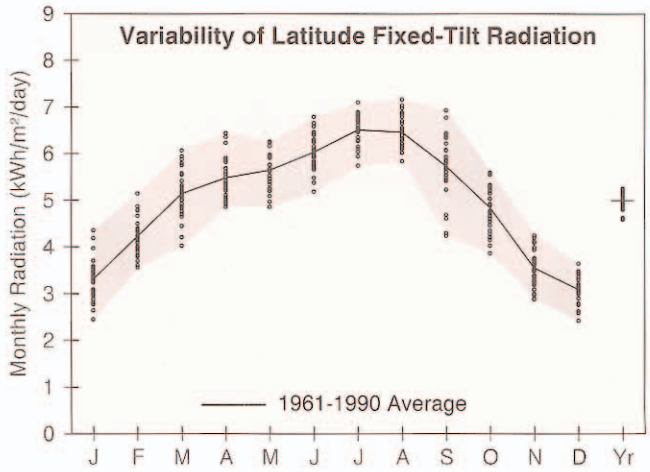
Billings, MT

WBAN NO. 24033

LATITUDE: 45.80° N
LONGITUDE: 108.53° W
ELEVATION: 1088 meters
MEAN PRESSURE: 891 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	1.7	2.6	3.8	5.0	5.9	6.7	7.0	6.1	4.5	3.1	1.9	1.4	4.1
	Min/Max	1.5/2.0	2.3/2.8	3.2/4.2	4.5/5.7	5.2/6.5	5.8/7.5	6.1/7.6	5.5/6.7	3.6/5.3	2.7/3.4	1.7/2.1	1.3/1.6	3.9/4.3
Latitude -15	Average	2.9	3.9	4.9	5.6	6.0	6.6	7.1	6.7	5.6	4.5	3.2	2.7	5.0
	Min/Max	2.2/3.8	3.3/4.6	4.0/5.8	5.0/6.6	5.2/6.7	5.7/7.4	6.2/7.7	6.1/7.4	4.2/6.8	3.7/5.2	2.6/3.8	2.1/3.1	4.6/5.2
Latitude	Average	3.3	4.2	5.1	5.5	5.6	6.0	6.5	6.5	5.7	4.8	3.5	3.1	5.0
	Min/Max	2.5/4.4	3.6/5.2	4.0/6.1	4.9/6.4	4.9/6.3	5.2/6.8	5.7/7.1	5.8/7.2	4.2/6.9	3.9/5.6	2.9/4.3	2.4/3.6	4.6/5.3
Latitude +15	Average	3.5	4.4	5.1	5.1	5.0	5.2	5.7	5.9	5.5	4.9	3.7	3.3	4.8
	Min/Max	2.6/4.7	3.7/5.4	3.9/6.0	4.5/6.0	4.3/5.5	4.5/5.8	5.0/6.2	5.3/6.5	4.0/6.7	3.9/5.7	3.0/4.5	2.6/4.0	4.4/5.0
90	Average	3.4	4.0	4.2	3.6	3.1	3.0	3.3	3.8	4.2	4.2	3.5	3.3	3.6
	Min/Max	2.4/4.7	3.2/4.9	3.1/5.0	3.2/4.2	2.8/3.4	2.7/3.3	3.0/3.6	3.5/4.2	3.1/5.1	3.3/4.9	2.8/4.3	2.5/3.9	3.3/3.9

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	2.5	3.7	5.4	6.8	7.9	9.1	9.8	8.8	6.7	4.6	2.9	2.2	5.9
	Min/Max	2.0/3.3	3.1/4.5	4.1/6.5	5.8/8.4	6.7/9.1	7.5/10.7	8.0/10.9	7.6/10.1	4.7/8.3	3.7/5.4	2.3/3.5	1.8/2.6	5.3/6.3
Latitude -15	Average	3.5	4.7	6.3	7.4	8.2	9.2	10.1	9.4	7.6	5.7	3.8	3.2	6.6
	Min/Max	2.5/4.6	3.9/5.9	4.7/7.7	6.3/9.1	6.8/9.4	7.5/10.9	8.2/11.1	8.1/10.8	5.2/9.5	4.4/6.7	3.0/4.7	2.4/3.8	5.9/7.0
Latitude	Average	3.8	5.0	6.4	7.3	7.9	8.8	9.7	9.2	7.6	6.0	4.1	3.5	6.6
	Min/Max	2.7/5.1	4.1/6.3	4.8/7.9	6.2/9.1	6.6/9.1	7.2/10.5	7.9/10.8	8.0/10.6	5.3/9.6	4.6/7.0	3.3/5.1	2.7/4.2	5.9/7.0
Latitude +15	Average	4.0	5.1	6.4	7.0	7.5	8.3	9.1	8.8	7.5	6.0	4.3	3.7	6.5
	Min/Max	2.8/5.4	4.2/6.4	4.7/7.8	5.9/8.7	6.2/8.6	6.7/9.8	7.4/10.1	7.6/10.2	5.1/9.4	4.6/7.1	3.4/5.3	2.8/4.4	5.8/6.9

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

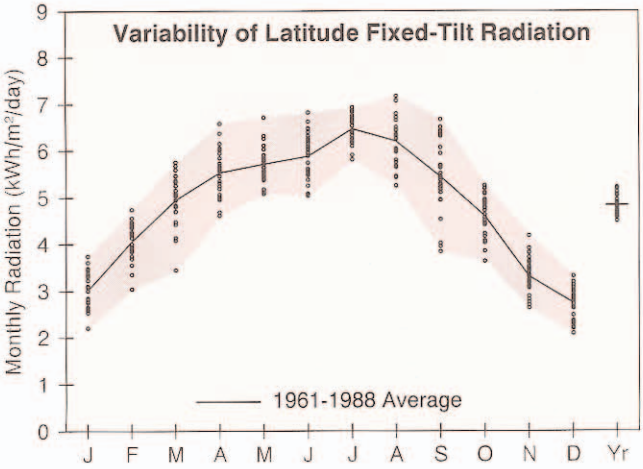
Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	4.0	5.1	6.5	7.4	8.3	9.4	10.3	9.4	7.7	6.1	4.3	3.8	6.9
	Min/Max	2.8/5.4	4.2/6.4	4.8/7.9	6.3/9.2	6.9/9.5	7.7/11.1	8.4/11.4	8.2/10.9	5.3/9.6	4.7/7.1	3.4/5.3	2.9/4.5	6.1/7.3

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	2.3	2.7	3.1	3.4	3.9	4.8	5.6	5.1	4.1	3.5	2.5	2.2	3.6
	Min/Max	1.2/3.6	1.8/3.9	2.0/4.5	2.4/4.8	2.7/5.0	3.5/6.3	4.2/6.5	4.1/6.3	2.3/5.7	2.3/4.4	1.7/3.4	1.5/3.1	3.0/4.0
1-Axis, N-S Horiz Axis	Average	1.4	2.2	3.3	4.3	5.2	6.4	7.4	6.7	4.9	3.3	1.8	1.3	4.0
	Min/Max	0.8/2.3	1.5/3.2	2.1/4.8	3.1/6.3	3.7/6.6	4.6/8.4	5.4/8.6	5.3/8.4	2.7/6.8	2.1/4.2	1.2/2.5	0.8/1.8	3.3/4.5
1-Axis, N-S Tilt=Latitude	Average	2.4	3.2	4.1	4.7	5.2	6.1	7.2	6.9	5.7	4.4	2.8	2.3	4.6
	Min/Max	1.3/3.9	2.2/4.7	2.6/6.0	3.4/6.8	3.7/6.6	4.4/8.0	5.3/8.4	5.5/8.7	3.1/7.9	2.8/5.6	1.9/3.9	1.5/3.2	3.8/5.1
2-Axis	Average	2.6	3.3	4.1	4.8	5.5	6.6	7.8	7.2	5.7	4.4	2.9	2.5	4.8
	Min/Max	1.4/4.2	2.3/4.8	2.6/6.1	3.4/6.9	3.9/6.9	4.8/8.7	5.6/9.0	5.7/9.0	3.1/8.0	2.9/5.7	2.0/4.1	1.6/3.5	3.9/5.3

