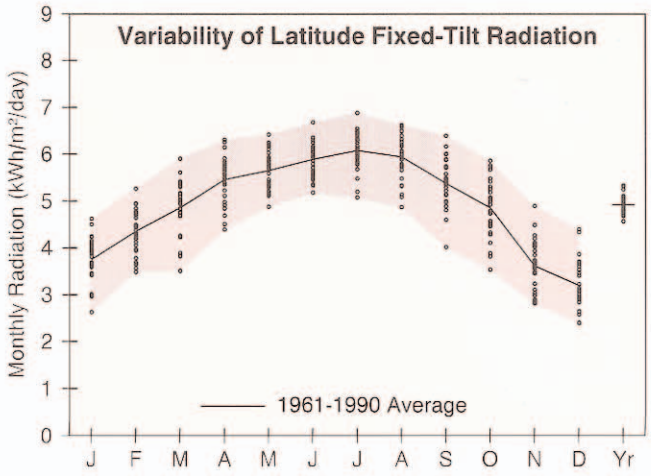
Columbia, MO

WBAN NO. 03945

LATITUDE: 38.82° N
LONGITUDE: 92.22° W
ELEVATION: 270 meters
MEAN PRESSURE: 986 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	2.2	3.0	4.0	5.2	6.0	6.6	6.6	5.9	4.6	3.5	2.3	1.9	4.3
	Min/Max	1.8/2.6	2.6/3.4	3.2/4.7	4.3/5.9	5.2/6.8	5.8/7.5	5.5/7.5	5.0/6.5	3.7/5.3	2.9/4.1	2.0/2.8	1.5/2.3	4.1/4.6
Latitude -15	Average	3.3	4.0	4.7	5.6	6.0	6.4	6.6	6.2	5.3	4.5	3.2	2.8	4.9
	Min/Max	2.4/4.0	3.3/4.7	3.5/5.7	4.5/6.4	5.2/6.8	5.6/7.3	5.5/7.4	5.1/6.8	4.1/6.3	3.4/5.4	2.6/4.3	2.2/3.7	4.6/5.3
Latitude	Average	3.8	4.4	4.9	5.5	5.6	5.9	6.1	5.9	5.4	4.9	3.6	3.2	4.9
	Min/Max	2.6/4.6	3.5/5.3	3.5/5.9	4.4/6.3	4.9/6.4	5.2/6.7	5.1/6.9	4.9/6.6	4.0/6.4	3.5/5.9	2.8/4.9	2.4/4.4	4.6/5.3
Latitude +15	Average	4.0	4.5	4.8	5.1	5.0	5.1	5.3	5.4	5.1	4.9	3.8	3.4	4.7
	Min/Max	2.7/5.0	3.5/5.5	3.4/5.8	4.0/5.8	4.3/5.7	4.5/5.7	4.5/6.0	4.4/6.0	3.8/6.2	3.5/6.0	2.9/5.2	2.5/4.8	4.3/5.1
90	Average	3.7	3.9	3.5	3.2	2.7	2.5	2.7	3.1	3.5	3.9	3.3	3.2	3.3
	Min/Max	2.4/4.7	3.0/4.9	2.6/4.3	2.5/3.6	2.4/2.9	2.3/2.7	2.4/2.9	2.6/3.5	2.6/4.2	2.7/4.8	2.5/4.7	2.2/4.6	2.9/3.6

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	3.2	4.2	5.3	6.8	7.7	8.5	8.7	7.8	6.3	5.0	3.2	2.7	5.8
	Min/Max	2.2/4.0	3.4/5.1	3.8/6.6	5.2/8.3	6.6/9.2	7.2/10.0	6.7/10.0	6.3/8.9	4.4/7.6	3.6/6.0	2.5/4.3	2.0/3.7	5.4/6.3
Latitude -15	Average	4.0	4.9	5.9	7.2	7.8	8.4	8.7	8.0	6.8	5.7	3.9	3.3	6.2
	Min/Max	2.7/5.0	3.8/6.1	4.1/7.4	5.4/8.7	6.6/9.3	7.2/10.0	6.7/10.1	6.4/9.2	4.7/8.3	4.0/7.0	3.0/5.4	2.4/4.7	5.8/6.9
Latitude	Average	4.4	5.2	6.0	7.1	7.6	8.1	8.4	7.9	6.9	6.0	4.2	3.7	6.3
	Min/Max	2.9/5.5	4.0/6.5	4.1/7.6	5.3/8.6	6.4/9.1	6.9/9.6	6.4/9.7	6.3/9.1	4.7/8.4	4.1/7.3	3.2/5.9	2.6/5.2	5.8/6.9
Latitude +15	Average	4.6	5.3	5.9	6.8	7.1	7.6	7.8	7.5	6.7	6.0	4.4	3.9	6.1
	Min/Max	3.0/5.8	4.1/6.7	4.0/7.5	5.0/8.3	6.0/8.5	6.4/8.9	6.0/9.1	5.9/8.6	4.6/8.2	4.1/7.4	3.2/6.1	2.7/5.6	5.6/6.8

