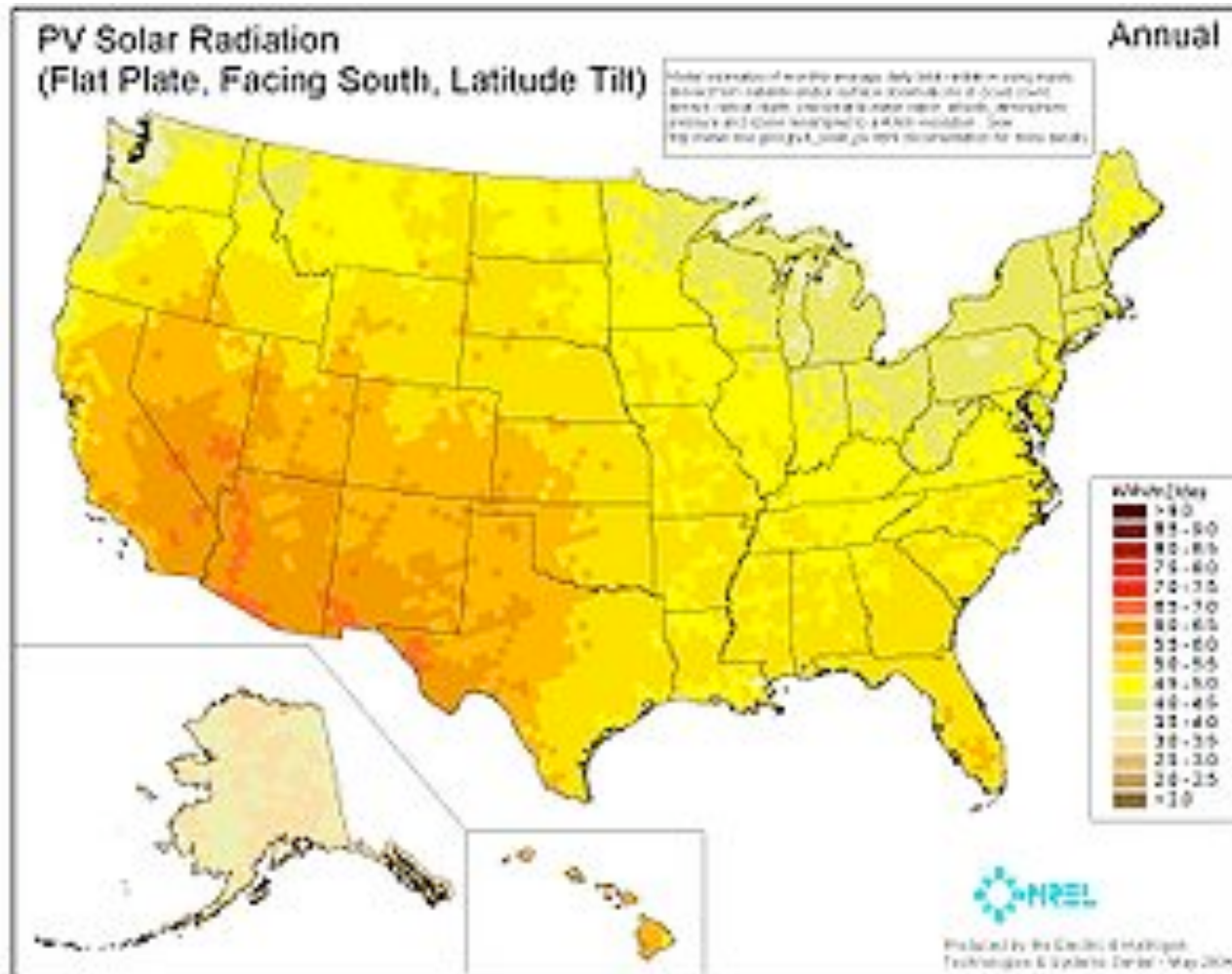
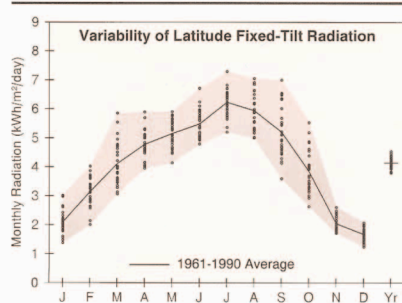