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-5.1	-1.7	1.9	7.6	12.8	18.2	22.5	21.5	15.1	9.5	1.7	-3.6	8.4
Daily Minimum Temp	-10.2	-7.0	-3.8	1.1	6.3	11.1	14.6	13.7	8.1	3.1	-3.6	-8.6	2.1
Daily Maximum Temp	-0.1	3.7	7.7	13.9	19.3	25.3	30.4	29.3	22.0	15.9	6.9	1.3	14.6
Record Minimum Temp	-34.4	-38.9	-28.3	-20.6	-10.0	0.0	5.0	4.4	-5.6	-21.7	-30.0	-35.6	-38.9
Record Maximum Temp	20.0	22.2	26.1	33.3	35.6	40.6	41.1	40.6	39.4	32.2	25.0	20.6	41.1
HDD, Base 18.3°C	727	560	508	323	176	66	7	23	134	277	498	681	3980
CDD, Base 18.3°C	0	0	0	0	3	63	136	122	36	3	0	0	362
Relative Humidity (%)	60	59	58	54	55	53	46	44	52	53	59	61	54
Wind Speed (m/s)	6.3	5.5	5.0	5.1	4.7	4.3	4.2	4.2	4.4	4.9	5.2	5.9	5.0



Cut Bank, MT

WBAN NO. 24137

LATITUDE: 48.60° N
LONGITUDE: 112.37° W
ELEVATION: 1170 meters
MEAN PRESSURE: 881 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	1.4	2.2	3.5	4.9	5.9	6.6	6.9	5.8	4.2	2.8	1.6	1.1	3.9
	Min/Max	1.2/1.6	1.9/2.5	2.8/3.9	4.2/5.6	5.3/6.8	5.7/7.6	6.3/7.4	5.1/6.6	3.3/4.8	2.4/3.0	1.4/1.8	1.0/1.3	3.7/4.1
Latitude -15	Average	2.6	3.7	4.8	5.6	6.1	6.5	7.0	6.5	5.4	4.3	2.9	2.4	4.8
	Min/Max	2.0/3.2	2.8/4.3	3.4/5.5	4.8/6.7	5.5/7.2	5.5/7.5	6.3/7.5	5.5/7.5	3.9/6.5	3.5/4.9	2.4/3.7	1.8/2.8	4.5/5.2
Latitude	Average	3.0	4.0	4.9	5.5	5.7	5.9	6.5	6.2	5.4	4.6	3.3	2.7	4.8
	Min/Max	2.2/3.7	3.0/4.7	3.4/5.8	4.6/6.6	5.1/6.7	5.0/6.8	5.8/6.9	5.3/7.2	3.8/6.7	3.6/5.3	2.6/4.2	2.1/3.3	4.5/5.2
Latitude +15	Average	3.2	4.2	4.9	5.1	5.1	5.1	5.6	5.6	5.2	4.6	3.5	2.9	4.6
	Min/Max	2.3/4.1	3.1/4.9	3.3/5.7	4.3/6.1	4.5/5.9	4.4/5.9	5.1/6.0	4.8/6.5	3.6/6.4	3.6/5.3	2.7/4.4	2.2/3.6	4.2/5.0
90	Average	3.1	3.9	4.1	3.8	3.4	3.2	3.6	3.9	4.1	4.1	3.3	2.9	3.6
	Min/Max	2.2/4.0	2.8/4.5	2.7/4.8	3.2/4.6	3.0/3.8	2.8/3.6	3.2/3.8	3.3/4.5	2.8/5.1	3.2/4.7	2.5/4.2	2.2/3.5	3.3/3.9

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	2.2	3.4	5.1	6.9	8.1	9.0	9.8	8.4	6.2	4.3	2.5	1.8	5.7
	Min/Max	1.7/2.7	2.6/4.0	3.5/6.1	5.5/8.5	7.1/9.8	7.3/11.1	8.6/10.7	6.9/10.1	4.2/7.7	3.4/5.0	2.0/3.2	1.4/2.2	5.2/6.1
Latitude -15	Average	3.1	4.5	6.1	7.6	8.4	9.1	10.1	9.0	7.1	5.4	3.5	2.8	6.4
	Min/Max	2.3/4.0	3.3/5.4	4.0/7.3	5.9/9.4	7.3/10.3	7.4/11.3	8.8/11.1	7.3/10.9	4.7/9.0	4.2/6.3	2.8/4.5	2.1/3.4	5.8/7.0
Latitude	Average	3.4	4.8	6.2	7.5	8.2	8.7	9.8	8.9	7.2	5.7	3.8	3.1	6.5
	Min/Max	2.5/4.4	3.5/5.7	4.0/7.5	5.9/9.4	7.1/10.0	7.1/10.9	8.5/10.7	7.2/10.7	4.7/9.1	4.3/6.6	3.0/4.9	2.3/3.8	5.9/7.0
Latitude +15	Average	3.6	4.9	6.2	7.2	7.7	8.2	9.2	8.4	7.0	5.7	4.0	3.2	6.3
	Min/Max	2.5/4.6	3.5/5.9	3.9/7.4	5.6/9.1	6.7/9.4	6.6/10.3	8.0/10.1	6.8/10.2	4.6/8.9	4.3/6.7	3.1/5.2	2.4/4.0	5.7/6.9

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	3.6	4.9	6.2	7.6	8.6	9.3	10.3	9.1	7.2	5.7	4.0	3.3	6.7
	Min/Max	2.6/4.7	3.5/5.9	4.1/7.5	6.0/9.5	7.4/10.4	7.6/11.7	9.0/11.3	7.4/10.9	4.8/9.1	4.4/6.7	3.1/5.2	2.4/4.1	6.1/7.3

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	2.2	2.7	3.1	3.4	3.9	4.4	5.4	4.6	3.7	3.2	2.4	2.1	3.4
	Min/Max	1.1/3.0	1.8/3.7	1.6/4.1	2.3/5.0	3.0/5.5	3.0/6.4	4.2/6.2	3.3/6.1	2.0/5.2	2.1/4.0	1.6/3.5	1.2/2.8	3.0/4.0
1-Axis, N-S Horiz Axis	Average	1.3	2.1	3.2	4.4	5.2	5.9	7.2	6.0	4.3	2.9	1.6	1.1	3.8
	Min/Max	0.7/1.8	1.4/2.8	1.6/4.4	2.8/6.4	4.0/7.3	4.1/8.7	5.5/8.2	4.3/8.1	2.2/6.0	1.9/3.7	1.1/2.3	0.7/1.6	3.2/4.4
1-Axis, N-S Tilt=Latitude	Average	2.3	3.2	4.1	4.8	5.3	5.7	7.0	6.4	5.1	4.1	2.7	2.1	4.4
	Min/Max	1.2/3.2	2.1/4.3	2.0/5.5	3.1/7.1	4.0/7.3	4.0/8.4	5.4/8.1	4.6/8.5	2.7/7.2	2.6/5.1	1.8/3.9	1.3/2.9	3.8/5.1
2-Axis	Average	2.5	3.3	4.1	4.9	5.6	6.2	7.6	6.6	5.1	4.1	2.8	2.3	4.6
	Min/Max	1.3/3.5	2.2/4.4	2.0/5.5	3.2/7.2	4.3/7.8	4.3/9.1	5.8/8.7	4.7/8.8	2.7/7.2	2.7/5.2	1.9/4.1	1.4/3.2	3.9/5.3

Average Climatic Conditions

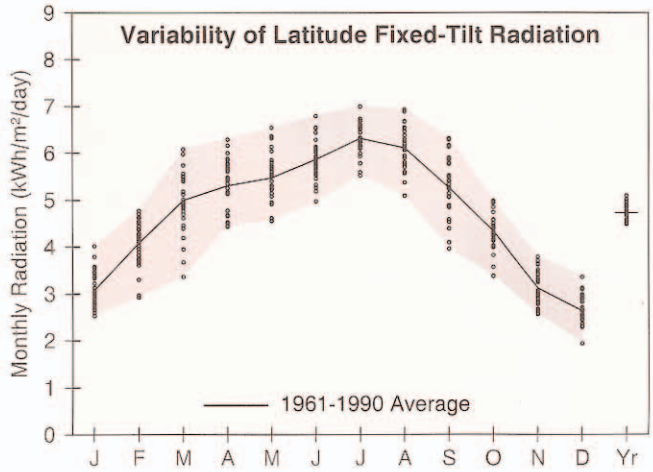
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-8.1	-4.9	-1.4	4.6	9.9	14.6	17.9	17.4	11.8	6.7	-1.4	-6.7	5.1
Daily Minimum Temp	-13.7	-10.8	-7.3	-2.1	3.1	7.5	9.7	9.2	4.1	-0.4	-7.2	-12.2	-1.7
Daily Maximum Temp	-2.5	1.0	4.6	11.2	16.8	21.7	26.1	25.6	19.4	13.7	4.3	-1.2	11.7
Record Minimum Temp	-37.2	-34.4	-31.1	-18.9	-10.6	-1.1	1.7	-0.6	-6.1	-21.1	-30.6	-39.4	-39.4
Record Maximum Temp	19.4	18.9	22.2	29.4	31.7	34.4	36.7	41.1	35.0	30.0	25.0	16.1	41.1
HDD, Base 18.3°C	818	650	612	412	260	125	43	86	209	362	593	777	4947
CDD, Base 18.3°C	0	0	0	0	0	13	31	57	13	0	0	0	114
Relative Humidity (%)	66	66	64	57	55	56	51	51	56	56	66	68	59
Wind Speed (m/s)	6.5	6.0	5.6	6.0	5.5	5.1	4.8	4.6	4.9	5.5	5.5	5.9	5.5