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

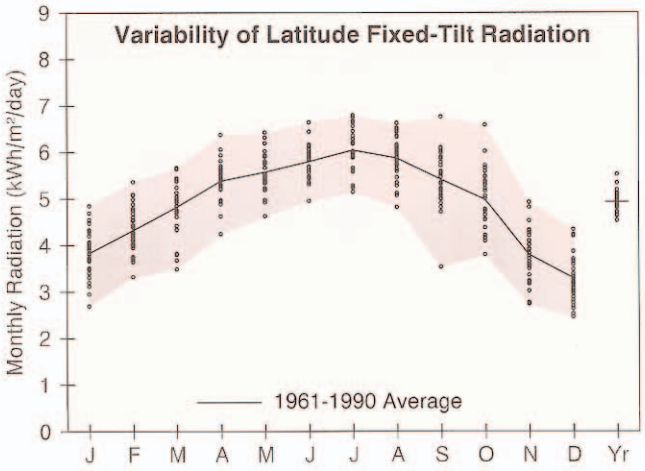
Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	4.6	5.3	6.0	7.2	7.9	8.6	8.8	8.1	6.9	6.0	4.4	3.9	6.5
	Min/Max	3.0/5.9	4.1/6.7	4.1/7.6	5.4/8.7	6.7/9.4	7.3/10.2	6.8/10.3	6.4/9.3	4.8/8.4	4.1/7.4	3.2/6.2	2.8/5.7	5.9/7.2

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	2.7	2.8	2.9	3.3	3.6	4.0	4.2	3.8	3.3	3.3	2.5	2.3	3.2
	Min/Max	1.5/3.9	1.8/3.8	1.2/4.2	2.0/4.3	2.6/4.8	2.9/5.4	2.4/5.4	2.6/4.6	1.7/4.4	1.7/4.4	1.4/3.9	1.3/3.8	2.8/3.8
1-Axis, N-S Horiz Axis	Average	2.0	2.6	3.3	4.3	4.8	5.3	5.6	5.0	4.0	3.3	2.0	1.6	3.6
	Min/Max	1.0/2.9	1.7/3.5	1.4/4.7	2.6/5.8	3.5/6.4	3.9/7.1	3.2/7.1	3.4/6.1	2.0/5.3	1.8/4.4	1.1/3.1	0.9/2.6	3.2/4.3
1-Axis, N-S Tilt=Latitude	Average	3.0	3.4	3.8	4.5	4.6	5.0	5.3	5.1	4.5	4.2	2.8	2.5	4.1
	Min/Max	1.5/4.3	2.2/4.6	1.6/5.5	2.7/6.1	3.5/6.3	3.7/6.7	3.0/6.8	3.4/6.2	2.2/6.0	2.2/5.5	1.6/4.5	1.4/4.0	3.5/4.8
2-Axis	Average	3.2	3.5	3.8	4.6	4.9	5.4	5.7	5.2	4.5	4.2	3.0	2.7	4.2
	Min/Max	1.7/4.6	2.2/4.8	1.6/5.6	2.8/6.2	3.6/6.6	4.0/7.3	3.3/7.3	3.5/6.4	2.2/6.0	2.2/5.6	1.6/4.7	1.5/4.4	3.6/5.0

