2.0 Site Characteristics

The U.S. EPR standard design is based on a set of conservatively established site parameters. These site parameters 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 the characteristics of its proposed site to the site parameters in Table 2.1-1. If the characteristics of the site fall within the assumed site parameters in Table 2.1-1, then the U.S. EPR standard design is bounding for the site. For site-specific characteristics that are outside the bounds of the assumptions presented in Table 2.1-1, the COL applicant will demonstrate that the U.S. EPR design acceptably meets the regulatory requirements, given the site-specific characteristic. In such an instance, the COL applicant will also demonstrate that the design commitments and acceptance criteria described in the FSAR do not need to be changed, or will propose new design commitments or acceptance criteria, or both.

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 Sections 2.3 and 2.4)	
Rainfall rate	≤19.4 in/hr
Sum of normal winter precipitation event and extreme frozen winter precipitation event ground load.	≤143 psf(1)
Seismology (Refer to Sections 2.5 & 3.7)	
Horizontal SSE Acceleration	0.3g PGA for EUR and 0.21g PGA for HF (CSDRS shapes – See Section 3.7)
Vertical SSE Acceleration	0.3g PGA for EUR and 0.18g PGA for HF (CSDRS shapes – See Section 3.7)
Fault Displacement Potential	No fault displacement is considered for safety-related SSC in U.S. EPR design certification.
Soil (Refer to Section 2.5)	
Minimum Static Bearing Capacity	Maximum static bearing demand is 23,100 lbs/ft^2 at the bottom of the Seismic Category I structure basemats. The ultimate static bearing capacity divided by 3.0 is greater than or equal to the maximum static bearing demand.

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

U.S. EPR Site Design Envelope	
Minimum Dynamic Bearing Capacity	The maximum dynamic bearing demand (combination of safe shutdown earthquake and static loads) at the corner of any Seismic Category I Structure basemat is: • 38,000 lbs/ft^2 (for soft soil)(5) • 48,000 lbs/ft^2 (for medium soil)(5) • 60,000 lbs/ft^2 (for hard soil)(5) For a site with shear wave velocity between soft and medium soil conditions or between medium and hard soil conditions, the maximum dynamic bearing demand is the larger of the two values. For sites not meeting the soil property requirements, a site-specific analysis is required. The ultimate dynamic bearing capacity divided by 2.0 is greater than or equal to the maximum dynamic bearing demand.
Minimum Shear Wave Velocity (Low strain best estimate average value at bottom of basemat)	1000 fps
Liquefaction	None
Maximum Settlement (across the basemat): 1. Differential Settlement 2. Tilt Settlement	Figure 3.8-124 through Figure 3.8-136 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.
Angle of Internal Friction (in situ and backfill)	26.6 degrees (minimum) (See Note 8) 30 degrees (maximum) (See Note 9)
Soil Density (γ) (in situ and backfill)	110 lb/ft^3 $\leq \gamma \leq$ 134 lb/ft^3 (See Note 7)

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

U.S. EPR Site Design Envelope	
Maximum Ground Water	3.3 ft below grade
Minimum Coefficient of Static Friction for Category I Structures (representative of all interfaces between basemat and soil)	0.5
NAB Coefficients of Friction	$0.5 \leq \mu \leq 0.7$
EPGB Coefficient of Side Wall Friction	$\mu \geq 0.36$
Inventory of Radionuclides Which Could Potentially Seep Into the Groundwater	
See Table 2.1-2—Bounding Values for Component Radionuclide Inventory	
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 and Hurricane)	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

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

U.S. EPR Site Design Envelope	
Maximum Wind Speed	230 mph
Radius of Maximum Rotational Speed	150 ft
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.
Hurricane (Refer to Sections 3.3 and 3.5)	
Maximum Wind Speed	230 mph
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 176 fps horizontal and 85 fps vertical.
	Automobile, 16.4 ft x 6.6 t x 4.3 ft, 4000 lb, 4086.7 in^2 impact area, impact velocity of 222 fps horizontal and 85 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 155 fps horizontal and 85 fps vertical.

Table 2.1-1—U.S. EPR Site Design Envelope
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U.S. EPR Site Design Envelope			
Temperature (Refer to Section 2.3)			
Air	0% Exceedance Values[3]	Maximum	115°F Dry Bulb / 80°F Wet Bulb (mean coincident)
		Minimum	-40°F
	1% Exceedance Values (seasonal basis)[4]	Maximum	100°F dry bulb/77°F mean coincident wet bulb 80°F wet bulb (noncoincident)
		Minimum	-10°F
Atmospheric Dispersion and Deposition Factors (χ/Q) (D/Q) (Refer to Section 2.3)			
Maximum Annual Average (limiting sector)			≤4.973E-06 s/m^3 (χ/Q) ≤5.0E-08 m^{-2} (D/Q)
Accident			
0-2 hr (EAB)			≤1E-03 s/m^3
0-2 hr (LPZ)			≤1.75E-04 s/m^3
2-8 hr (LPZ)			≤1.35E-04 s/m^3
8-24 hr (LPZ)			≤1.00E-04 s/m^3
1-4 day (LPZ)			≤5.40E-05 s/m^3
4-30 day (LPZ)			≤2.20E-05 s/m^3

