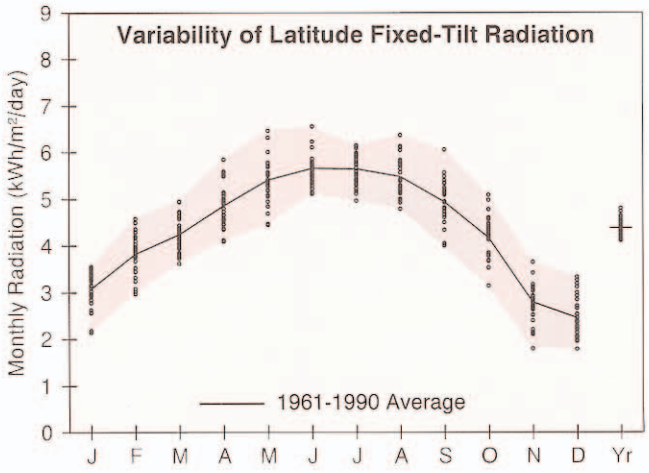


Chicago, IL

WBAN NO. 94846

LATITUDE: 41.78° N
LONGITUDE: 87.75° W
ELEVATION: 190 meters
MEAN PRESSURE: 992 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	1.8	2.6	3.5	4.6	5.7	6.3	6.1	5.4	4.2	3.0	1.8	1.5	3.9
	Min/Max	1.5/2.1	2.2/3.0	3.1/3.9	4.0/5.3	4.8/6.8	5.7/7.2	5.4/6.6	4.8/6.1	3.6/4.9	2.5/3.5	1.4/2.1	1.2/1.7	3.7/4.2
Latitude -15	Average	2.7	3.5	4.1	5.0	5.8	6.1	6.1	5.7	4.9	3.9	2.5	2.2	4.4
	Min/Max	2.0/3.1	2.8/4.2	3.6/4.8	4.2/5.9	4.8/6.9	5.5/7.1	5.4/6.6	5.0/6.6	4.0/5.9	3.0/4.7	1.7/3.3	1.6/2.9	4.2/4.8
Latitude	Average	3.1	3.8	4.2	4.9	5.4	5.7	5.6	5.5	4.9	4.2	2.8	2.4	4.4
	Min/Max	2.1/3.5	3.0/4.6	3.6/4.9	4.1/5.8	4.4/6.5	5.1/6.6	5.0/6.2	4.8/6.4	4.0/6.1	3.1/5.1	1.8/3.7	1.8/3.3	4.1/4.8
Latitude +15	Average	3.3	3.9	4.1	4.5	4.8	4.9	4.9	5.0	4.7	4.2	2.9	2.6	4.1
	Min/Max	2.2/3.8	3.0/4.7	3.5/4.9	3.8/5.4	4.0/5.7	4.4/5.7	4.3/5.4	4.3/5.8	3.8/5.8	3.1/5.2	1.8/3.8	1.8/3.6	3.8/4.5
90	Average	3.1	3.5	3.2	3.0	2.8	2.6	2.7	3.1	3.4	3.4	2.5	2.4	3.0
	Min/Max	2.0/3.7	2.5/4.3	2.7/3.8	2.5/3.6	2.4/3.2	2.5/3.0	2.5/2.9	2.8/3.5	2.7/4.2	2.5/4.3	1.5/3.5	1.7/3.5	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	2.5	3.5	4.5	5.9	7.3	8.0	7.9	7.0	5.6	4.1	2.4	1.9	5.1
	Min/Max	1.7/2.9	2.7/4.2	3.9/5.4	4.7/7.3	5.8/9.1	7.1/9.6	6.9/8.9	5.9/8.5	4.4/6.9	3.0/5.0	1.6/3.0	1.5/2.6	4.7/5.7
Latitude -15	Average	3.2	4.2	5.0	6.2	7.4	8.0	7.9	7.3	6.2	4.8	2.9	2.5	5.5
	Min/Max	2.2/3.7	3.2/5.2	4.3/6.1	5.0/7.8	5.9/9.4	7.1/9.6	6.9/9.0	6.1/9.0	4.8/7.7	3.5/6.0	1.8/3.9	1.8/3.4	5.1/6.2
Latitude	Average	3.5	4.5	5.1	6.1	7.2	7.7	7.7	7.2	6.2	5.0	3.1	2.7	5.5
	Min/Max	2.3/4.1	3.3/5.5	4.3/6.2	4.9/7.8	5.7/9.1	6.8/9.2	6.7/8.7	6.0/8.8	4.8/7.8	3.6/6.3	1.9/4.2	1.9/3.8	5.1/6.2
Latitude +15	Average	3.7	4.5	5.0	5.9	6.8	7.2	7.2	6.8	6.0	5.0	3.2	2.9	5.3
	Min/Max	2.4/4.3	3.3/5.6	4.2/6.1	4.6/7.4	5.4/8.6	6.3/8.6	6.2/8.1	5.7/8.4	4.6/7.6	3.5/6.3	1.9/4.4	2.0/4.1	4.9/6.0