Glasgow, MT

WBAN NO. 94008

LATITUDE: 48.22° N
LONGITUDE: 106.62° W
ELEVATION: 700 meters
MEAN PRESSURE: 933 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	1.5	2.3	3.6	4.7	5.7	6.5	6.7	5.7	4.1	2.7	1.6	1.2	3.9
	Min/Max	1.3/1.7	1.9/2.7	2.8/4.2	4.1/5.4	4.8/6.7	5.6/7.4	5.9/7.4	5.0/6.4	3.3/4.7	2.3/2.9	1.4/1.7	1.0/1.3	3.7/4.1
Latitude -15	Average	2.7	3.7	4.8	5.4	5.8	6.4	6.8	6.4	5.2	4.1	2.8	2.3	4.7
	Min/Max	2.3/3.5	2.7/4.3	3.3/5.8	4.6/6.4	4.9/7.0	5.4/7.4	6.0/7.6	5.3/7.2	4.0/6.2	3.2/4.6	2.3/3.3	1.7/2.9	4.5/5.1
Latitude	Average	3.1	4.1	5.0	5.3	5.5	5.9	6.3	6.1	5.3	4.3	3.1	2.6	4.7
	Min/Max	2.5/4.0	2.9/4.8	3.4/6.1	4.4/6.3	4.6/6.5	5.0/6.8	5.5/7.0	5.1/6.9	4.0/6.3	3.4/5.0	2.6/3.8	1.9/3.3	4.5/5.1
Latitude +15	Average	3.3	4.2	4.9	4.9	4.8	5.0	5.5	5.5	5.0	4.4	3.3	2.8	4.5
	Min/Max	2.7/4.3	3.0/5.0	3.2/6.1	4.1/5.8	4.0/5.8	4.3/5.8	4.8/6.0	4.6/6.3	3.8/6.1	3.4/5.0	2.7/4.0	2.0/3.7	4.2/4.8
90	Average	3.2	3.9	4.2	3.6	3.2	3.1	3.4	3.8	3.9	3.8	3.1	2.8	3.5
	Min/Max	2.6/4.3	2.7/4.7	2.6/5.5	3.0/4.2	2.7/3.7	2.8/3.5	3.1/3.7	3.2/4.3	2.9/4.8	2.9/4.4	2.5/3.8	2.0/3.7	3.3/3.8

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	2.3	3.5	5.2	6.6	7.7	8.9	9.5	8.2	6.0	4.1	2.4	1.8	5.5
	Min/Max	1.8/2.9	2.5/4.1	3.5/6.3	5.1/8.2	6.1/9.6	7.1/10.3	8.0/10.7	6.9/9.6	4.4/7.4	3.1/4.7	2.0/2.9	1.4/2.3	5.2/6.0
Latitude -15	Average	3.2	4.5	6.1	7.2	8.0	9.0	9.8	8.9	6.9	5.1	3.3	2.7	6.2
	Min/Max	2.6/4.2	3.2/5.4	4.0/7.5	5.5/9.0	6.3/10.1	7.1/10.5	8.2/11.1	7.3/10.4	5.0/8.6	3.8/5.9	2.7/4.1	1.9/3.5	5.8/6.8
Latitude	Average	3.5	4.8	6.3	7.2	7.7	8.6	9.4	8.7	6.9	5.3	3.6	3.0	6.3
	Min/Max	2.8/4.7	3.3/5.8	4.0/7.8	5.4/9.0	6.1/9.8	6.8/10.1	7.9/10.7	7.1/10.2	5.0/8.7	4.0/6.2	2.9/4.4	2.1/3.8	5.8/6.9
Latitude +15	Average	3.7	4.9	6.2	6.9	7.3	8.1	8.9	8.3	6.8	5.3	3.7	3.1	6.1
	Min/Max	2.9/4.9	3.4/5.9	3.9/7.8	5.2/8.6	5.7/9.3	6.4/9.5	7.4/10.1	6.8/9.7	4.8/8.5	4.0/6.2	3.0/4.6	2.2/4.1	5.7/6.7

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

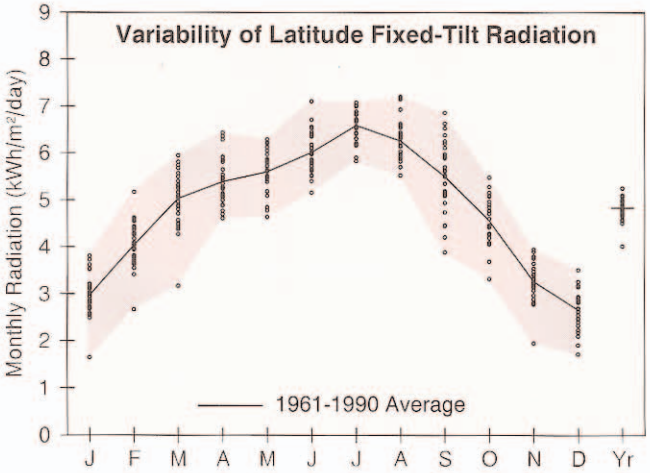
Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	3.7	5.0	6.3	7.3	8.1	9.2	10.0	8.9	7.0	5.4	3.7	3.2	6.5
	Min/Max	3.0/5.0	3.4/5.9	4.0/7.8	5.5/9.1	6.4/10.2	7.3/10.8	8.4/11.3	7.3/10.4	5.0/8.7	4.0/6.3	3.0/4.7	2.2/4.2	6.0/7.1

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	2.0	2.6	2.9	3.3	3.7	4.5	5.2	4.5	3.5	3.0	2.2	1.8	3.3
	Min/Max	1.3/3.0	1.4/3.5	1.5/4.1	1.8/4.8	2.3/5.3	2.9/6.0	3.9/6.3	3.2/5.8	2.1/4.9	2.0/3.8	1.5/3.0	0.9/2.6	2.9/3.9
1-Axis, N-S Horiz Axis	Average	1.2	2.0	3.1	4.2	4.9	5.9	6.8	5.9	4.1	2.7	1.5	1.0	3.6
	Min/Max	0.8/1.8	1.1/2.8	1.6/4.3	2.2/6.2	3.1/7.1	3.8/7.8	5.2/8.3	4.3/7.6	2.4/5.8	1.7/3.4	1.0/2.0	0.5/1.5	3.2/4.3
1-Axis, N-S Tilt=Latitude	Average	2.2	3.0	3.9	4.6	4.9	5.7	6.7	6.2	4.9	3.8	2.4	1.9	4.2
	Min/Max	1.4/3.2	1.7/4.2	2.0/5.4	2.4/6.8	3.2/7.2	3.7/7.5	5.1/8.1	4.5/8.0	2.9/6.8	2.4/4.7	1.6/3.4	1.0/2.7	3.7/4.9
2-Axis	Average	2.3	3.1	3.9	4.7	5.2	6.2	7.2	6.4	4.9	3.8	2.6	2.0	4.4
	Min/Max	1.5/3.4	1.7/4.3	2.0/5.4	2.5/6.9	3.3/7.6	4.0/8.1	5.4/8.7	4.7/8.3	2.9/6.8	2.5/4.8	1.7/3.5	1.0/3.0	3.9/5.2

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-11.9	-8.1	-1.4	6.8	12.8	18.0	21.6	20.8	14.1	7.8	-1.6	-9.3	5.8
Daily Minimum Temp	-17.1	-13.4	-7.2	0.0	5.8	10.7	13.7	12.9	6.7	0.7	-7.3	-14.7	-0.8
Daily Maximum Temp	-6.7	-2.7	4.3	13.6	19.6	25.3	29.3	28.6	21.3	14.8	4.2	-3.9	12.3
Record Minimum Temp	-43.9	-38.3	-32.8	-19.4	-6.7	0.6	5.0	2.8	-6.7	-21.1	-32.2	-38.9	-43.9
Record Maximum Temp	12.8	18.9	25.0	32.8	38.9	42.2	40.0	42.2	39.4	32.2	23.9	15.0	42.2
HDD, Base 18.3°C	937	739	613	345	179	67	11	39	148	326	597	858	4858
CDD, Base 18.3°C	0	0	0	0	7	57	111	116	20	0	0	0	310
Relative Humidity (%)	73	75	70	58	56	55	51	48	55	59	70	75	62
Wind Speed (m/s)	4.4	4.6	5.1	5.4	5.5	4.9	4.9	4.9	5.0	4.7	4.3	4.5	4.8