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-2.4	0.1	6.2	12.6	17.6	22.3	25.2	24.0	19.9	13.6	6.7	-0.1	12.2
Daily Minimum Temp	-7.5	-5.1	0.6	6.5	11.7	16.2	19.0	17.7	13.9	7.5	1.4	-4.9	6.4
Daily Maximum Temp	2.6	5.2	11.8	18.7	23.4	28.2	31.4	30.4	26.0	19.8	12.0	4.6	17.8
Record Minimum Temp	-28.3	-26.1	-20.6	-7.2	-1.7	6.1	8.9	5.6	0.0	-5.6	-17.8	-28.9	-28.9
Record Maximum Temp	23.3	27.8	29.4	32.2	32.2	39.4	43.9	43.3	38.3	33.9	28.3	24.4	43.9
HDD, Base 18.3°C	644	512	376	176	76	6	0	0	29	158	348	572	2896
CDD, Base 18.3°C	0	0	0	4	52	124	213	178	77	12	0	0	661
Relative Humidity (%)	71	71	67	63	69	71	69	70	71	68	71	74	69
Wind Speed (m/s)	5.0	5.0	5.5	5.3	4.3	3.9	3.7	3.6	3.9	4.4	4.8	4.9	4.5



Kansas City, MO

WBAN NO. 03947

LATITUDE: 39.30° N
LONGITUDE: 94.72° W
ELEVATION: 315 meters
MEAN PRESSURE: 984 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	2.2	3.0	3.9	5.1	5.9	6.5	6.6	5.8	4.6	3.6	2.3	1.9	4.3
	Min/Max	1.8/2.6	2.5/3.5	3.1/4.5	4.2/5.9	4.9/6.8	5.5/7.4	5.7/7.4	4.9/6.4	3.3/5.6	2.9/4.4	1.9/2.8	1.6/2.2	4.1/4.7
Latitude -15	Average	3.4	4.0	4.7	5.5	5.9	6.3	6.5	6.1	5.3	4.6	3.4	2.9	4.9
	Min/Max	2.4/4.2	3.1/4.9	3.5/5.4	4.4/6.5	4.9/6.8	5.4/7.3	5.6/7.4	5.1/6.9	3.6/6.6	3.6/6.0	2.5/4.3	2.2/3.7	4.6/5.4
Latitude	Average	3.8	4.3	4.8	5.4	5.6	5.8	6.0	5.9	5.4	5.0	3.8	3.3	4.9
	Min/Max	2.7/4.8	3.3/5.4	3.5/5.7	4.2/6.4	4.6/6.4	4.9/6.6	5.2/6.8	4.8/6.6	3.5/6.8	3.8/6.6	2.7/4.9	2.5/4.3	4.5/5.5
Latitude +15	Average	4.1	4.4	4.7	5.0	4.9	5.0	5.3	5.3	5.2	5.0	4.0	3.5	4.7
	Min/Max	2.8/5.2	3.3/5.6	3.3/5.6	3.9/5.9	4.1/5.7	4.3/5.7	4.5/5.9	4.4/6.0	3.3/6.5	3.8/6.7	2.8/5.3	2.6/4.7	4.3/5.3
90	Average	3.8	3.8	3.5	3.1	2.7	2.5	2.7	3.1	3.6	4.0	3.5	3.3	3.3
	Min/Max	2.5/4.9	2.7/4.8	2.4/4.2	2.5/3.6	2.3/2.9	2.3/2.7	2.4/2.9	2.6/3.5	2.3/4.5	3.0/5.5	2.4/4.8	2.3/4.5	2.9/3.7

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	3.3	4.2	5.3	6.7	7.7	8.4	8.7	7.8	6.4	5.1	3.4	2.7	5.8
	Min/Max	2.3/4.1	3.2/5.2	3.8/6.5	5.0/8.4	6.1/9.2	6.8/10.2	7.2/10.3	6.1/8.9	4.0/8.2	3.9/6.8	2.5/4.4	2.1/3.5	5.3/6.6
Latitude -15	Average	4.1	4.9	5.9	7.1	7.8	8.4	8.8	8.1	6.9	5.9	4.1	3.5	6.3
	Min/Max	2.8/5.3	3.7/6.2	4.1/7.3	5.2/8.8	6.1/9.4	6.8/10.1	7.3/10.4	6.3/9.3	4.2/9.0	4.4/8.0	3.0/5.5	2.5/4.6	5.8/7.2
Latitude	Average	4.5	5.2	6.0	7.0	7.5	8.1	8.5	8.0	7.0	6.2	4.5	3.8	6.4
	Min/Max	3.0/5.8	3.9/6.6	4.1/7.4	5.1/8.8	5.9/9.1	6.5/9.7	7.0/10.0	6.1/9.2	4.2/9.1	4.6/8.4	3.2/5.9	2.7/5.1	5.8/7.3
Latitude +15	Average	4.7	5.3	5.9	6.7	7.1	7.5	7.9	7.6	6.8	6.2	4.6	4.0	6.2
	Min/Max	3.1/6.1	3.9/6.8	4.0/7.3	4.8/8.4	5.6/8.6	6.0/9.1	6.6/9.4	5.8/8.7	4.0/9.0	4.6/8.5	3.2/6.2	2.8/5.4	5.6/7.1