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	3.7	4.6	5.1	6.2	7.5	8.2	8.1	7.4	6.2	5.0	3.2	2.9	5.7
	Min/Max	2.4/4.3	3.4/5.6	4.3/6.2	5.0/7.8	6.0/9.5	7.2/9.8	7.1/9.2	6.2/9.0	4.8/7.8	3.6/6.3	1.9/4.4	2.0/4.1	5.2/6.4

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	2.2	2.2	2.6	3.3	3.7	3.6	3.3	2.9	2.6	1.7	1.5	2.6
	Min/Max	1.1/2.5	1.3/3.3	1.6/3.1	1.8/3.8	2.1/4.9	3.0/4.9	2.8/4.4	2.3/4.4	1.9/4.1	1.5/3.6	0.7/2.6	0.9/2.5	2.3/3.2
1-Axis, N-S Horiz Axis	Average	1.3	1.9	2.4	3.3	4.3	4.8	4.8	4.2	3.4	2.5	1.3	1.0	2.9
	Min/Max	0.7/1.7	1.1/2.8	1.6/3.4	2.2/4.8	2.8/6.4	4.0/6.4	3.8/5.9	3.0/5.9	2.2/4.7	1.4/3.5	0.5/1.9	0.6/1.6	2.6/3.6
1-Axis, N-S Tilt=Latitude	Average	2.1	2.6	2.9	3.6	4.3	4.6	4.6	4.3	3.9	3.2	1.9	1.6	3.3
	Min/Max	1.2/2.7	1.5/3.9	2.0/4.1	2.4/5.2	2.8/6.3	3.7/6.1	3.7/5.6	3.1/6.1	2.5/5.4	1.9/4.5	0.8/2.9	0.9/2.6	2.9/4.0
2-Axis	Average	2.3	2.7	2.9	3.6	4.5	5.0	4.9	4.5	3.9	3.3	2.0	1.7	3.4
	Min/Max	1.3/2.9	1.6/4.0	2.0/4.1	2.4/5.2	3.0/6.7	4.1/6.6	3.9/6.1	3.2/6.2	2.5/5.4	1.9/4.5	0.8/3.0	1.0/2.8	3.0/4.2

Average Climatic Conditions

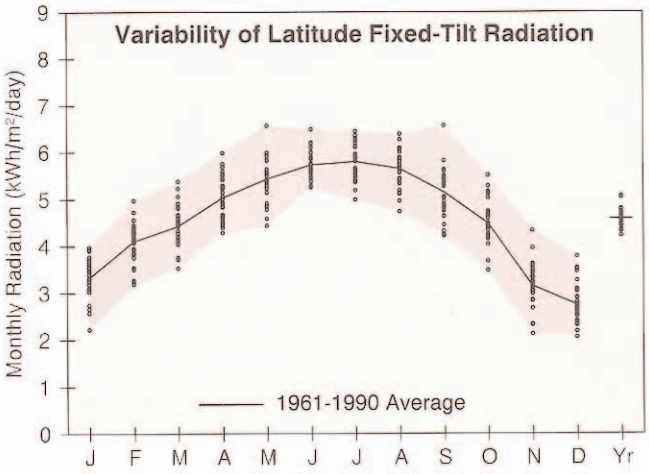
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-6.1	-3.7	2.9	9.2	14.9	20.3	22.9	22.1	18.0	11.6	4.4	-3.0	9.4
Daily Minimum Temp	-10.6	-8.2	-1.9	3.7	8.7	14.2	17.0	16.4	12.2	5.7	-0.2	-7.2	4.2
Daily Maximum Temp	-1.7	0.8	7.7	14.8	21.2	26.4	28.7	27.7	23.8	17.4	9.1	1.1	14.8
Record Minimum Temp	-32.8	-27.2	-22.2	-13.9	-4.4	2.2	4.4	5.0	-2.2	-8.3	-17.2	-31.7	-32.8
Record Maximum Temp	18.3	21.7	31.1	32.8	33.9	40.0	38.9	38.3	37.2	32.8	25.6	21.7	40.0
HDD, Base 18.3°C	758	616	479	273	131	19	3	11	47	217	417	661	3631
CDD, Base 18.3°C	0	0	0	0	26	79	144	126	37	7	0	0	418
Relative Humidity (%)	72	72	70	65	64	66	68	71	71	69	73	76	70
Wind Speed (m/s)	5.2	5.1	5.4	5.3	4.6	4.2	3.7	3.6	4.0	4.5	4.8	4.9	4.6