Great Falls, MT

WBAN NO. 24143

LATITUDE: 47.48° N
LONGITUDE: 111.37° W
ELEVATION: 1116 meters
MEAN PRESSURE: 888 millibars

STATION TYPE: Primary

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	1.4	2.4	3.7	4.9	5.8	6.7	7.1	5.9	4.3	2.8	1.7	1.2	4.0
	Min/Max	1.1/1.7	2.2/2.8	2.9/4.1	4.3/5.7	4.9/6.5	5.7/7.9	6.3/7.6	5.3/6.7	3.4/5.1	2.4/3.2	1.3/1.9	0.9/1.4	3.7/4.2
Latitude -15	Average	2.6	3.7	4.8	5.5	6.0	6.6	7.2	6.5	5.4	4.3	2.9	2.3	4.8
	Min/Max	1.5/3.3	2.6/4.7	3.2/5.6	4.8/6.6	5.0/6.7	5.6/7.8	6.3/7.7	5.8/7.5	3.9/6.7	3.2/5.1	1.8/3.5	1.5/3.0	4.1/5.2
Latitude	Average	3.0	4.0	5.0	5.4	5.6	6.0	6.6	6.3	5.5	4.6	3.3	2.7	4.8
	Min/Max	1.6/3.8	2.7/5.2	3.2/5.9	4.6/6.4	4.6/6.3	5.2/7.1	5.8/7.1	5.5/7.2	3.9/6.9	3.3/5.5	2.0/4.0	1.7/3.5	4.0/5.3
Latitude +15	Average	3.2	4.2	5.0	5.0	4.9	5.2	5.7	5.7	5.3	4.6	3.4	2.9	4.6
	Min/Max	1.7/4.1	2.6/5.4	3.0/5.9	4.3/6.0	4.1/5.6	4.5/6.1	5.1/6.2	5.0/6.5	3.7/6.6	3.3/5.6	2.0/4.2	1.8/3.8	3.7/5.0
90	Average	3.1	3.8	4.2	3.7	3.2	3.2	3.5	3.9	4.1	4.0	3.2	2.8	3.5
	Min/Max	1.5/4.1	2.3/5.0	2.4/5.2	3.1/4.4	2.7/3.6	2.8/3.6	3.2/3.8	3.4/4.4	2.8/5.1	2.8/4.9	1.8/3.9	1.7/3.7	2.8/3.9

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	2.2	3.5	5.2	6.6	7.8	9.0	9.9	8.4	6.3	4.3	2.5	1.8	5.6
	Min/Max	1.3/2.8	2.4/4.7	3.2/6.4	5.6/8.3	6.0/9.1	7.1/11.4	8.4/11.0	7.2/10.2	4.3/7.7	2.9/5.2	1.5/3.1	1.3/2.4	4.7/6.2
Latitude -15	Average	3.1	4.5	6.1	7.2	8.1	9.1	10.2	9.0	7.2	5.3	3.5	2.7	6.3
	Min/Max	1.7/4.0	2.8/6.1	3.5/7.4	6.0/9.1	6.2/9.4	7.2/11.6	8.6/11.3	7.7/10.9	4.7/8.9	3.6/6.6	2.0/4.3	1.7/3.6	5.1/7.0
Latitude	Average	3.4	4.8	6.3	7.2	7.8	8.7	9.8	8.9	7.3	5.6	3.7	3.0	6.4
	Min/Max	1.8/4.4	2.9/6.5	3.5/7.6	6.0/9.1	6.0/9.2	6.9/11.1	8.3/10.9	7.5/10.8	4.7/9.1	3.7/6.9	2.1/4.6	1.9/4.0	5.0/7.1
Latitude +15	Average	3.5	4.9	6.2	6.9	7.4	8.2	9.2	8.4	7.1	5.6	3.9	3.2	6.2
	Min/Max	1.8/4.6	2.8/6.6	3.4/7.6	5.7/8.7	5.6/8.7	6.4/10.5	7.8/10.3	7.2/10.3	4.6/8.9	3.7/7.0	2.1/4.8	2.0/4.3	4.8/6.9

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	3.6	4.9	6.3	7.3	8.2	9.3	10.4	9.1	7.3	5.6	3.9	3.2	6.6
	Min/Max	1.8/4.7	2.9/6.6	3.5/7.6	6.1/9.1	6.3/9.6	7.4/11.9	8.8/11.6	7.7/11.0	4.8/9.1	3.7/7.0	2.2/4.9	2.0/4.3	5.2/7.3

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	2.0	2.6	3.0	3.2	3.7	4.5	5.4	4.6	3.7	3.2	2.3	1.9	3.3
	Min/Max	0.5/2.9	0.4/3.9	0.8/4.0	2.1/4.7	2.4/4.7	3.0/6.8	4.1/6.3	3.7/6.2	1.9/5.3	1.7/4.4	0.9/3.2	1.0/2.9	2.2/3.9
1-Axis, N-S Horiz Axis	Average	1.2	2.0	3.1	4.0	4.9	5.9	7.2	6.0	4.4	2.9	1.5	1.1	3.7
	Min/Max	0.3/1.8	0.3/3.4	0.8/4.2	2.7/6.2	3.1/6.3	3.8/9.0	5.5/8.5	4.8/8.3	2.1/6.0	1.4/4.1	0.6/2.1	0.5/1.7	2.5/4.3
1-Axis, N-S Tilt=Latitude	Average	2.1	3.0	3.9	4.4	4.9	5.7	7.1	6.4	5.2	4.0	2.5	2.0	4.3
	Min/Max	0.6/3.1	0.5/4.8	1.0/5.3	3.0/6.7	3.1/6.3	3.7/8.7	5.4/8.3	5.0/8.7	2.5/7.2	2.0/5.6	1.0/3.5	1.0/3.0	2.8/5.0
2-Axis	Average	2.3	3.1	3.9	4.5	5.2	6.2	7.6	6.6	5.2	4.0	2.7	2.1	4.5
	Min/Max	0.6/3.3	0.5/4.9	1.0/5.3	3.0/6.8	3.3/6.7	4.0/9.4	5.8/8.9	5.2/9.0	2.6/7.2	2.0/5.6	1.0/3.7	1.1/3.3	2.9/5.3

Average Climatic Conditions

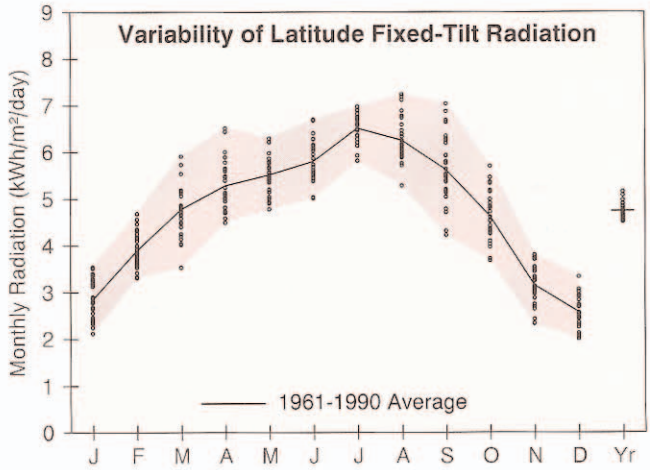
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-6.0	-2.6	0.7	6.4	11.7	16.4	20.1	19.4	13.7	8.6	1.1	-4.5	7.1
Daily Minimum Temp	-11.3	-8.2	-5.1	-0.1	4.9	9.2	11.8	11.2	6.4	2.1	-4.3	-9.7	0.6
Daily Maximum Temp	-0.8	3.1	6.5	12.9	18.4	23.7	28.5	27.6	20.9	15.2	6.4	0.6	13.6
Record Minimum Temp	-38.3	-37.2	-33.9	-21.1	-9.4	-0.6	4.4	1.7	-6.1	-23.9	-31.7	-41.7	-41.7
Record Maximum Temp	16.7	20.0	25.6	31.7	33.9	38.3	40.6	41.1	36.7	32.8	24.4	20.6	41.1
HDD, Base 18.3°C	754	585	546	357	207	87	21	51	166	302	518	708	4301
CDD, Base 18.3°C	0	0	0	0	0	30	76	83	26	0	0	0	216
Relative Humidity (%)	63	62	60	54	54	52	45	46	53	53	59	63	55
Wind Speed (m/s)	6.4	5.9	5.4	5.5	4.9	4.6	4.3	4.3	4.7	5.5	6.2	6.4	5.4

