

## **Appendix R1.3**

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### **Meteorology and Climate Change**

This appendix presents a table that estimates greenhouse gas emissions for existing renewable energy projects within the Plan Area. This appendix also presents climate data for each ecoregion subarea, in a series of 10 tables.

## Appendix R1.3 Meteorology and Climate Change

### R1.3.1 Existing Projects' GHG Emissions

Project	Technology Type	County	MW	Construction (MTCO <sub>2</sub> e per year)	Operations (MTCO <sub>2</sub> e per year)	Decommissioning (MTCO <sub>2</sub> e per year)	Combined Construction + Operation (MTCO <sub>2</sub> e per year)	Threshold	Estd. Production (MWh annual) <sup>2</sup>	Displaced Annual GHG emissions (MTCO <sub>2</sub> e) <sup>3</sup>	
Ocotillo Express Wind	Wind	Imperial	315	495.8	647.9	495.8 (or less)	1,639.5	7,000 MTCO <sub>2</sub> e/year	921,690	346,940	
Alta East Wind	Wind	Kern	300	184.5	332.0	184.5 (or less)	701	7,000 MTCO <sub>2</sub> e/year	877,800	330,419	
Desert Sunlight Solar Farm	Solar PV	Riverside	550	946	1,224.30	946 (or less)	3,116.3	11,023 MTCO <sub>2</sub> e/year	1,200,000	451,701	
Ivanpah Solar Electric Generating	Solar Power Tower	San Bernardino	390	232	194	not evaluated	426	10,000 MTCO <sub>2</sub> e/year	960,000	361,361	
Casa Diablo <sup>1</sup>	Geothermal	Mono	33	275.9	148.6	80.2	504.7	10,000 MTCO <sub>2</sub> e/year	288,000	67,918	
Genesis NextEra	Solar Trough	Riverside	250	52,974 <sup>4</sup>	4,133.0	4,133 (or less)	0.007 MTCO <sub>2</sub> e/MWh	0.5 MTCO <sub>2</sub> e per MWh	600,000	225,850	
Centinela Solar	Solar PV	Imperial	170	2,932 <sup>5</sup>	825.5	2,932 (or less)	6,689.5	10,000 MTCO <sub>2</sub> e/year	365,500	137,580	
Imperial Solar Energy Center South	Solar PV	Imperial	130	2,281 <sup>5</sup>	688.8	not evaluated	689	10,000 MTCO <sub>2</sub> e/year	279,500	105,209	
Rosamond I and II	Solar PV	Kern	40	78	5.6	255.4	339	7,000 MTCO <sub>2</sub> e/year	86,000	32,372	
Pacific Wind Energy	Wind	Kern	140	4,521.9 <sup>5</sup>	982.8	not evaluated	982.8	Not Included	409,640	154,196	
<b>Sum of Capacity (MW):</b>			<b>2,318</b>	<b>Average Emissions (MTCO<sub>2</sub>e per year) per MW Capacity:</b>			<b>9.97 per MW</b>				

<sup>1</sup>Not a baseline project.

<sup>2</sup>2926 hours per MW assumed for Ocotillo Express and Alta East Wind Projects, 2150 hours per MW assumed for Centinela, Imperial and Rosamond Solar PV Projects.

<sup>3</sup>Displace GHG emissions derived from the CARB Staff Report: Initial Statement of Reasons for Proposed Regulation for a California Renewable Electricity Standard, Appendix D - 830 lbs per MWh for solar and wind & 520 lbs per MWh for geothermal.

<sup>4</sup>Emissions for the entire construction period (37 months).

<sup>5</sup>Not amortized or annualized.

## R1.3-2 Climate Summaries

### Cadiz Valley and Chocolate Mountains Ecoregion

The Cadiz Valley and Chocolate Mountains Ecoregion lies within the northern half of the Sonoran Desert Ecoregion. Table R1.3-1 below provides a summary of climate data representative of the ecoregion, as recorded at the Eagle Mountain station located within the central/southerly portion of the ecoregion.