Moline, IL

WBAN NO. 14923

LATITUDE: 41.45° N
LONGITUDE: 90.52° W
ELEVATION: 181 meters
MEAN PRESSURE: 995 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	1.9	2.7	3.6	4.7	5.7	6.4	6.3	5.5	4.3	3.2	2.0	1.6	4.0
	Min/Max	1.5/2.2	2.4/3.1	3.1/4.1	4.2/5.5	4.7/6.9	5.8/7.2	5.4/6.9	4.7/6.1	3.8/5.3	2.6/3.7	1.6/2.4	1.3/1.9	3.8/4.4
Latitude -15	Average	2.9	3.8	4.3	5.1	5.8	6.2	6.2	5.9	5.1	4.2	2.8	2.4	4.6
	Min/Max	2.0/3.5	3.0/4.5	3.5/5.2	4.4/6.1	4.7/7.0	5.7/7.1	5.4/6.9	4.9/6.6	4.2/6.4	3.3/5.1	2.0/3.8	1.9/3.2	4.3/5.0
Latitude	Average	3.3	4.1	4.4	5.0	5.4	5.7	5.8	5.6	5.1	4.5	3.1	2.7	4.6
	Min/Max	2.2/4.0	3.2/5.0	3.5/5.4	4.3/6.0	4.4/6.6	5.3/6.5	5.0/6.4	4.7/6.4	4.2/6.6	3.5/5.5	2.1/4.3	2.1/3.8	4.2/5.1
Latitude +15	Average	3.5	4.2	4.3	4.6	4.8	4.9	5.1	5.1	4.9	4.5	3.3	2.9	4.4
	Min/Max	2.3/4.3	3.2/5.1	3.4/5.3	3.9/5.6	3.9/5.8	4.5/5.6	4.4/5.6	4.3/5.8	4.0/6.3	3.5/5.6	2.1/4.6	2.2/4.1	4.0/4.8
90	Average	3.4	3.8	3.3	3.1	2.7	2.6	2.7	3.1	3.5	3.7	2.9	2.8	3.1
	Min/Max	2.1/4.2	2.9/4.4	2.6/4.1	2.6/3.6	2.4/3.2	2.5/2.9	2.5/3.0	2.7/3.5	2.8/4.5	2.8/4.6	1.8/4.2	1.9/4.0	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	2.8	3.8	4.8	6.2	7.4	8.3	8.3	7.4	6.0	4.5	2.7	2.2	5.4
	Min/Max	1.8/3.3	3.0/4.7	3.7/6.0	5.1/7.6	5.7/9.4	7.2/9.7	6.9/9.4	6.1/8.5	4.8/7.8	3.5/5.4	1.9/3.7	1.6/3.0	5.0/6.1
Latitude -15	Average	3.5	4.6	5.3	6.5	7.6	8.3	8.3	7.7	6.6	5.2	3.4	2.8	5.8
	Min/Max	2.3/4.3	3.5/5.7	4.0/6.8	5.4/8.1	5.8/9.7	7.2/9.7	6.9/9.5	6.3/8.9	5.2/8.7	4.0/6.5	2.2/4.8	2.1/4.0	5.3/6.6
Latitude	Average	3.8	4.9	5.4	6.5	7.3	7.9	8.0	7.6	6.6	5.5	3.6	3.1	5.9
	Min/Max	2.4/4.7	3.7/6.1	4.1/7.0	5.3/8.0	5.6/9.4	6.9/9.4	6.7/9.1	6.1/8.8	5.2/8.8	4.1/6.8	2.3/5.2	2.2/4.4	5.3/6.6
Latitude +15	Average	4.0	5.0	5.3	6.2	6.9	7.4	7.5	7.2	6.4	5.5	3.7	3.3	5.7
	Min/Max	2.5/4.9	3.7/6.2	4.0/6.9	5.0/7.7	5.2/8.9	6.4/8.7	6.3/8.6	5.8/8.4	5.0/8.6	4.1/6.9	2.3/5.4	2.3/4.7	5.1/6.5