Helena, MT

WBAN NO. 24144

LATITUDE: 46.60° N
LONGITUDE: 112.00° W
ELEVATION: 1188 meters
MEAN PRESSURE: 881 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	1.5	2.3	3.5	4.8	5.8	6.5	7.0	5.9	4.4	2.9	1.7	1.2	4.0
	Min/Max	1.2/1.7	2.1/2.7	2.9/4.2	4.2/5.6	5.1/6.5	5.6/7.5	6.3/7.6	5.1/6.8	3.6/5.2	2.5/3.3	1.5/1.9	1.1/1.4	3.8/4.2
Latitude -15	Average	2.5	3.6	4.6	5.4	5.9	6.4	7.1	6.5	5.5	4.3	2.8	2.2	4.7
	Min/Max	1.9/3.1	3.1/4.3	3.5/5.6	4.6/6.6	5.1/6.7	5.5/7.4	6.3/7.6	5.5/7.5	4.2/6.9	3.5/5.3	2.2/3.3	1.8/2.8	4.5/5.1
Latitude	Average	2.8	3.9	4.8	5.3	5.5	5.8	6.5	6.2	5.6	4.6	3.1	2.6	4.7
	Min/Max	2.1/3.5	3.3/4.7	3.5/5.9	4.5/6.5	4.8/6.3	5.0/6.7	5.8/7.0	5.3/7.2	4.2/7.0	3.7/5.7	2.3/3.8	2.0/3.3	4.5/5.2
Latitude +15	Average	3.0	4.0	4.7	4.9	4.9	5.0	5.7	5.7	5.4	4.7	3.3	2.8	4.5
	Min/Max	2.2/3.8	3.4/4.9	3.4/5.9	4.2/6.1	4.2/5.6	4.3/5.7	5.1/6.0	4.8/6.6	4.0/6.8	3.7/5.8	2.4/4.0	2.1/3.6	4.3/4.9
90	Average	2.9	3.7	3.9	3.5	3.1	3.0	3.4	3.8	4.1	4.0	3.1	2.7	3.4
	Min/Max	2.1/3.8	3.0/4.6	2.7/5.2	3.0/4.3	2.8/3.5	2.6/3.3	3.1/3.6	3.2/4.3	3.1/5.2	3.1/5.1	2.3/3.8	2.0/3.6	3.2/3.8

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	2.2	3.4	5.0	6.5	7.8	8.8	10.0	8.6	6.5	4.4	2.5	1.8	5.6
	Min/Max	1.6/2.7	3.0/4.1	3.7/6.2	5.4/8.4	6.4/9.2	7.2/11.0	8.5/11.3	7.2/10.2	4.8/8.3	3.5/5.6	1.9/3.0	1.4/2.3	5.2/6.1
Latitude -15	Average	3.0	4.3	5.8	7.1	8.1	8.9	10.2	9.2	7.4	5.5	3.4	2.6	6.3
	Min/Max	2.1/3.7	3.7/5.2	4.1/7.3	5.8/9.2	6.6/9.6	7.3/11.1	8.7/11.5	7.6/11.0	5.3/9.6	4.2/6.9	2.4/4.1	2.0/3.4	5.8/6.9
Latitude	Average	3.2	4.6	6.0	7.0	7.8	8.6	9.9	9.0	7.5	5.7	3.6	2.9	6.3
	Min/Max	2.3/4.1	3.9/5.6	4.2/7.6	5.7/9.1	6.3/9.3	7.0/10.7	8.4/11.1	7.4/10.8	5.3/9.7	4.4/7.3	2.6/4.5	2.2/3.8	5.9/7.0
Latitude +15	Average	3.4	4.7	5.9	6.7	7.4	8.0	9.3	8.6	7.3	5.7	3.8	3.0	6.2
	Min/Max	2.4/4.3	3.9/5.7	4.1/7.6	5.4/8.8	5.9/8.8	6.5/10.1	7.9/10.5	7.0/10.3	5.1/9.5	4.4/7.4	2.7/4.7	2.3/4.1	5.7/6.8

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

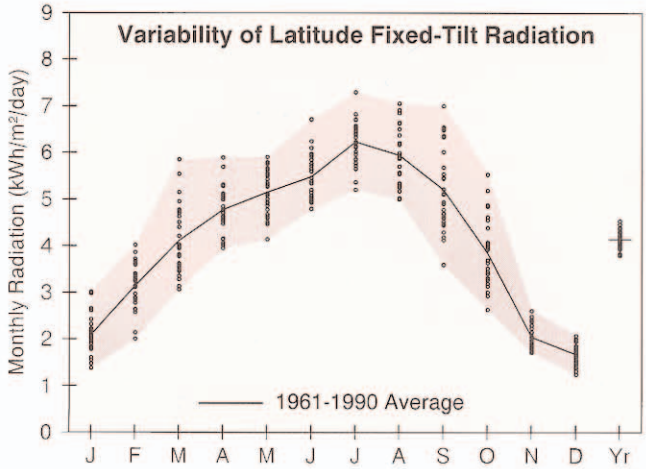
Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	3.4	4.7	6.0	7.1	8.2	9.2	10.4	9.2	7.5	5.8	3.8	3.1	6.5
	Min/Max	2.4/4.4	3.9/5.7	4.2/7.6	5.8/9.2	6.7/9.7	7.5/11.5	8.9/11.8	7.6/11.1	5.3/9.7	4.4/7.4	2.7/4.7	2.3/4.1	6.1/7.2

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	1.9	2.5	2.8	3.2	3.8	4.5	5.7	4.8	4.0	3.3	2.2	1.8	3.4
	Min/Max	1.1/2.7	1.6/3.4	1.6/3.8	2.1/4.9	2.6/5.0	3.1/6.5	4.3/6.7	3.6/6.4	2.3/5.8	2.2/4.7	1.0/3.0	1.1/2.6	3.0/4.0
1-Axis, N-S Horiz Axis	Average	1.2	2.0	3.0	4.1	5.0	6.0	7.6	6.4	4.7	3.0	1.5	1.0	3.8
	Min/Max	0.7/1.7	1.3/2.8	1.7/4.2	2.7/6.3	3.4/6.7	4.1/8.8	5.6/9.1	4.8/8.5	2.7/6.8	2.0/4.4	0.6/2.1	0.6/1.5	3.3/4.5
1-Axis, N-S Tilt=Latitude	Average	2.0	3.0	3.8	4.5	5.0	5.8	7.4	6.7	5.5	4.1	2.4	1.8	4.3
	Min/Max	1.2/3.0	1.9/4.1	2.1/5.2	2.9/6.9	3.4/6.7	4.0/8.4	5.5/8.9	5.0/8.9	3.1/8.1	2.7/6.0	1.1/3.3	1.2/2.7	3.8/5.1
2-Axis	Average	2.1	3.0	3.8	4.5	5.3	6.3	7.9	6.9	5.6	4.2	2.5	2.0	4.5
	Min/Max	1.3/3.2	1.9/4.2	2.1/5.2	3.0/7.0	3.6/7.1	4.3/9.2	5.9/9.6	5.2/9.2	3.1/8.1	2.8/6.0	1.1/3.5	1.3/2.9	4.0/5.3

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-6.9	-3.1	0.9	6.3	11.4	16.7	20.7	19.7	13.0	7.3	-0.2	-6.0	6.7
Daily Minimum Temp	-12.4	-8.9	-5.4	-0.8	4.2	9.1	11.9	10.9	5.0	-0.2	-6.3	-11.6	-0.4
Daily Maximum Temp	-1.3	2.7	7.1	13.4	18.6	24.3	29.4	28.4	21.0	14.7	5.8	-0.4	13.7
Record Minimum Temp	-41.1	-36.1	-34.4	-17.2	-8.3	-1.1	2.2	0.0	-7.8	-22.2	-39.4	-38.9	-41.1
Record Maximum Temp	16.7	20.0	25.0	29.4	33.3	37.8	38.9	40.6	37.2	29.4	22.2	17.8	40.6
HDD, Base 18.3°C	782	601	541	360	216	76	19	36	178	343	557	754	4462
CDD, Base 18.3°C	0	0	0	0	0	28	91	77	18	0	0	0	214
Relative Humidity (%)	67	65	60	54	54	52	46	47	55	59	65	69	58
Wind Speed (m/s)	3.1	3.4	3.7	4.1	3.9	3.7	3.5	3.2	3.2	3.1	3.1	2.8	3.4