**Table R1.3-1  
 Monthly Climate Summary for Eagle Mountain Station, 1933 To 2012**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip. (in)	Average Total Snowfall (in)	Average Snow Depth (in)
January	64.5	44.4	0.51	0.0	0
February	68.9	48.0	0.43	0.0	0
March	74.8	52.8	0.34	0.0	0
April	82.6	59.7	0.09	0.0	0
May	91.0	67.9	0.04	0.0	0
June	100.0	76.5	0.03	0.0	0
July	104.9	82.6	0.27	0.0	0
August	103.4	82.6	0.27	0.0	0
September	98.3	74.9	0.43	0.0	0
October	87.0	64.1	0.21	0.0	0
November	73.9	52.4	0.19	0.0	0
December	65.4	45.2	0.49	0.0	0
Annual	84.6	62.5	3.65	0.0	0

Source: WRCC, National Oceanic and Atmospheric Administration (NOAA) Cooperative Stations Climatological Data, 9/1/1933 to 2/27/2012. Accessed <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca2598>, on April 18, 2012.

### Imperial and Borrego Valley Ecoregion

The Imperial and Borrego Valley Ecoregion lies within the southern half of the Colorado Desert Ecoregion. Table R1.3-2 below provides a summary of the climate data for the Imperial station located in the south-central portion of the ecoregion.

**Table R1.3-2**  
**Monthly Climate Summary for Imperial Station, 1901 To 2011**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip. (in)	Average Total Snowfall (in)	Average Snow Depth (in)
January	69.7	41.1	0.39	0.0	0
February	73.8	44.9	0.48	0.0	0
March	79.4	49.5	0.25	0.0	0
April	86.1	55.2	0.10	0.0	0
May	93.8	61.7	0.02	0.0	0
June	102.5	68.9	0.00	0.0	0
July	106.7	76.7	0.10	0.0	0
August	105.4	77.0	0.31	0.0	0
September	101.0	70.8	0.24	0.0	0
October	90.3	59.6	0.25	0.0	0
November	78.2	47.9	0.20	0.0	0
December	69.8	41.4	0.49	0.0	0
Annual	88.1	57.9	2.84	0.0	0

Source: WRCC, NOAA Cooperative Stations Climatological Data, 11/1/1901 to 12/31/2011. Accessed <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca4223> on April 18, 2012.

### Kingston and Funeral Mountains Ecoregion

The Kingston and Funeral Mountains Ecoregion occupies the northeast edge of the Mojave Desert Ecoregion. Table R1.3-3 below provides a summary of the climate data for the Shoshone station located in the north-central portion of the ecoregion.

**Table R1.3-3**  
**Monthly Climate Summary for Shoshone Station, 1972 To 2011**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip. (in)	Average Total Snowfall (in)	Average Snow Depth (in)
January	58.9	39.4	0.77	0.2	0
February	65.3	42.4	0.98	0.0	0
March	72.8	46.9	0.74	0.0	0
April	79.9	51.5	0.23	0.0	0
May	90.8	61.4	0.22	0.0	0
June	98.2	68.8	0.03	0.0	0
July	108.7	78.3	0.14	0.0	0

**Table R1.3-3**  
**Monthly Climate Summary for Shoshone Station, 1972 To 2011**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip. (in)	Average Total Snowfall (in)	Average Snow Depth (in)
August	105.7	74.8	0.30	0.0	0
September	99.4	69.2	0.27	0.0	0
October	85.1	56.9	0.26	0.0	0
November	74.1	48.3	0.33	0.0	0
December	58.8	38.0	0.52	0.0	0
Annual	83.1	56.3	4.79	0.2	0

Source: WRCC, NOAA Cooperative Stations Climatological Data, 12/1/1972 to 3/14/2011. <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca8200>, on April 23, 2012.

### Mojave and Silurian Valley Ecoregion

The Mojave and Silurian Valley Ecoregion lies within the central portion of the Mojave Desert Ecoregion. Table R1.3-4 below provides a summary of the climate data from the Baker station located in the approximate center of the ecoregion.

**Table R1.3-4**  
**Monthly Climate Summary for Baker Station, 1971 To 2012**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip. (in)	Average Total Snowfall (in)	Average Snow Depth (in)
January	63.2	34.6	0.47	0.0	0
February	68.7	39.4	0.71	0.0	0
March	76.8	45.6	0.53	0.0	0
April	84.3	51.6	0.20	0.0	0
May	94.8	61.2	0.12	0.0	0
June	104.8	70.2	0.07	0.0	0
July	110.3	77.0	0.23	0.0	0
August	107.9	75.1	0.47	0.0	0
September	100.1	67.1	0.38	0.0	0
October	72.6	42.8	0.31	0.0	0
November	72.6	42.8	0.31	0.0	0
December	62.4	33.9	0.41	0.0	0
Annual	86.1	54.4	4.15	0.0	0

Source: WRCC, NOAA Cooperative Stations Climatological Data, 12/1/1971 to 2/27/2012. Accessed <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca0436>, on April 20, 2012.