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

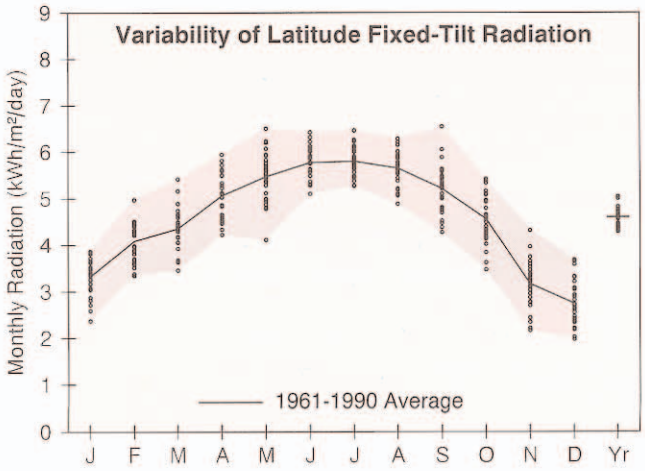
Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	4.1	5.0	5.4	6.6	7.7	8.5	8.5	7.7	6.6	5.5	3.7	3.3	6.1
	Min/Max	2.5/5.0	3.7/6.2	4.1/7.0	5.4/8.1	5.9/9.8	7.4/10.0	7.1/9.6	6.3/8.9	5.2/8.8	4.1/6.9	2.3/5.4	2.3/4.8	5.5/6.9

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	2.6	2.4	2.9	3.4	4.0	4.0	3.6	3.2	3.0	2.1	1.8	2.9
	Min/Max	1.1/2.9	1.5/3.7	1.4/3.6	2.0/4.1	2.0/5.1	3.1/5.2	2.8/4.9	2.6/4.5	2.1/4.9	1.9/4.1	0.8/3.4	1.2/3.0	2.5/3.6
1-Axis, N-S Horiz Axis	Average	1.6	2.2	2.7	3.7	4.6	5.2	5.3	4.7	3.9	2.9	1.6	1.2	3.3
	Min/Max	0.8/2.1	1.3/3.3	1.5/4.2	2.7/5.3	2.7/6.8	4.0/6.8	3.8/6.5	3.5/5.9	2.5/6.0	1.9/3.9	0.6/2.6	0.8/2.0	2.8/4.1
1-Axis, N-S Tilt=Latitude	Average	2.4	3.1	3.3	3.9	4.5	4.9	5.1	4.9	4.4	3.7	2.3	1.9	3.7
	Min/Max	1.2/3.2	1.8/4.5	1.8/4.9	2.9/5.6	2.6/6.7	3.8/6.5	3.7/6.3	3.5/6.0	2.9/6.8	2.4/5.1	0.9/3.8	1.3/3.2	3.1/4.6
2-Axis	Average	2.6	3.2	3.3	4.0	4.7	5.3	5.4	5.0	4.4	3.8	2.4	2.1	3.9
	Min/Max	1.3/3.5	1.8/4.6	1.8/5.0	2.9/5.7	2.8/7.0	4.1/7.0	3.9/6.7	3.7/6.2	2.9/6.8	2.5/5.1	0.9/4.0	1.4/3.5	3.3/4.8

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-6.7	-4.0	3.0	10.2	16.3	21.7	24.0	22.6	18.2	11.7	4.2	-3.7	9.8
Daily Minimum Temp	-11.5	-8.9	-2.2	4.1	9.9	15.3	18.1	16.6	11.8	5.4	-0.7	-8.1	4.2
Daily Maximum Temp	-2.0	0.9	8.2	16.3	22.7	28.1	29.9	28.6	24.4	17.9	9.1	0.8	15.4
Record Minimum Temp	-32.8	-31.7	-28.3	-13.9	-3.3	3.9	7.8	4.4	-4.4	-8.9	-22.8	-31.1	-32.8
Record Maximum Temp	20.6	21.7	31.1	33.9	40.0	40.0	40.6	41.1	37.8	33.3	26.7	20.6	41.1
HDD, Base 18.3°C	777	626	476	243	104	6	0	6	41	213	423	682	3597
CDD, Base 18.3°C	0	0	0	0	42	107	176	139	36	7	0	0	506
Relative Humidity (%)	70	70	68	64	65	66	70	73	73	68	71	74	69
Wind Speed (m/s)	5.1	4.8	5.5	5.4	4.6	4.2	3.5	3.4	3.7	4.3	4.8	4.9	4.5