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

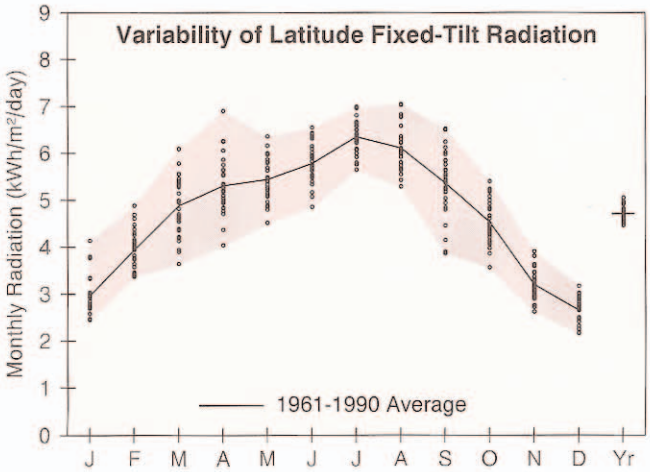
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-6.4	-3.0	0.9	6.2	10.7	14.3	17.6	17.2	11.8	5.5	-0.6	-5.2	5.8
Daily Minimum Temp	-10.7	-7.7	-4.5	-0.5	3.6	6.7	8.4	7.9	3.7	-1.4	-4.6	-9.2	-0.7
Daily Maximum Temp	-2.1	1.7	6.3	12.9	17.9	21.9	26.7	26.3	19.8	12.4	3.5	-1.2	12.2
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

Lewistown, MT

WBAN NO. 24036

LATITUDE: 47.05° N
LONGITUDE: 109.45° W
ELEVATION: 1264 meters
MEAN PRESSURE: 872 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	1.5	2.3	3.6	4.8	5.7	6.4	6.8	5.8	4.2	2.8	1.7	1.2	3.9
	Min/Max	1.3/1.8	2.1/2.7	3.0/4.2	3.9/5.9	4.8/6.5	5.5/7.3	6.1/7.4	5.1/6.6	3.3/4.9	2.5/3.2	1.5/1.9	1.1/1.4	3.7/4.1
Latitude -15	Average	2.6	3.6	4.7	5.4	5.8	6.3	6.9	6.4	5.3	4.2	2.9	2.3	4.7
	Min/Max	2.2/3.6	3.1/4.4	3.6/5.8	4.2/7.0	4.8/6.8	5.3/7.2	6.1/7.6	5.5/7.3	3.9/6.4	3.4/5.0	2.4/3.4	1.9/2.7	4.5/5.0
Latitude	Average	3.0	3.9	4.9	5.3	5.4	5.8	6.4	6.1	5.4	4.5	3.2	2.7	4.7
	Min/Max	2.5/4.1	3.4/4.9	3.6/6.1	4.0/6.9	4.5/6.4	4.9/6.6	5.7/7.0	5.3/7.1	3.9/6.5	3.6/5.4	2.6/3.9	2.2/3.2	4.5/5.0
Latitude +15	Average	3.2	4.1	4.8	4.9	4.8	5.0	5.5	5.5	5.1	4.6	3.4	2.8	4.5
	Min/Max	2.6/4.5	3.4/5.1	3.5/6.2	3.7/6.4	4.0/5.6	4.2/5.6	4.9/6.1	4.8/6.4	3.7/6.3	3.6/5.5	2.7/4.2	2.3/3.4	4.2/4.8
90	Average	3.1	3.8	4.1	3.7	3.1	3.0	3.4	3.7	4.0	4.0	3.2	2.8	3.5
	Min/Max	2.5/4.3	3.0/4.8	2.9/5.5	2.8/4.6	2.6/3.6	2.6/3.3	3.1/3.6	3.3/4.3	2.8/4.9	3.1/4.8	2.5/3.9	2.2/3.3	3.3/3.8

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	2.2	3.5	5.1	6.6	7.6	8.7	9.6	8.3	6.2	4.3	2.5	1.9	5.6
	Min/Max	1.9/3.0	3.0/4.3	3.8/6.4	4.8/9.1	6.2/9.4	6.9/10.5	8.2/10.8	7.1/9.9	4.3/7.6	3.4/5.1	2.0/3.1	1.6/2.2	5.2/6.0
Latitude -15	Average	3.1	4.4	5.9	7.2	7.9	8.8	9.8	8.9	7.0	5.3	3.4	2.7	6.2
	Min/Max	2.5/4.3	3.7/5.6	4.3/7.6	5.1/10.0	6.4/9.8	6.9/10.6	8.4/11.1	7.5/10.6	4.8/8.8	4.1/6.5	2.7/4.3	2.2/3.2	5.8/6.7
Latitude	Average	3.4	4.7	6.1	7.1	7.7	8.5	9.5	8.7	7.1	5.6	3.7	3.0	6.3
	Min/Max	2.7/4.8	3.9/6.0	4.3/7.9	5.0/9.9	6.2/9.5	6.6/10.3	8.1/10.8	7.4/10.5	4.8/8.9	4.3/6.8	2.9/4.7	2.4/3.6	5.8/6.7
Latitude +15	Average	3.5	4.8	6.0	6.8	7.2	7.9	8.9	8.3	6.9	5.6	3.8	3.2	6.1
	Min/Max	2.8/5.1	4.0/6.2	4.3/7.9	4.8/9.6	5.8/9.0	6.2/9.6	7.6/10.1	7.0/10.0	4.7/8.7	4.3/6.8	3.0/4.8	2.5/3.8	5.7/6.6

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

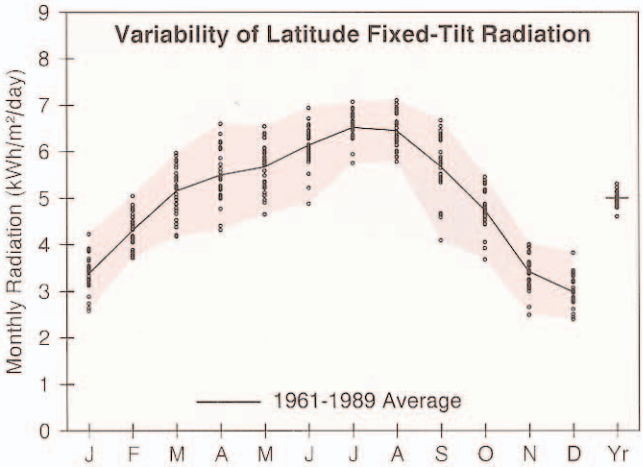
Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	3.6	4.8	6.1	7.2	8.0	9.0	10.0	8.9	7.1	5.6	3.9	3.2	6.5
	Min/Max	2.9/5.2	4.0/6.2	4.4/7.9	5.1/10.0	6.5/9.9	7.1/10.9	8.6/11.3	7.6/10.7	4.8/8.9	4.3/6.8	3.0/4.9	2.5/3.9	6.0/7.0

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	2.0	2.5	2.8	3.2	3.6	4.4	5.3	4.6	3.6	3.2	2.2	1.9	3.3
	Min/Max	1.2/3.7	1.6/3.7	1.6/4.0	1.6/5.4	2.3/5.1	2.8/6.0	4.0/6.5	3.5/6.0	2.0/5.0	1.9/4.2	1.7/3.1	1.3/2.6	2.9/3.8
1-Axis, N-S Horiz Axis	Average	1.2	2.0	3.0	4.0	4.8	5.8	7.0	6.0	4.3	2.9	1.5	1.1	3.7
	Min/Max	0.7/2.3	1.4/3.1	1.7/4.3	2.1/7.0	3.2/6.8	3.8/8.0	5.3/8.6	4.6/8.0	2.3/5.9	1.8/3.9	1.1/2.2	0.7/1.5	3.2/4.3
1-Axis, N-S Tilt=Latitude	Average	2.1	3.0	3.8	4.4	4.8	5.6	6.9	6.3	5.1	4.0	2.5	1.9	4.2
	Min/Max	1.3/3.9	2.0/4.5	2.2/5.3	2.3/7.7	3.2/6.8	3.6/7.7	5.2/8.4	4.8/8.4	2.7/7.0	2.5/5.3	1.9/3.5	1.4/2.7	3.7/4.9
2-Axis	Average	2.2	3.0	3.8	4.5	5.1	6.1	7.4	6.5	5.1	4.0	2.6	2.1	4.4
	Min/Max	1.3/4.2	2.0/4.6	2.2/5.4	2.3/7.8	3.3/7.2	3.9/8.4	5.6/9.0	5.0/8.7	2.7/7.0	2.5/5.4	2.0/3.7	1.5/2.9	3.9/5.1