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	4.8	5.3	6.0	7.1	7.9	8.6	8.9	8.2	7.0	6.2	4.7	4.1	6.6
	Min/Max	3.1/6.2	3.9/6.8	4.2/7.4	5.2/8.9	6.2/9.5	6.9/10.4	7.4/10.6	6.3/9.4	4.2/9.1	4.6/8.5	3.3/6.2	2.9/5.5	5.9/7.5

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	2.9	2.9	2.9	3.3	3.6	4.1	4.4	4.0	3.5	3.5	2.8	2.5	3.4
	Min/Max	1.5/4.2	1.8/4.2	1.5/4.0	1.9/4.7	2.3/5.0	2.7/5.7	3.1/5.7	2.5/4.9	1.4/5.2	2.2/5.3	1.6/4.1	1.5/3.8	2.8/4.2
1-Axis, N-S Horiz Axis	Average	2.1	2.6	3.3	4.3	4.8	5.5	5.8	5.3	4.3	3.5	2.2	1.7	3.8
	Min/Max	1.0/3.1	1.7/3.9	1.6/4.7	2.4/6.2	3.0/6.6	3.5/7.5	4.1/7.7	3.3/6.4	1.7/6.3	2.2/5.3	1.3/3.2	1.0/2.6	3.2/4.7
1-Axis, N-S Tilt=Latitude	Average	3.2	3.5	3.9	4.5	4.7	5.1	5.6	5.3	4.8	4.5	3.1	2.6	4.2
	Min/Max	1.6/4.6	2.2/5.1	1.9/5.5	2.5/6.5	3.0/6.4	3.3/7.1	3.9/7.3	3.3/6.5	1.9/7.1	2.8/6.7	1.9/4.6	1.6/4.0	3.6/5.3
2-Axis	Average	3.4	3.6	3.9	4.6	5.0	5.6	6.0	5.5	4.8	4.5	3.3	2.8	4.4
	Min/Max	1.7/4.9	2.3/5.3	2.0/5.5	2.5/6.6	3.1/6.8	3.6/7.7	4.2/7.9	3.5/6.7	1.9/7.1	2.8/6.8	2.0/4.8	1.7/4.3	3.7/5.5

Average Climatic Conditions

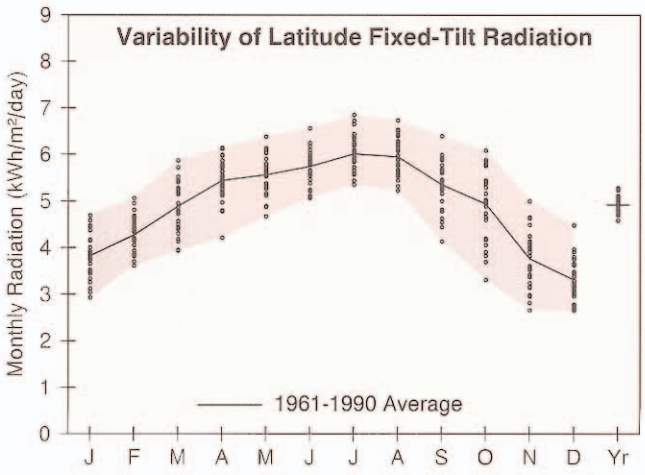
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-3.5	-0.4	5.9	12.5	17.8	22.9	25.8	24.5	19.7	13.7	6.2	-0.9	12.0
Daily Minimum Temp	-8.5	-5.7	0.3	6.6	12.2	17.3	20.1	18.7	13.8	7.6	0.9	-5.6	6.5
Daily Maximum Temp	1.5	4.8	11.6	18.4	23.5	28.5	31.5	30.2	25.6	19.7	11.4	3.8	17.6
Record Minimum Temp	-27.2	-28.3	-23.3	-11.1	-1.1	5.6	11.1	6.1	0.6	-6.1	-17.2	-30.6	-30.6
Record Maximum Temp	20.6	24.4	30.0	33.9	33.3	40.6	41.7	42.8	38.9	33.3	27.8	21.1	42.8
HDD, Base 18.3°C	677	526	384	181	75	4	0	3	31	155	365	596	2996
CDD, Base 18.3°C	0	0	0	6	59	141	233	194	73	10	0	0	716
Relative Humidity (%)	68	67	64	61	66	68	66	68	70	64	68	71	67
Wind Speed (m/s)	4.9	4.9	5.5	5.4	4.6	4.3	4.1	4.0	4.1	4.5	4.8	4.8	4.6