Peoria, IL

WBAN NO. 14842

LATITUDE: 40.67° N
LONGITUDE: 89.68° W
ELEVATION: 199 meters
MEAN PRESSURE: 993 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	2.0	2.8	3.6	4.8	5.8	6.4	6.3	5.5	4.4	3.2	2.0	1.6	4.0
	Min/Max	1.6/2.2	2.5/3.2	3.0/4.2	4.1/5.6	4.4/6.8	5.8/7.2	5.8/6.9	4.8/6.1	3.8/5.3	2.7/3.7	1.6/2.5	1.3/1.9	3.8/4.4
Latitude -15	Average	2.9	3.7	4.2	5.2	5.8	6.3	6.2	5.9	5.2	4.3	2.9	2.4	4.6
	Min/Max	2.2/3.4	3.1/4.5	3.4/5.2	4.3/6.1	4.4/6.9	5.6/7.0	5.7/6.9	5.1/6.5	4.3/6.4	3.3/5.0	2.0/3.8	1.8/3.2	4.3/5.0
Latitude	Average	3.3	4.1	4.4	5.1	5.5	5.8	5.8	5.7	5.2	4.6	3.2	2.7	4.6
	Min/Max	2.4/3.9	3.3/5.0	3.5/5.4	4.2/5.9	4.1/6.5	5.1/6.4	5.3/6.5	4.9/6.3	4.3/6.5	3.5/5.4	2.2/4.3	2.0/3.7	4.3/5.0
Latitude +15	Average	3.5	4.2	4.2	4.7	4.8	5.0	5.1	5.1	5.0	4.6	3.3	2.9	4.4
	Min/Max	2.5/4.1	3.4/5.1	3.3/5.3	3.9/5.5	3.7/5.7	4.4/5.5	4.6/5.6	4.4/5.7	4.0/6.3	3.4/5.5	2.2/4.6	2.0/4.0	4.0/4.8
90	Average	3.3	3.7	3.2	3.0	2.7	2.6	2.7	3.1	3.5	3.7	2.9	2.7	3.1
	Min/Max	2.2/4.0	3.0/4.4	2.6/4.0	2.5/3.5	2.2/3.1	2.3/2.8	2.5/3.0	2.7/3.4	2.8/4.4	2.7/4.5	1.9/4.1	1.8/3.9	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	2.8	3.8	4.7	6.2	7.5	8.3	8.2	7.4	6.0	4.6	2.7	2.2	5.4
	Min/Max	2.0/3.3	3.2/4.7	3.7/5.9	5.1/7.6	5.3/9.4	7.4/9.7	7.3/9.1	6.2/8.2	4.9/7.8	3.4/5.5	1.9/3.7	1.6/2.9	5.0/6.1
Latitude -15	Average	3.5	4.6	5.2	6.6	7.6	8.3	8.3	7.7	6.6	5.3	3.4	2.8	5.8
	Min/Max	2.4/4.1	3.7/5.7	4.0/6.7	5.3/8.1	5.3/9.6	7.4/9.7	7.3/9.3	6.4/8.6	5.3/8.6	3.9/6.4	2.2/4.7	2.0/3.8	5.4/6.6
Latitude	Average	3.8	4.8	5.3	6.5	7.4	8.0	8.0	7.5	6.7	5.6	3.6	3.1	5.9
	Min/Max	2.6/4.5	3.9/6.1	4.0/6.8	5.2/8.0	5.2/9.3	7.1/9.3	7.1/8.9	6.2/8.5	5.3/8.7	4.0/6.8	2.3/5.1	2.1/4.3	5.4/6.6
Latitude +15	Average	4.0	4.9	5.2	6.2	6.9	7.4	7.5	7.2	6.5	5.6	3.7	3.2	5.7
	Min/Max	2.7/4.8	3.9/6.2	4.0/6.8	5.0/7.7	4.8/8.8	6.6/8.7	6.6/8.4	5.9/8.1	5.1/8.5	4.0/6.8	2.4/5.3	2.2/4.5	5.2/6.5

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	5.0	5.3	6.6	7.7	8.5	8.4	7.7	6.7	5.6	3.8	3.3	6.1
	Min/Max	2.7/4.8	3.9/6.2	4.1/6.9	5.3/8.1	5.4/9.7	7.6/9.9	7.5/9.4	6.4/8.6	5.3/8.7	4.1/6.8	2.4/5.3	2.2/4.6	5.6/6.8

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	2.5	2.3	2.9	3.4	4.0	3.9	3.6	3.2	3.0	2.1	1.8	2.9
	Min/Max	1.3/2.9	1.6/3.7	1.3/3.5	2.0/4.0	1.8/5.0	3.1/5.1	3.2/4.8	2.6/4.2	2.2/4.8	1.9/4.0	0.9/3.3	1.0/3.0	2.5/3.5
1-Axis, N-S Horiz Axis	Average	1.6	2.2	2.6	3.7	4.6	5.2	5.2	4.7	3.9	3.0	1.6	1.2	3.3
	Min/Max	0.9/2.1	1.4/3.3	1.5/3.9	2.6/5.2	2.4/6.7	4.2/6.7	4.2/6.4	3.4/5.6	2.7/5.8	1.8/4.0	0.7/2.5	0.6/2.0	2.8/4.1
1-Axis, N-S Tilt=Latitude	Average	2.4	3.0	3.1	3.9	4.5	4.9	5.0	4.8	4.4	3.8	2.3	1.9	3.7
	Min/Max	1.3/3.2	1.9/4.4	1.8/4.7	2.7/5.6	2.4/6.5	3.9/6.4	4.0/6.1	3.5/5.7	3.0/6.6	2.3/5.1	1.0/3.7	1.0/3.1	3.2/4.5
2-Axis	Average	2.6	3.1	3.1	4.0	4.7	5.4	5.3	4.9	4.4	3.9	2.4	2.1	3.8
	Min/Max	1.4/3.4	2.0/4.6	1.8/4.7	2.8/5.6	2.5/6.9	4.3/6.9	4.3/6.5	3.6/5.9	3.0/6.6	2.4/5.1	1.0/3.8	1.1/3.4	3.3/4.7