USA Solar Insolation Map





Kalispell, MT

WBAN NO. 24146

LATITUDE: 48.30° N
 LONGITUDE: 114.27° W
 ELEVATION: 904 meters
 MEAN PRESSURE: 912 millibars
 STATION TYPE: Secondary

Solar Radiation for Flat-Plate Collectors Facing South at a Fixed Tilt (kWh/m²/day), Uncertainty ±9%

Tilt (°)		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
0	Average	1.2	2.0	3.1	4.3	5.4	6.1	6.7	5.6	4.0	2.5	1.3	1.0	3.6
	Min/Max	0.9/1.5	1.5/2.3	2.5/4.0	3.7/5.1	4.5/6.1	5.4/7.5	5.6/7.8	4.9/6.5	3.2/5.1	2.0/3.2	1.2/1.4	0.8/1.1	3.4/3.8
Latitude -15	Average	1.9	2.9	4.0	4.9	5.5	6.0	6.7	6.2	5.1	3.6	1.9	1.5	4.2
	Min/Max	1.3/2.7	1.9/3.7	3.0/5.5	4.1/6.0	4.5/6.3	5.3/7.4	5.6/7.9	5.3/7.3	3.7/6.8	2.6/5.1	1.6/2.4	1.2/1.9	3.9/4.6
Latitude	Average	2.1	3.1	4.1	4.8	5.1	5.5	6.2	5.9	5.2	3.8	2.0	1.7	4.1
	Min/Max	1.4/3.0	2.0/4.0	3.1/5.8	4.0/5.9	4.1/5.9	4.8/6.7	5.2/7.3	5.0/7.1	3.6/7.0	2.6/5.5	1.7/2.6	1.2/2.1	3.8/4.5
Latitude +15	Average	2.2	3.2	4.0	4.4	4.6	4.7	5.4	5.4	5.0	3.8	2.1	1.7	3.9
	Min/Max	1.4/3.2	2.0/4.2	2.9/5.9	3.6/5.5	3.7/5.2	4.2/5.8	4.6/6.3	4.5/6.4	3.4/6.7	2.6/5.6	1.7/2.7	1.3/2.2	3.5/4.3
90	Average	2.1	3.0	3.4	3.2	3.0	3.0	3.4	3.7	3.9	3.3	1.9	1.7	3.0
	Min/Max	1.3/3.2	1.7/4.0	2.4/5.3	2.7/4.0	2.5/3.4	2.7/3.5	3.0/3.9	3.1/4.4	2.6/5.3	2.2/4.9	1.5/2.5	1.1/2.2	2.7/3.3

Solar Radiation for 1-Axis Tracking Flat-Plate Collectors with a North-South Axis (kWh/m²/day), Uncertainty ±9%

Axis Tilt (°)		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
0	Average	1.6	2.8	4.3	5.9	7.2	8.2	9.5	8.1	6.0	3.6	1.7	1.3	5.0
	Min/Max	1.1/2.3	1.9/3.5	3.2/6.0	4.7/7.4	5.6/8.6	6.9/10.8	7.2/11.5	6.5/9.9	4.0/8.3	2.6/5.2	1.4/2.0	1.0/1.5	4.5/5.5
Latitude -15	Average	2.1	3.5	4.9	6.4	7.5	8.3	9.7	8.7	6.8	4.5	2.1	1.7	5.5
	Min/Max	1.4/3.1	2.2/4.5	3.6/7.2	5.0/8.1	5.6/8.9	6.9/11.0	7.4/11.9	6.9/10.6	4.4/9.7	3.0/6.7	1.8/2.7	1.2/2.1	5.0/6.1
Latitude	Average	2.3	3.6	5.0	6.3	7.2	8.0	9.4	8.5	6.9	4.7	2.3	1.8	5.5
	Min/Max	1.5/3.4	2.3/4.8	3.6/7.4	4.9/8.1	5.4/8.7	6.7/10.6	7.1/11.5	6.8/10.5	4.4/9.8	3.0/7.0	1.9/2.9	1.3/2.3	4.9/6.2
Latitude +15	Average	2.4	3.7	5.0	6.0	6.8	7.5	8.9	8.1	6.7	4.7	2.3	1.9	5.3
	Min/Max	1.5/3.6	2.2/4.9	3.5/7.4	4.7/7.8	5.1/8.2	6.2/10.0	6.7/10.9	6.4/10.0	4.2/9.6	3.0/7.0	1.9/3.0	1.3/2.4	4.8/6.0