Springfield, MO

WBAN NO. 13995

LATITUDE: 37.23° N
LONGITUDE: 93.38° W
ELEVATION: 387 meters
MEAN PRESSURE: 972 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	2.4	3.1	4.1	5.2	5.9	6.4	6.6	5.9	4.7	3.7	2.5	2.0	4.4
	Min/Max	2.0/2.7	2.8/3.4	3.4/4.7	4.2/5.8	5.0/6.7	5.7/7.4	5.9/7.5	5.3/6.6	3.8/5.4	2.7/4.3	2.0/3.0	1.8/2.4	4.2/4.6
Latitude -15	Average	3.4	3.9	4.7	5.6	5.9	6.2	6.5	6.2	5.3	4.6	3.4	2.9	4.9
	Min/Max	2.6/4.1	3.4/4.6	3.9/5.6	4.3/6.2	5.0/6.8	5.5/7.2	5.8/7.4	5.4/7.0	4.1/6.3	3.2/5.6	2.5/4.4	2.4/3.8	4.6/5.2
Latitude	Average	3.8	4.3	4.9	5.4	5.6	5.7	6.0	5.9	5.4	4.9	3.8	3.3	4.9
	Min/Max	2.9/4.7	3.6/5.1	3.9/5.9	4.2/6.1	4.7/6.4	5.1/6.6	5.3/6.8	5.2/6.7	4.1/6.4	3.3/6.1	2.7/5.0	2.7/4.5	4.6/5.3
Latitude +15	Average	4.1	4.4	4.8	5.0	4.9	5.0	5.2	5.4	5.1	5.0	3.9	3.5	4.7
	Min/Max	3.1/5.1	3.7/5.3	3.8/5.8	3.9/5.7	4.2/5.7	4.4/5.6	4.7/5.9	4.7/6.1	3.9/6.2	3.3/6.2	2.7/5.3	2.8/4.9	4.3/5.1
90	Average	3.7	3.7	3.5	3.0	2.5	2.3	2.5	3.0	3.4	3.9	3.4	3.3	3.2
	Min/Max	2.7/4.6	3.0/4.5	2.7/4.2	2.4/3.4	2.2/2.8	2.1/2.5	2.3/2.7	2.6/3.3	2.6/4.1	2.5/4.9	2.2/4.8	2.5/4.6	2.8/3.5

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	3.4	4.2	5.4	6.8	7.6	8.3	8.7	7.9	6.3	5.1	3.5	2.8	5.9
	Min/Max	2.5/4.1	3.5/4.9	4.2/6.6	4.9/8.0	6.1/9.0	6.9/9.9	7.6/10.3	6.7/9.4	4.8/7.8	3.4/6.5	2.5/4.6	2.3/3.8	5.5/6.3
Latitude -15	Average	4.1	4.9	6.0	7.1	7.7	8.2	8.7	8.2	6.8	5.9	4.1	3.5	6.3
	Min/Max	3.0/5.1	4.0/5.8	4.5/7.3	5.1/8.4	6.1/9.1	6.9/9.8	7.6/10.3	6.9/9.7	5.1/8.5	3.8/7.4	2.8/5.6	2.7/4.8	5.8/6.8
Latitude	Average	4.5	5.1	6.1	7.1	7.5	7.9	8.4	8.0	6.9	6.1	4.4	3.8	6.3
	Min/Max	3.2/5.6	4.2/6.2	4.5/7.5	5.0/8.4	5.9/8.8	6.6/9.4	7.3/10.0	6.8/9.5	5.1/8.6	3.9/7.8	3.0/6.1	3.0/5.3	5.8/6.9
Latitude +15	Average	4.7	5.2	6.0	6.8	7.0	7.4	7.9	7.6	6.7	6.2	4.6	4.0	6.2
	Min/Max	3.4/5.9	4.2/6.4	4.4/7.4	4.8/8.0	5.5/8.3	6.2/8.8	6.8/9.3	6.4/9.1	4.9/8.4	3.8/7.9	3.0/6.4	3.1/5.7	5.6/6.7