Average Climatic Conditions

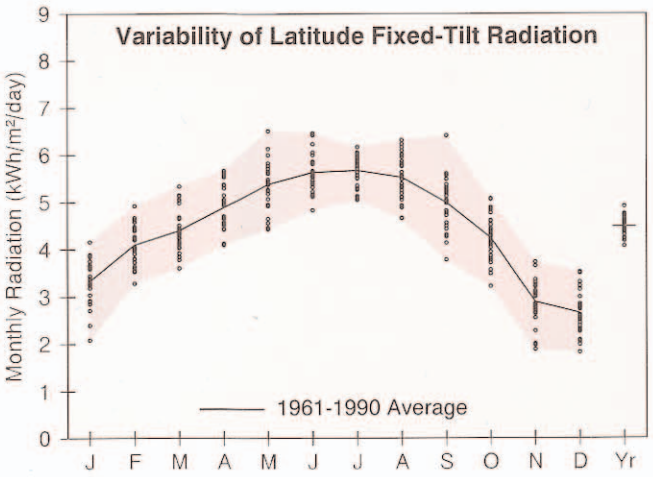
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-5.8	-3.2	3.9	10.8	16.6	21.9	24.2	22.8	18.9	12.2	5.1	-2.8	10.4
Daily Minimum Temp	-10.4	-7.9	-1.2	4.9	10.5	15.9	18.6	17.3	12.9	6.2	0.3	-7.1	5.0
Daily Maximum Temp	-1.2	1.6	8.9	16.7	22.7	27.9	29.8	28.4	24.9	18.2	9.9	1.4	15.8
Record Minimum Temp	-31.7	-27.8	-23.3	-10.0	-3.9	3.9	8.3	5.0	-3.3	-7.2	-18.9	-30.6	-31.7
Record Maximum Temp	21.1	22.2	30.0	33.3	33.9	40.6	39.4	39.4	37.8	32.2	27.2	21.7	40.6
HDD, Base 18.3°C	747	602	448	227	102	6	0	5	30	198	397	654	3416
CDD, Base 18.3°C	0	0	0	0	48	114	181	145	48	8	0	0	546
Relative Humidity (%)	74	74	71	65	66	67	72	74	73	70	74	78	71
Wind Speed (m/s)	4.9	4.8	5.3	5.1	4.3	3.8	3.4	3.3	3.6	4.1	4.7	4.7	4.3

Rockford, IL

WBAN NO. 94822

LATITUDE: 42.20° N
LONGITUDE: 89.10° W
ELEVATION: 221 meters
MEAN PRESSURE: 990 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	1.9	2.7	3.5	4.6	5.7	6.3	6.1	5.4	4.2	3.0	1.8	1.5	3.9
	Min/Max	1.4/2.2	2.4/3.1	3.1/4.1	4.0/5.2	4.7/6.8	5.4/7.2	5.6/6.7	4.6/6.0	3.5/5.1	2.5/3.4	1.5/2.1	1.2/1.8	3.7/4.2
Latitude -15	Average	2.9	3.8	4.3	5.0	5.7	6.1	6.1	5.7	5.0	4.0	2.6	2.3	4.5
	Min/Max	1.9/3.6	3.1/4.5	3.5/5.1	4.2/5.8	4.7/6.9	5.3/7.0	5.4/6.7	4.9/6.5	3.8/6.3	3.1/4.7	1.8/3.3	1.7/3.0	4.1/4.9
Latitude	Average	3.3	4.1	4.4	4.9	5.4	5.6	5.7	5.5	5.0	4.2	2.9	2.6	4.5
	Min/Max	2.1/4.2	3.3/4.9	3.6/5.3	4.1/5.7	4.4/6.5	4.8/6.5	5.1/6.2	4.7/6.3	3.8/6.4	3.2/5.1	1.9/3.7	1.8/3.5	4.1/4.9
Latitude +15	Average	3.6	4.2	4.3	4.5	4.8	4.9	4.9	5.0	4.8	4.3	3.0	2.8	4.3
	Min/Max	2.1/4.5	3.3/5.1	3.5/5.2	3.8/5.3	3.9/5.7	4.2/5.6	4.4/5.4	4.2/5.7	3.5/6.2	3.2/5.1	1.9/3.9	1.9/3.8	3.8/4.7
90	Average	3.4	3.8	3.4	3.0	2.8	2.7	2.8	3.1	3.4	3.5	2.7	2.7	3.1
	Min/Max	1.9/4.3	3.0/4.5	2.8/4.2	2.5/3.5	2.4/3.2	2.4/2.9	2.5/2.9	2.6/3.5	2.5/4.5	2.5/4.3	1.6/3.6	1.7/3.8	2.7/3.4