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-6.6	-3.9	-0.8	4.9	9.9	14.7	18.5	18.2	12.3	7.2	0.1	-5.2	5.8
Daily Minimum Temp	-12.7	-9.9	-6.9	-1.8	2.9	7.3	9.9	9.5	4.4	-0.2	-6.4	-11.3	-1.3
Daily Maximum Temp	-0.6	2.2	5.2	11.6	16.9	22.2	27.1	26.8	20.1	14.6	6.4	0.9	12.8
Record Minimum Temp	-37.2	-36.1	-31.1	-20.6	-8.9	-4.4	1.7	0.6	-8.3	-20.6	-33.3	-41.1	-41.1
Record Maximum Temp	22.8	18.9	22.2	28.0	31.0	36.7	36.7	39.4	36.1	29.4	23.9	23.9	39.4
HDD, Base 18.3°C	773	622	594	403	260	123	42	73	197	344	548	730	4711
CDD, Base 18.3°C	0	0	0	0	0	14	47	67	16	0	0	0	144
Relative Humidity (%)	68	69	68	62	63	64	55	53	59	59	65	67	63
Wind Speed (m/s)	5.0	4.6	4.3	4.6	4.3	3.8	3.8	3.7	3.8	4.0	4.3	4.6	4.2



Miles City, MT

WBAN NO. 24037

LATITUDE: 46.43° N
LONGITUDE: 105.87° W
ELEVATION: 803 meters
MEAN PRESSURE: 922 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	1.7	2.6	3.8	4.9	5.9	6.8	7.0	6.0	4.4	3.0	1.8	1.4	4.1
	Min/Max	1.4/1.9	2.3/2.8	3.3/4.2	4.1/5.8	4.9/6.8	5.5/7.7	6.2/7.5	5.5/6.6	3.5/5.0	2.5/3.2	1.5/2.0	1.2/1.5	3.8/4.4
Latitude -15	Average	3.0	3.9	5.0	5.6	6.0	6.7	7.1	6.7	5.6	4.4	3.0	2.6	5.0
	Min/Max	2.3/3.7	3.4/4.6	4.1/5.7	4.5/6.7	5.0/7.0	5.3/7.6	6.2/7.6	6.0/7.4	4.1/6.5	3.5/5.0	2.3/3.5	2.1/3.3	4.6/5.3
Latitude	Average	3.4	4.3	5.2	5.5	5.7	6.1	6.5	6.5	5.7	4.7	3.4	3.0	5.0
	Min/Max	2.6/4.2	3.7/5.1	4.2/6.0	4.3/6.6	4.7/6.5	4.9/6.9	5.8/7.1	5.8/7.1	4.1/6.7	3.7/5.4	2.5/4.0	2.4/3.8	4.6/5.3
Latitude +15	Average	3.6	4.5	5.1	5.1	5.0	5.3	5.6	5.8	5.4	4.8	3.6	3.2	4.8
	Min/Max	2.7/4.6	3.9/5.3	4.1/5.9	4.0/6.1	4.1/5.7	4.2/5.9	5.0/6.1	5.2/6.4	3.9/6.4	3.7/5.5	2.6/4.3	2.5/4.2	4.4/5.0
90	Average	3.5	4.1	4.3	3.7	3.2	3.1	3.4	3.9	4.2	4.1	3.4	3.2	3.7
	Min/Max	2.6/4.5	3.4/4.8	3.3/5.2	2.9/4.3	2.7/3.6	2.6/3.4	3.0/3.6	3.5/4.2	2.9/4.9	3.1/4.8	2.3/4.1	2.4/4.1	3.4/3.9

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	2.6	3.8	5.4	6.9	8.0	9.3	9.9	8.8	6.6	4.5	2.7	2.1	5.9
	Min/Max	2.0/3.2	3.2/4.4	4.3/6.3	5.2/8.6	6.6/9.6	6.7/10.9	8.6/10.9	7.5/10.0	4.6/7.9	3.5/5.2	2.0/3.2	1.7/2.7	5.3/6.4
Latitude -15	Average	3.5	4.8	6.3	7.5	8.3	9.4	10.1	9.4	7.5	5.6	3.6	3.0	6.6
	Min/Max	2.7/4.4	4.1/5.7	4.9/7.5	5.5/9.4	6.7/9.9	6.8/11.0	8.8/11.2	8.0/10.7	5.1/9.1	4.2/6.5	2.6/4.4	2.4/4.0	6.0/7.2
Latitude	Average	3.9	5.1	6.5	7.4	8.0	9.1	9.8	9.2	7.6	5.9	4.0	3.4	6.7
	Min/Max	2.9/4.9	4.3/6.1	5.0/7.7	5.4/9.3	6.5/9.7	6.5/10.6	8.5/10.8	7.9/10.6	5.1/9.2	4.4/6.8	2.8/4.8	2.7/4.4	6.0/7.2
Latitude +15	Average	4.1	5.3	6.4	7.1	7.6	8.5	9.2	8.8	7.4	5.9	4.1	3.6	6.5
	Min/Max	3.0/5.2	4.4/6.3	4.9/7.7	5.2/9.0	6.2/9.1	6.0/10.0	7.9/10.2	7.5/10.1	4.9/9.0	4.4/6.9	2.8/4.9	2.8/4.7	5.8/7.1

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	4.1	5.3	6.5	7.5	8.4	9.7	10.3	9.4	7.6	5.9	4.1	3.6	6.9
	Min/Max	3.0/5.2	4.4/6.3	5.0/7.7	5.5/9.4	6.8/10.1	6.9/11.3	8.9/11.4	8.1/10.8	5.1/9.2	4.4/6.9	2.9/5.0	2.8/4.8	6.2/7.5

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	2.3	2.7	3.1	3.4	3.9	4.9	5.5	5.0	4.0	3.4	2.4	2.1	3.6
	Min/Max	1.2/3.2	2.0/3.9	2.0/4.5	1.7/4.9	2.7/5.3	2.7/6.4	4.4/6.5	4.0/6.1	2.1/5.2	2.2/4.3	1.5/3.2	1.4/3.3	3.0/4.2
1-Axis, N-S Horiz Axis	Average	1.4	2.2	3.3	4.4	5.2	6.5	7.4	6.5	4.8	3.1	1.7	1.2	4.0
	Min/Max	0.7/2.1	1.6/3.2	2.1/4.7	2.2/6.4	3.7/7.0	3.5/8.4	5.9/8.8	5.1/8.1	2.5/6.3	2.0/4.0	1.0/2.3	0.8/1.9	3.3/4.7
1-Axis, N-S Tilt=Latitude	Average	2.5	3.2	4.2	4.8	5.2	6.3	7.2	6.8	5.6	4.3	2.7	2.2	4.6
	Min/Max	1.3/3.5	2.3/4.6	2.6/5.9	2.5/6.9	3.7/7.0	3.4/8.1	5.7/8.6	5.3/8.5	2.9/7.3	2.7/5.4	1.6/3.6	1.4/3.4	3.9/5.4
2-Axis	Average	2.6	3.3	4.2	4.9	5.5	6.8	7.7	7.1	5.6	4.3	2.8	2.4	4.8
	Min/Max	1.4/3.7	2.4/4.8	2.6/5.9	2.5/7.1	3.9/7.4	3.7/8.8	6.2/9.2	5.5/8.8	2.9/7.3	2.8/5.4	1.7/3.8	1.5/3.7	4.0/5.6