## Owens River Valley Ecoregion

The Owens River Valley Ecoregion lies within the Eastern Sierra Nevada Ecoregion. Table R1.3-5 below provides a summary of the climate data for the Haiwee station located near the central portion of the ecoregion.

**Table R1.3-5**  
**Monthly Climate Summary for Haiwee Station, 1923 To 2013**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip. (in)	Average Total Snowfall (in)	Average Snow Depth (in)
January	52.0	29.1	1.08	1.4	0
February	56.7	32.7	1.30	1.1	0
March	63.1	37.2	0.86	0.6	0
April	70.5	43.5	0.34	0.1	0
May	79.6	51.4	0.22	0.0	0
June	89.1	59.2	0.09	0.0	0
July	95.6	65.8	0.23	0.0	0
August	93.9	63.9	0.29	0.0	0
September	87.2	57.3	0.27	0.0	0
October	75.8	47.2	0.29	0.0	0
November	62.2	36.5	0.55	0.7	0
December	52.7	30.1	0.99	0.9	0
Annual	73.2	46.1	6.5	4.9	0

Source: WRCC, NOAA Cooperative Stations Climatological Data, 5/1/1923 to 3/31/2013. Accessed <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca3710> on June 12, 2013.

## Panamint Death Valley Ecoregion

The Panamint Death Valley Ecoregion occupies the central–north portion of the Mojave Desert Ecoregion. Table R1.3-6 below provides a summary of the climate data for the Trona station located in the central portion of the ecoregion.

**Table R1.3-6**  
**Monthly Climate Summary for Trona Station, 1920 To 2012**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip (in)	Average Total Snowfall (in)	Average Snow Depth (in)
January	58.2	32.9	0.73	0.3	0
February	64.7	38.0	0.87	0.0	0

**Table R1.3-6**  
**Monthly Climate Summary for Trona Station, 1920 To 2012**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip (in)	Average Total Snowfall (in)	Average Snow Depth (in)
March	71.4	43.6	0.47	0.0	0
April	79.2	50.0	0.17	0.0	0
May	88.5	58.3	0.09	0.0	0
June	98.4	66.0	0.07	0.0	0
July	105.5	73.3	0.11	0.0	0
August	103.3	71.8	0.20	0.0	0
September	96.3	64.1	0.19	0.0	0
October	83.8	52.8	0.17	0.0	0
November	69.1	40.4	0.34	0.0	0
December	58.3	33.2	0.52	0.0	0
Annual	81.4	52.0	3.94	0.3	0

Source: WRCC, NOAA Cooperative Stations Climatological Data, 1/1/1920 to 2/27/2012. Accessed <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca9035>, on April 24, 2012.

### Pinto Lucerne Valley and Eastern Slopes Ecoregion

The Pinto Lucerne Valley and Eastern Slopes Ecoregion lies mostly within the Mojave Desert Ecoregion, but portions of this ecoregion along its southern boundary lie within the Southwestern California Ecoregion. Table R1.3-7 below provides a summary of the climate data for the Twentynine Palms station located in the central easterly portion of the ecoregion.

**Table R1.3-7**  
**Monthly Climate Summary For Twentynine Palms Station, 1935 To 2012**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip. (in)	Average Total Snowfall (in)	Average Snow Depth (in)
January	62.7	35.9	0.50	0.5	0
February	67.4	38.9	0.42	0.0	0
March	73.9	43.2	0.37	0.0	0
April	81.7	49.5	0.12	0.0	0
May	90.7	57.4	0.07	0.0	0
June	99.9	65.1	0.01	0.0	0
July	105.1	72.1	0.54	0.0	0
August	103.1	70.8	0.74	0.0	0

**Table R1.3-7**  
**Monthly Climate Summary For Twentynine Palms Station, 1935 To 2012**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip. (in)	Average Total Snowfall (in)	Average Snow Depth (in)
September	97.1	63.9	0.42	0.0	0
October	85.3	52.8	0.29	0.0	0
November	71.6	41.8	0.28	0.0	0
December	63.0	36.0	0.51	0.2	0
Annual	83.4	52.3	4.26	0.7	0

Source: WRCC, NOAA Cooperative Stations Climatological Data, 5/1/1935 to 2/26/2012. Accessed <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca9099>, on April 23, 2012.