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

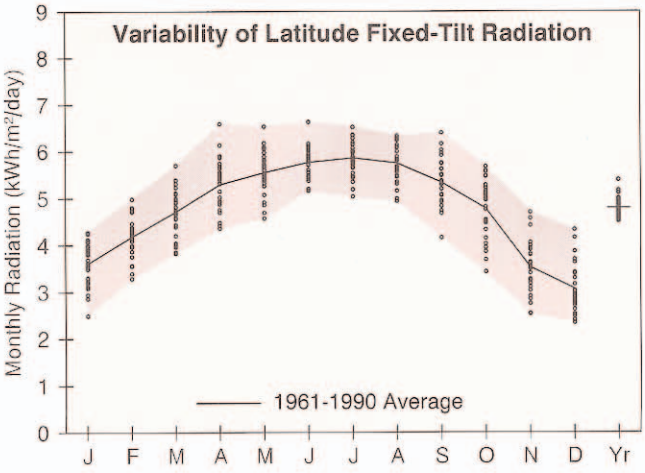
Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	4.7	5.2	6.1	7.2	7.8	8.4	8.9	8.2	6.9	6.2	4.6	4.1	6.5
	Min/Max	3.4/5.9	4.2/6.4	4.6/7.5	5.1/8.4	6.2/9.2	7.0/10.1	7.7/10.5	6.9/9.7	5.1/8.6	3.9/7.9	3.0/6.4	3.1/5.7	6.0/7.1

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	Average	2.8	2.7	2.9	3.3	3.6	4.0	4.3	4.0	3.3	3.4	2.7	2.4	3.3
Horiz Axis	Min/Max	1.7/3.9	1.9/3.8	1.7/4.1	1.9/4.4	2.5/4.7	2.8/5.4	3.4/5.8	3.1/5.2	1.9/4.6	1.7/4.8	1.4/4.1	1.4/3.8	2.8/3.8
1-Axis, N-S	Average	2.1	2.6	3.4	4.4	4.8	5.3	5.8	5.3	4.1	3.5	2.2	1.7	3.8
Horiz Axis	Min/Max	1.2/3.0	1.8/3.5	1.9/4.6	2.4/5.8	3.3/6.2	3.7/7.2	4.5/7.8	4.1/6.9	2.5/5.8	1.8/5.0	1.2/3.5	0.9/2.8	3.3/4.3
1-Axis, N-S	Average	3.1	3.3	3.9	4.6	4.6	5.0	5.5	5.3	4.6	4.3	3.0	2.6	4.2
Tilt=Latitude	Min/Max	1.8/4.3	2.3/4.6	2.2/5.4	2.5/6.0	3.2/6.0	3.5/6.7	4.3/7.4	4.1/7.0	2.7/6.3	2.2/6.1	1.6/4.8	1.4/4.1	3.6/4.8
2-Axis	Average	3.3	3.4	3.9	4.6	4.9	5.4	5.9	5.5	4.6	4.4	3.2	2.8	4.3
	Min/Max	1.9/4.6	2.4/4.8	2.2/5.4	2.5/6.1	3.4/6.4	3.8/7.3	4.6/7.9	4.2/7.2	2.7/6.4	2.2/6.2	1.7/5.0	1.5/4.5	3.7/5.0