Average Climatic Conditions

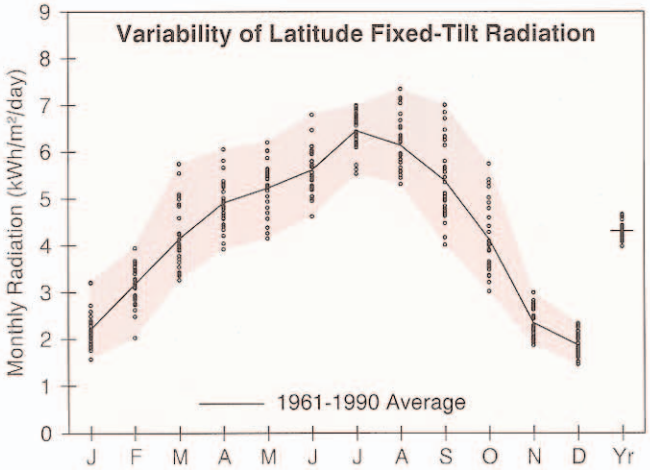
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-8.9	-4.8	0.7	7.8	13.8	19.4	23.7	22.5	15.4	8.9	0.1	-7.1	7.6
Daily Minimum Temp	-14.3	-10.6	-5.4	1.0	7.0	12.3	15.9	14.7	8.1	1.9	-5.7	-12.6	1.1
Daily Maximum Temp	-3.5	0.8	6.8	14.5	20.6	26.6	31.6	30.3	22.8	15.8	5.8	-1.7	14.2
Record Minimum Temp	-37.2	-37.8	-30.6	-15.0	-5.6	1.7	6.7	2.2	-5.0	-17.2	-31.7	-40.0	-40.0
Record Maximum Temp	14.4	19.4	26.7	32.8	37.8	41.1	42.2	40.6	40.0	33.9	22.2	18.9	42.2
HDD, Base 18.3°C	844	649	546	317	148	47	3	22	127	293	548	789	4331
CDD, Base 18.3°C	0	0	0	0	8	80	170	151	40	0	0	0	449
Relative Humidity (%)	72	72	68	58	57	55	47	45	54	60	69	73	61
Wind Speed (m/s)	4.6	4.5	4.9	5.2	5.1	4.6	4.4	4.4	4.5	4.5	4.2	4.4	4.6

Missoula, MT

WBAN NO. 24153

LATITUDE: 46.92° N
LONGITUDE: 114.08° W
ELEVATION: 972 meters
MEAN PRESSURE: 905 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	1.3	2.1	3.2	4.5	5.5	6.3	6.9	5.8	4.2	2.7	1.4	1.1	3.8
	Min/Max	1.1/1.6	1.6/2.5	2.7/4.0	3.8/5.4	4.4/6.3	5.2/7.6	5.9/7.5	5.1/6.8	3.4/5.2	2.3/3.4	1.3/1.6	1.0/1.3	3.5/4.0
Latitude -15	Average	2.0	3.0	4.0	5.0	5.6	6.1	7.0	6.4	5.3	3.9	2.1	1.7	4.4
	Min/Max	1.5/2.8	2.0/3.6	3.2/5.4	4.1/6.2	4.5/6.6	5.1/7.5	6.0/7.6	5.6/7.6	4.0/6.8	2.9/5.3	1.8/2.7	1.4/2.0	4.0/4.7
Latitude	Average	2.2	3.2	4.1	4.9	5.2	5.6	6.4	6.1	5.4	4.1	2.3	1.9	4.3
	Min/Max	1.6/3.2	2.0/3.9	3.3/5.7	3.9/6.1	4.2/6.2	4.6/6.8	5.5/7.0	5.3/7.3	4.0/7.0	3.0/5.7	1.9/3.0	1.5/2.3	4.0/4.7
Latitude +15	Average	2.3	3.2	4.0	4.5	4.6	4.8	5.6	5.5	5.1	4.1	2.4	2.0	4.0
	Min/Max	1.6/3.4	2.0/4.1	3.1/5.8	3.6/5.6	3.7/5.5	4.0/5.8	4.8/6.1	4.8/6.6	3.8/6.7	3.0/5.8	1.9/3.1	1.5/2.5	3.7/4.4
90	Average	2.2	2.9	3.3	3.3	3.0	2.9	3.4	3.7	4.0	3.6	2.2	1.9	3.0
	Min/Max	1.5/3.4	1.7/3.8	2.5/5.1	2.6/4.0	2.4/3.5	2.5/3.4	3.0/3.6	3.3/4.4	2.9/5.2	2.5/5.1	1.7/2.9	1.4/2.4	2.8/3.4

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	1.7	2.8	4.3	6.1	7.3	8.4	9.9	8.5	6.2	4.0	1.9	1.4	5.2
	Min/Max	1.3/2.5	1.8/3.4	3.5/6.0	4.7/7.8	5.4/8.8	6.6/10.9	8.0/11.1	7.0/10.3	4.4/8.4	3.0/5.6	1.5/2.4	1.1/1.7	4.8/5.7
Latitude -15	Average	2.3	3.5	5.0	6.5	7.5	8.5	10.2	9.0	7.1	4.9	2.5	1.9	5.7
	Min/Max	1.6/3.4	2.1/4.3	3.9/7.1	5.0/8.6	5.6/9.2	6.6/11.0	8.1/11.4	7.4/11.1	4.9/9.7	3.5/7.0	1.9/3.2	1.5/2.4	5.2/6.3
Latitude	Average	2.4	3.7	5.1	6.5	7.3	8.2	9.9	8.9	7.1	5.1	2.6	2.0	5.7
	Min/Max	1.6/3.7	2.2/4.6	3.9/7.3	4.9/8.5	5.3/8.9	6.4/10.6	7.9/11.0	7.3/11.0	4.9/9.8	3.5/7.3	2.0/3.4	1.5/2.6	5.2/6.3
Latitude +15	Average	2.5	3.7	5.0	6.2	6.9	7.7	9.3	8.5	7.0	5.1	2.7	2.1	5.6
	Min/Max	1.7/3.9	2.2/4.7	3.8/7.3	4.7/8.1	5.0/8.4	5.9/10.0	7.4/10.4	6.9/10.5	4.7/9.6	3.5/7.4	2.1/3.5	1.6/2.7	5.0/6.1

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	2.6	3.8	5.1	6.6	7.6	8.7	10.4	9.1	7.2	5.1	2.7	2.1	5.9
	Min/Max	1.7/3.9	2.2/4.7	3.9/7.3	5.0/8.6	5.6/9.3	6.8/11.4	8.3/11.6	7.5/11.2	4.9/9.8	3.6/7.4	2.1/3.6	1.6/2.8	5.4/6.5

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	1.1	1.7	2.3	2.9	3.4	4.2	5.6	4.7	3.8	2.8	1.3	1.0	2.9
	Min/Max	0.2/2.1	0.6/2.5	1.3/3.7	1.8/4.4	1.7/4.7	2.9/6.5	3.9/6.6	3.5/6.4	2.1/5.8	1.5/4.7	0.7/2.0	0.5/1.6	2.5/3.4
1-Axis, N-S Horiz Axis	Average	0.7	1.4	2.4	3.7	4.5	5.6	7.6	6.3	4.4	2.6	0.9	0.6	3.4
	Min/Max	0.1/1.4	0.5/2.1	1.4/3.9	2.3/5.7	2.3/6.3	3.8/8.7	5.2/8.9	4.6/8.6	2.4/7.0	1.5/4.4	0.5/1.4	0.3/0.9	2.9/3.9
1-Axis, N-S Tilt=Latitude	Average	1.2	2.0	3.0	4.0	4.5	5.4	7.4	6.6	5.2	3.6	1.5	1.0	3.8
	Min/Max	0.2/2.3	0.7/3.0	1.8/4.9	2.5/6.2	2.3/6.3	3.7/8.3	5.1/8.7	4.8/9.0	2.8/8.2	2.0/5.9	0.7/2.3	0.6/1.6	3.2/4.4
2-Axis	Average	1.2	2.1	3.0	4.1	4.8	5.9	7.9	6.8	5.2	3.6	1.6	1.1	4.0
	Min/Max	0.3/2.5	0.8/3.1	1.8/5.0	2.5/6.3	2.4/6.6	4.0/9.1	5.5/9.4	5.0/9.3	2.8/8.2	2.0/6.0	0.8/2.4	0.6/1.8	3.4/4.6

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-5.2	-1.6	2.1	6.8	11.0	15.6	19.3	18.8	13.2	6.8	0.2	-4.8	6.8
Daily Minimum Temp	-9.2	-6.2	-3.9	-0.6	3.3	7.8	10.1	9.6	4.7	-0.4	-4.3	-8.7	0.2
Daily Maximum Temp	-1.1	3.0	8.1	14.2	18.7	23.3	28.6	27.9	21.6	13.9	4.8	-1.0	13.5
Record Minimum Temp	-36.1	-32.8	-25.0	-10.0	-6.1	-0.6	-0.6	0.0	-6.7	-17.8	-30.6	-34.4	-36.1
Record Maximum Temp	15.0	15.6	23.9	30.6	35.0	36.7	40.6	40.6	37.2	29.4	18.9	15.6	40.6
HDD, Base 18.3°C	728	557	503	347	227	99	36	45	168	358	543	717	4329
CDD, Base 18.3°C	0	0	0	0	0	16	67	59	13	0	0	0	156
Relative Humidity (%)	81	78	70	61	62	61	52	53	63	71	80	84	68
Wind Speed (m/s)	2.4	2.6	3.0	3.5	3.4	3.3	3.3	3.0	2.8	2.3	2.5	2.2	2.9