Table 2.1-1—U.S. EPR Site Design Envelope
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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 Safeguard Building Canopy**	**Equipment Hatch Releases via Material Lock**	**Depressurization Shaft Releases**	**Main Steam Relief Train Silencer**
0–2 hours (s/m^3)	1.93E-03	6.52E-03	(See Note 6)	(See Note 6)	4.30E-03
2–8 hours (s/m^3)	1.73E-03	5.68E-03	(See Note 6)	(See Note 6)	3.71E-03
8–24 hours (s/m^3)	6.74E-04	2.34E-03	(See Note 6)	(See Note 6)	1.46E-03
1–4 days (s/m^3)	5.12E-04	1.63E-03	(See Note 6)	(See Note 6)	1.12E-03
4–30 days (s/m^3)	4.72E-04	1.50E-03	(See Note 6)	(See Note 6)	1.03E-03

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 Safeguard Building Canopy**	**Equipment Hatch Releases via Material Lock**	**Depressurization Shaft Releases**	**Main Steam Relief Train Silencer**
0–2 hours (s/m^3)	4.30E-03	1.67E-02	(See Note 6)	(See Note 6)	1.76E-02
2–8 hours (s/m^3)	3.71E-03	1.47E-02	(See Note 6)	(See Note 6)	1.48E-02
8–24 hours (s/m^3)	1.46E-03	5.96E-03	(See Note 6)	(See Note 6)	5.88E-03
1–4 days (s/m^3)	1.12E-03	4.28E-03	(See Note 6)	(See Note 6)	4.55E-03
4–30 days (s/m^3)	1.03E-03	3.89E-03	(See Note 6)	(See Note 6)	4.16E-03

Note:

1. The effect of the extreme liquid winter precipitation event on roof loads is negligible due to the lack of parapets.

2. Deleted.

3. By definition, zero percent exceedance temperature values exclude peaks of temperatures less than two hours in duration. The zero percent exceedance temperature values are based on conservative estimates of 100-year return period values and historic extreme values, whichever is bounding.

4. For maximum values, data from the summer months or June, July, and August are used. For minimum values, data from the winter months of December, January, and February are used.

5. The shear wave velocities (strain compatible best estimate average values directly beneath the foundation basemat) of soft, medium, and hard soils are 1000 ft/sec, 1640 ft/sec, and greater than or equal to 6601 ft/sec, respectively.

6. The atmospheric dispersion parameters for the equipment hatch and depressurization shaft releases are bounded by the parameters for the releases via the Safeguard Building canopy.

7. Soil densities provided in this table are associated with the structural design of basemats and walls below grade. Soil densities used in dynamic soil structure interaction analyses are defined in terms of the value of the shear wave velocity in Table . The shear wave velocity layers and depths are defined in Table 3.7.1-6, Table 3.7.1-8 and Table 3.7.1-9.

8. Minimum angle of internal friction is associated with the soil's ability to develop the minimum coefficient of static friction.

9. Maximum angle of internal friction is associated with the passive soil pressure coefficient so that soil pressure acting on walls below grade does not exceed capacity. If the maximum angle of internal friction is higher than 30 degrees, a site-specific analysis will be performed using the site-specific soil parameters and site-specific SSE to demonstrate that the capacity of the below grade walls is not exceeded.

Table 2.1-2—Bounding Values for Component Radionuclide Inventory

Nuclide	Activity (μCi/g)	Nuclide	Activity (μCi/g)
Br-84	1.7E-02	Y-91	8.1E-05
I-129	4.6E-08	Y-92	1.4E-04
I-131	7.4E-01	Y-93	6.5E-05
I-132	3.7E-01	Zr-95	9.3E-05
I-133	1.3E+00	Nb-95	9.4E-05
I-134	2.4E-01	Mo-99	1.1E-01
I-135	7.9E-01	Tc-99	1.1E-09
Cs-134	1.7E-01	Tc-99m	4.6E-02
Cs-136	5.3E-02	Ru-103	7.8E-05
Cs-137	1.1E-01	Ru-106	2.7E-05
Cr-51	2.0E-03	Ag-110m	2.0E-07
Mn-54	1.0E-03	Te-129m	1.5E-03
Fe-55	7.6E-04	Te-129	2.4E-03
Fe-59	1.9E-04	Te-131m	3.7E-03
Co-58	2.9E-03	Te-131	2.6E-03
Co-60	3.4E-04	Te-132	4.1E-02
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
Sr-89	6.4E-04	Ce-143	7.6E-05
Sr-90	3.3E-05	Ce-144	6.9E-05
Sr-91	1.0E-03	Np-239	8.7E-04
Y-91m	5.2E-04	H-3	1.0E+00

Table 2.1-3—Deleted

Table 2.1-4—Deleted

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