Solar Radiation for 2-Axis Tracking Flat-Plate Collectors (kWh/m²/day), Uncertainty ±9%

Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	2.4	3.7	5.1	6.4	7.6	8.6	10.0	8.7	6.9	4.7	2.3	1.9	5.7
	Min/Max	1.5/3.6	2.3/4.9	3.7/7.4	5.0/8.2	5.8/9.1	7.2/11.3	7.5/12.1	7.0/10.7	4.4/9.8	3.0/7.1	1.9/3.0	1.3/2.4	5.1/6.3

Direct Beam Solar Radiation for Concentrating Collectors (kWh/m²/day), Uncertainty ±8%

Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
1-Axis, E-W Horiz Axis	Average	0.9	1.6	2.2	2.7	3.3	4.0	5.2	4.4	3.6	2.5	1.0	0.7	2.7
	Min/Max	0.1/2.0	0.5/2.6	1.2/3.7	1.8/4.1	1.9/4.4	2.8/6.3	3.4/7.0	3.0/6.0	1.8/5.8	1.2/4.4	0.6/1.6	0.3/1.2	2.3/3.2
1-Axis, N-S Horiz Axis	Average	0.6	1.2	2.3	3.5	4.4	5.3	6.9	5.8	4.2	2.3	0.7	0.4	3.2
	Min/Max	0.1/1.2	0.4/2.1	1.2/3.8	2.2/5.2	2.6/6.0	3.7/8.4	4.4/9.3	3.9/8.0	2.0/6.9	1.1/4.0	0.4/1.2	0.2/0.7	2.7/3.7
1-Axis, N-S Tilt=Latitude	Average	1.0	1.9	2.9	3.8	4.4	5.1	6.8	6.2	5.0	3.2	1.1	0.8	3.5
	Min/Max	0.1/2.1	0.6/3.1	1.6/4.9	2.5/5.7	2.6/6.0	3.6/8.1	4.3/9.1	4.2/8.5	2.4/8.1	1.5/5.6	0.6/1.9	0.4/1.2	3.0/4.2
2-Axis	Average	1.1	1.9	2.9	3.9	4.7	5.6	7.3	6.4	5.0	3.2	1.2	0.8	3.7
	Min/Max	0.1/2.3	0.7/3.2	1.6/4.9	2.5/5.8	2.7/6.3	3.9/8.8	4.6/9.8	4.3/8.7	2.4/8.2	1.5/5.6	0.6/1.9	0.4/1.3	3.1/4.4