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	2.7	3.8	4.7	6.0	7.3	8.1	8.0	7.1	5.7	4.2	2.5	2.1	5.2
	Min/Max	1.7/3.3	3.0/4.6	3.8/5.8	4.8/7.2	5.8/9.3	6.8/9.5	6.9/9.1	5.9/8.4	4.3/7.4	3.2/5.0	1.7/3.2	1.5/2.7	4.7/5.8
Latitude -15	Average	3.5	4.6	5.3	6.3	7.4	8.1	8.1	7.4	6.3	4.9	3.1	2.7	5.7
	Min/Max	2.1/4.4	3.5/5.7	4.2/6.6	5.0/7.6	5.8/9.6	6.8/9.6	7.0/9.2	6.2/8.8	4.7/8.3	3.7/6.0	1.9/4.1	1.8/3.6	5.1/6.4
Latitude	Average	3.8	4.9	5.4	6.2	7.2	7.7	7.8	7.3	6.3	5.1	3.3	3.0	5.7
	Min/Max	2.3/4.8	3.7/6.0	4.2/6.8	4.9/7.5	5.6/9.3	6.5/9.2	6.7/8.8	6.0/8.7	4.6/8.5	3.8/6.3	2.0/4.4	2.0/4.1	5.1/6.4
Latitude +15	Average	4.0	5.0	5.3	6.0	6.8	7.2	7.3	6.9	6.2	5.1	3.4	3.1	5.5
	Min/Max	2.3/5.1	3.7/6.2	4.1/6.7	4.7/7.2	5.3/8.8	6.1/8.6	6.3/8.3	5.7/8.3	4.4/8.3	3.7/6.3	2.0/4.6	2.0/4.3	4.9/6.3

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

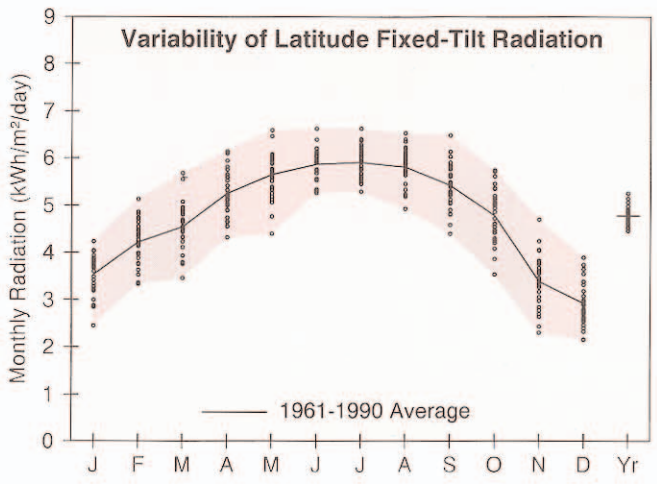
Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	4.1	5.0	5.4	6.3	7.5	8.3	8.2	7.5	6.4	5.2	3.4	3.2	5.9
	Min/Max	2.3/5.2	3.7/6.2	4.2/6.8	5.1/7.6	5.9/9.7	7.0/9.8	7.1/9.3	6.2/8.9	4.7/8.5	3.8/6.4	2.0/4.6	2.0/4.4	5.2/6.6