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-0.5	2.1	7.8	13.3	18.1	22.9	25.6	24.9	20.6	14.3	7.8	1.8	13.2
Daily Minimum Temp	-6.4	-3.9	1.3	6.7	11.8	16.6	19.2	18.3	14.3	7.7	1.9	-3.7	7.0
Daily Maximum Temp	5.4	7.9	14.1	19.9	24.4	29.1	32.0	31.4	26.8	21.0	13.7	7.4	19.4
Record Minimum Temp	-25.0	-27.2	-19.4	-7.8	-1.1	5.6	6.7	6.7	-0.6	-6.1	-15.6	-26.7	-27.2
Record Maximum Temp	24.4	27.2	30.6	33.9	33.9	38.3	45.0	41.1	40.0	33.9	26.7	25.0	45.0
HDD, Base 18.3°C	584	456	327	156	61	3	0	0	24	138	317	512	2577
CDD, Base 18.3°C	0	0	0	6	54	139	226	203	91	14	0	0	733
Relative Humidity (%)	68	69	65	65	71	72	70	70	73	68	70	71	69
Wind Speed (m/s)	4.9	4.9	5.4	5.0	4.2	3.8	3.4	3.5	3.8	4.2	4.6	4.8	4.4



St. Louis, MO

WBAN NO. 13994

LATITUDE: 38.75° N
LONGITUDE: 90.38° W
ELEVATION: 172 meters
MEAN PRESSURE: 997 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	2.2	2.9	3.9	5.0	5.9	6.4	6.4	5.7	4.6	3.5	2.3	1.8	4.2
	Min/Max	1.7/2.5	2.5/3.4	3.3/4.5	4.3/6.1	4.9/6.9	5.8/7.4	5.5/7.1	4.9/6.2	3.8/5.3	2.8/3.9	1.9/2.7	1.6/2.3	4.0/4.7
Latitude -15	Average	3.2	3.8	4.6	5.4	5.9	6.3	6.3	6.0	5.3	4.5	3.2	2.7	4.8
	Min/Max	2.3/3.7	3.1/4.5	3.8/5.5	4.5/6.7	4.9/6.9	5.6/7.2	5.4/7.0	5.1/6.6	4.2/6.3	3.3/5.2	2.4/4.1	2.1/3.7	4.5/5.3
Latitude	Average	3.6	4.2	4.7	5.3	5.6	5.8	5.9	5.7	5.3	4.8	3.5	3.1	4.8
	Min/Max	2.5/4.3	3.3/5.0	3.8/5.7	4.4/6.6	4.6/6.5	5.2/6.6	5.0/6.5	4.9/6.3	4.2/6.4	3.4/5.7	2.5/4.7	2.3/4.3	4.5/5.4
Latitude +15	Average	3.8	4.3	4.6	4.9	4.9	5.0	5.1	5.2	5.1	4.8	3.7	3.3	4.6
	Min/Max	2.6/4.6	3.3/5.2	3.7/5.6	4.0/6.1	4.1/5.8	4.5/5.7	4.4/5.7	4.5/5.8	4.0/6.2	3.4/5.8	2.6/5.0	2.4/4.7	4.3/5.1
90	Average	3.5	3.7	3.4	3.1	2.6	2.4	2.6	3.0	3.5	3.8	3.2	3.0	3.2
	Min/Max	2.3/4.3	2.7/4.6	2.7/4.1	2.5/3.7	2.3/2.9	2.3/2.6	2.3/2.7	2.6/3.3	2.7/4.2	2.6/4.7	2.2/4.5	2.2/4.5	2.8/3.5

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	3.1	4.0	5.1	6.6	7.6	8.3	8.3	7.6	6.2	4.9	3.1	2.5	5.6
	Min/Max	2.2/3.7	3.1/4.8	4.0/6.4	5.2/8.5	6.1/9.4	7.3/10.0	7.2/9.5	6.3/8.4	4.7/7.8	3.4/5.9	2.3/4.2	2.0/3.5	5.3/6.5
Latitude -15	Average	3.8	4.7	5.7	6.9	7.7	8.3	8.4	7.8	6.8	5.6	3.8	3.2	6.1
	Min/Max	2.6/4.6	3.6/5.6	4.3/7.2	5.4/9.0	6.1/9.6	7.2/10.0	7.2/9.5	6.4/8.8	5.0/8.6	3.9/6.8	2.7/5.2	2.4/4.6	5.7/7.0
Latitude	Average	4.2	5.0	5.8	6.8	7.5	7.9	8.1	7.7	6.8	5.9	4.1	3.5	6.1
	Min/Max	2.8/5.1	3.7/6.0	4.4/7.3	5.3/8.9	5.9/9.3	6.9/9.6	6.9/9.2	6.3/8.6	5.0/8.7	4.0/7.2	2.8/5.7	2.6/5.1	5.7/7.1
Latitude +15	Average	4.4	5.1	5.7	6.5	7.0	7.4	7.6	7.3	6.7	5.9	4.2	3.7	6.0
	Min/Max	2.8/5.3	3.8/6.2	4.3/7.3	5.1/8.6	5.5/8.8	6.5/8.9	6.5/8.6	6.0/8.2	4.8/8.5	4.0/7.2	2.8/5.9	2.7/5.4	5.5/6.9