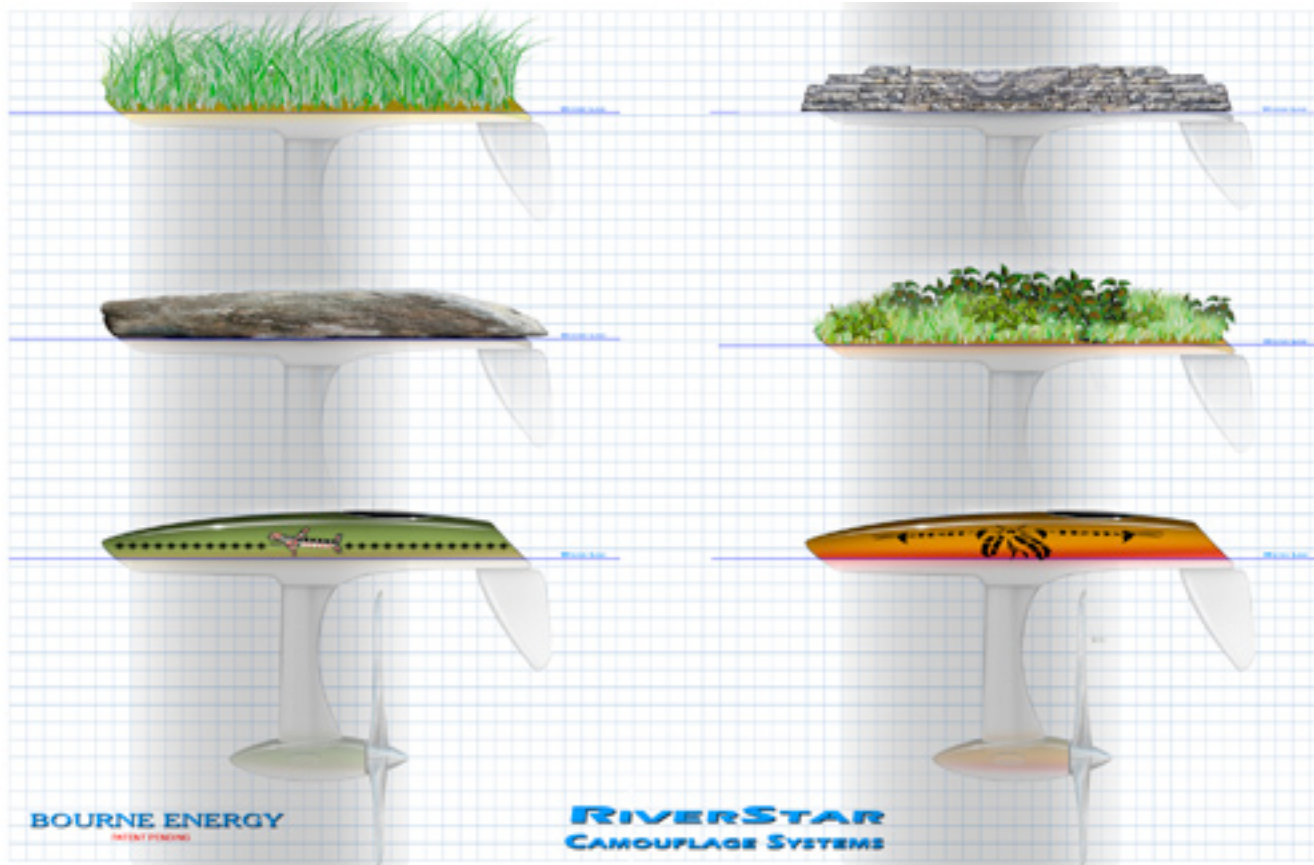
Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-6.4	-3.0	0.9	6.2	10.7	14.3	17.6	17.2	11.8	5.5	-0.6	-5.2	5.8
Daily Minimum Temp	-10.7	-7.7	-4.5	-0.5	3.6	6.7	8.4	7.9	3.7	-1.4	-4.6	-9.2	-0.7
Daily Maximum Temp	-2.1	1.7	6.3	12.9	17.9	21.9	26.7	26.3	19.8	12.4	3.5	-1.2	12.2
Record Minimum Temp	-38.9	-37.8	-33.9	-12.2	-7.2	-2.2	-0.6	-0.6	-8.9	-19.4	-33.3	-37.2	-38.9
Record Maximum Temp	11.7	13.9	22.2	28.9	34.4	35.6	40.0	40.6	37.2	27.8	18.3	13.9	40.6
HDD, Base 18.3°C	767	597	539	363	236	131	54	71	204	398	567	728	4654
CDD, Base 18.3°C	0	0	0	0	0	11	30	35	7	0	0	0	83
Relative Humidity (%)	78	76	70	61	61	62	57	57	65	73	79	81	68
Wind Speed (m/s)	2.6	2.6	3.1	3.6	3.4	3.1	3.0	2.9	2.9	2.3	2.6	2.3	2.9



Typical Off-Grid System

In Stream - Hydro Power





source: PHOTON International 04/07

How far a car can drive based on any of the following forms of energy, each produced from 100m x 100m (2.5 acres) of land...