.03	86	51	70.96	84
4	67.02	77	28	71.03	86	52	69.33	84
5	69.04	78	29	71.03	86	53	68.90	81
6	68.48	78	30	70.02	81	54	69.46	81
7	68.14	77	31	68.24	79	55	69.13	80
8	67.10	74	32	68.25	79	56	69.69	80
9	67.10	74	33	68.13	77	57	67.70	79
10	67.80	76	34	68.13	77	58	67.70	79
11	67.23	76	35	69.70	80	59	68.58	80
12	69.79	82	36	71.79	83	60	71.53	84
13	70.98	84	37	72.98	85	61	72.40	85
14	72.71	86	38	75.02	88	62	73	87
15	74.15	89	39	76.71	92	63	73.29	88
16	74.71	93	40	77.49	95	64	73.58	89
17	74.98	94	41	78.24	98	65	73.58	89
18	75.82	93	42	78.72	100	66	73.33	92
19	74.98	98	43	78.48	99	67	73.08	93
20	74.20	97	44	77.91	99	68	73.36	94
21	74.19	97	45	77.91	99	69	74.42	94
22	74.16	95	46	77.10	98	70	74.14	93
23	74.15	93	47	76.85	97	71	74.68	93
24	72.22	90	48	75.24	93	72	73.28	88

Notes:

1. Only 72 hours of temperature data are provided because the site specific makeup water system will provide sufficient flow rates of makeup water to compensate for system volume losses for the remaining 27 days of the required 30-day period.

Table 2.1-4—Design Values for Minimum Water Cooling in the UHS

Time (hr)	Wet Bulb Temp (°F)	Dry Bulb Temp (°F)
1	75.8	82
2	76.1	83
3	76.1	83
4	77.3	85
5	79.7	89
6	80.8	91
7	82.0	93
8	84.6	99
9	85.3	99
10	85.3	99
11	84.2	100
12	84.2	100
13	84.6	99
14	83.9	99
15	83.9	99
16	82.6	96
17	82.6	93
18	82.1	91
19	82.1	91
20	81.9	90
21	80.7	88
22	80.7	88
23	79.5	86
24	79.5	86

Next File