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	4.4	5.1	5.8	6.9	7.8	8.5	8.5	7.9	6.9	5.9	4.3	3.7	6.3
	Min/Max	2.9/5.4	3.8/6.2	4.4/7.4	5.4/9.0	6.2/9.7	7.4/10.2	7.3/9.7	6.5/8.8	5.1/8.7	4.0/7.3	2.9/5.9	2.7/5.5	5.9/7.3

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	2.5	2.6	2.7	3.1	3.5	3.9	4.0	3.7	3.3	3.2	2.4	2.1	3.1
	Min/Max	1.3/3.4	1.7/3.4	1.7/4.0	1.9/4.8	2.3/5.1	3.2/5.5	2.8/5.1	2.6/4.5	2.0/4.7	1.8/4.2	1.2/3.8	1.3/3.6	2.8/3.9
1-Axis, N-S Horiz Axis	Average	1.9	2.4	3.0	4.0	4.7	5.2	5.3	4.9	4.0	3.3	1.9	1.5	3.5
	Min/Max	0.9/2.6	1.5/3.2	1.9/4.6	2.4/6.2	3.1/6.8	4.3/7.2	3.9/6.7	3.5/6.0	2.3/5.9	1.8/4.3	1.0/3.1	0.9/2.5	3.1/4.5
1-Axis, N-S Tilt=Latitude	Average	2.7	3.1	3.6	4.3	4.6	4.9	5.1	4.9	4.5	4.1	2.7	2.2	3.9
	Min/Max	1.4/3.8	2.0/4.2	2.2/5.3	2.5/6.5	3.1/6.7	4.0/6.8	3.7/6.4	3.5/6.1	2.6/6.6	2.3/5.4	1.4/4.3	1.4/3.8	3.5/5.0
2-Axis	Average	2.9	3.2	3.6	4.3	4.8	5.3	5.5	5.1	4.5	4.1	2.9	2.4	4.1
	Min/Max	1.5/4.0	2.0/4.2	2.2/5.3	2.6/6.6	3.2/7.1	4.3/7.4	4.0/6.9	3.6/6.3	2.6/6.6	2.3/5.4	1.4/4.6	1.5/4.2	3.6/5.2

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-1.5	1.1	7.3	13.7	18.9	24.1	26.6	25.3	21.2	14.7	7.9	1.1	13.4
Daily Minimum Temp	-6.2	-3.8	1.9	8.0	13.3	18.7	21.3	19.9	15.8	9.1	3.2	-3.3	8.2
Daily Maximum Temp	3.2	5.9	12.6	19.4	24.5	29.6	31.8	30.7	26.6	20.3	12.6	5.4	18.6
Record Minimum Temp	-27.8	-23.3	-20.6	-5.6	-0.6	6.1	10.6	8.3	2.2	-5.0	-17.2	-26.7	-27.8
Record Maximum Temp	24.4	29.4	31.7	33.9	33.9	38.9	41.7	41.7	40.0	34.4	29.4	24.4	41.7
HDD, Base 18.3°C	615	484	343	148	62	0	0	0	12	132	313	536	2643
CDD, Base 18.3°C	0	0	0	9	81	173	255	217	98	18	0	0	852
Relative Humidity (%)	73	72	68	63	66	67	68	70	72	69	72	76	70
Wind Speed (m/s)	4.9	4.8	5.3	5.2	4.3	4.1	3.8	3.6	3.8	4.1	4.6	4.8	4.4