### Piute Valley and Sacramento Mountains Ecoregion

The Piute Valley and Sacramento Mountains Ecoregion largely lies within the far southeast part of the Mojave Desert Ecoregion but also overlaps the far northeast part of the Sonoran Desert Ecoregion. Table R1.3-8 below provides a summary of the climate data for the Needles FAA Airport station located in the far eastern part of the ecoregion.

**Table R1.3-8**  
**Monthly Climate Summary for Needles FAA Airport Station, 1948 to 2012**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip (in)	Average Total Snowfall (in)	Average Snow Depth (in)
January	64.0	42.1	0.63	0.3	0
February	69.7	45.6	0.55	0.0	0
March	76.4	50.1	0.49	0.0	0
April	84.8	57.5	0.22	0.0	0
May	94.2	66.8	0.09	0.0	0
June	104.0	76.0	0.03	0.0	0
July	108.9	83.6	0.31	0.0	0
August	106.8	81.7	0.62	0.0	0
September	100.8	74.0	0.42	0.0	0
October	88.1	61.6	0.29	0.0	0
November	73.5	49.7	0.35	0.0	0
December	63.8	42.2	0.44	0.0	0
Annual	86.2	60.9	4.44	0.3	0

Source: WRCC, NOAA Cooperative Stations Climatological Data, 7/1/1948 to 2/26/2012. Accessed <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca6118>, on April 23, 2012.

## Providence and Bullion Mountains Ecoregion

The Providence and Bullion Mountains Ecoregion lies within the east-central portion of the Mojave Desert Ecoregion. Table R1.3-9 below provides a summary of the climate data for the Mitchell Caverns station located in the eastern half of the ecoregion.

**Table R1.3-9**  
**Monthly Climate Summary for Mitchell Caverns Station, 1958 to 2011**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip (in)	Average Total Snowfall (in)	Average Snow Depth (in)
January	54.2	38.3	1.26	0.6	0
February	56.4	39.7	1.64	0.4	0
March	61.3	43.0	1.23	0.6	0
April	68.8	48.1	0.55	0.2	0
May	78.4	57.0	0.23	0.1	0
June	88.2	66.4	0.09	0.0	0
July	93.5	72.1	0.80	0.0	0
August	91.3	70.3	1.37	0.0	0
September	85.1	64.7	0.76	0.0	0
October	74.4	55.7	0.66	0.0	0
November	62.2	45.0	0.68	0.2	0
December	54.6	38.4	1.18	1.0	0
Annual	72.3	53.2	10.45	3.3	0

Source: WRCC, NOAA Cooperative Stations Climatological Data, 3/11/1958 to 4/30/2011. Accessed <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca5721>, on April 23, 2012.

## West Mojave and Eastern Slopes Ecoregion

The West Mojave and Eastern Slopes Ecoregion lies within the west part of the Mojave Desert Ecoregion. Table R1.3-10 below provides a summary of the climate data for the Mojave weather station located in the central portion of the ecoregion.

**Table R1.3-10**  
**Monthly Climate Summary for Mojave Station, 1904 to 2010**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip (in)	Average Total Snowfall (in)	Average Snow Depth (in)
January	57.8	34.2	1.20	0.8	0
February	61.2	37.1	1.27	0.4	0

**Table R1.3-10**  
**Monthly Climate Summary for Mojave Station, 1904 to 2010**

Month	Average Max Temp (F)	Average Min Temp (F)	Average Total Precip (in)	Average Total Snowfall (in)	Average Snow Depth (in)
March	64.7	41.0	0.93	0.2	0
April	71.3	46.3	0.30	0.0	0
May	79.9	55.1	0.09	0.0	0
June	89.9	63.8	0.03	0.0	0
July	97.7	69.8	0.11	0.0	0
August	96.4	68.0	0.15	0.0	0
September	89.0	60.3	0.21	0.0	0
October	78.5	50.3	0.24	0.0	0
November	65.7	40.2	0.53	0.1	0
December	57.2	32.9	0.87	0.2	0
Annual	75.8	49.9	5.93	1.7	0

Source: WRCC, NOAA Cooperative Stations Climatological Data, 1/1/1904 to 6/30/2010. Accessed <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca5756>, on April 20, 2012.