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	2.5	2.4	2.7	3.3	3.8	3.8	3.4	3.0	2.7	1.8	1.7	2.8
	Min/Max	1.0/3.1	1.5/3.7	1.5/3.5	1.8/3.7	2.1/5.1	2.8/5.1	2.8/4.6	2.5/4.5	1.8/4.7	1.7/3.6	0.7/2.8	0.9/2.8	2.3/3.4
1-Axis, N-S Horiz Axis	Average	1.5	2.2	2.6	3.4	4.4	4.9	5.0	4.4	3.6	2.6	1.4	1.1	3.1
	Min/Max	0.7/2.1	1.2/3.3	1.6/3.8	2.3/4.9	2.7/6.8	3.7/6.6	3.7/6.2	3.2/5.8	2.2/5.5	1.7/3.5	0.6/2.1	0.6/1.8	2.6/3.8
1-Axis, N-S Tilt=Latitude	Average	2.4	3.0	3.1	3.7	4.3	4.7	4.8	4.5	4.1	3.4	2.0	1.8	3.5
	Min/Max	1.1/3.3	1.8/4.5	1.9/4.6	2.5/5.2	2.7/6.7	3.5/6.3	3.6/5.9	3.3/6.0	2.5/6.3	2.2/4.5	0.8/3.1	1.0/2.9	2.9/4.3
2-Axis	Average	2.6	3.1	3.1	3.8	4.6	5.1	5.1	4.7	4.1	3.5	2.1	2.0	3.6
	Min/Max	1.1/3.6	1.8/4.6	1.9/4.6	2.5/5.3	2.8/7.1	3.8/6.8	3.8/6.3	3.3/6.2	2.5/6.3	2.2/4.6	0.9/3.3	1.0/3.2	3.0/4.5

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-7.7	-5.1	1.7	8.7	15.1	20.4	22.9	21.6	17.3	10.8	3.3	-4.4	8.7
Daily Minimum Temp	-12.3	-9.9	-3.3	2.7	8.6	14.1	16.9	15.7	11.1	4.8	-1.4	-8.8	3.2
Daily Maximum Temp	-3.0	-0.2	6.6	14.7	21.6	26.8	28.8	27.4	23.4	16.8	7.9	-0.1	14.2
Record Minimum Temp	-32.8	-30.0	-23.9	-15.0	-4.4	3.3	6.1	5.0	-2.8	-9.4	-23.3	-31.1	-32.8
Record Maximum Temp	17.2	20.0	29.4	32.8	35.0	38.3	39.4	40.0	38.9	32.2	24.4	18.9	40.0
HDD, Base 18.3°C	806	655	517	288	133	13	3	8	55	237	450	706	3872
CDD, Base 18.3°C	0	0	0	0	31	77	144	110	23	5	0	0	390
Relative Humidity (%)	75	74	72	66	65	66	71	74	74	71	75	78	72
Wind Speed (m/s)	5.0	4.8	5.4	5.3	4.7	4.2	3.7	3.5	3.8	4.3	4.8	4.8	4.5



Springfield, IL

WBAN NO. 93822

LATITUDE: 39.83° N
LONGITUDE: 89.67° W
ELEVATION: 187 meters
MEAN PRESSURE: 995 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	2.1	2.9	3.7	5.0	6.0	6.5	6.4	5.7	4.6	3.4	2.2	1.7	4.2
	Min/Max	1.6/2.3	2.5/3.3	3.1/4.4	4.3/5.7	4.7/6.9	5.9/7.4	5.8/7.1	4.9/6.4	3.9/5.3	2.8/3.9	1.8/2.7	1.4/2.1	4.0/4.6
Latitude -15	Average	3.1	3.9	4.4	5.4	6.0	6.4	6.4	6.0	5.4	4.5	3.1	2.6	4.8
	Min/Max	2.2/3.7	3.1/4.7	3.4/5.4	4.5/6.2	4.7/7.0	5.7/7.2	5.7/7.1	5.1/6.8	4.4/6.3	3.4/5.3	2.2/4.1	2.0/3.3	4.5/5.2
Latitude	Average	3.5	4.2	4.5	5.3	5.6	5.9	5.9	5.8	5.4	4.8	3.4	2.9	4.8
	Min/Max	2.5/4.2	3.3/5.1	3.5/5.7	4.3/6.1	4.4/6.6	5.3/6.6	5.3/6.6	4.9/6.5	4.4/6.5	3.5/5.7	2.3/4.7	2.2/3.9	4.5/5.3
Latitude +15	Average	3.8	4.4	4.4	4.9	5.0	5.1	5.1	5.3	5.2	4.8	3.5	3.1	4.5
	Min/Max	2.5/4.6	3.4/5.3	3.3/5.6	4.0/5.7	3.9/5.8	4.6/5.7	4.6/5.8	4.5/5.9	4.2/6.2	3.5/5.8	2.3/5.0	2.2/4.2	4.2/5.0
90	Average	3.5	3.8	3.3	3.1	2.7	2.5	2.7	3.1	3.6	3.9	3.1	2.9	3.2
	Min/Max	2.3/4.4	2.9/4.6	2.6/4.4	2.5/3.6	2.3/3.0	2.4/2.7	2.5/2.9	2.7/3.4	2.9/4.4	2.8/4.7	2.0/4.5	2.0/4.1	2.9/3.5

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	3.0	4.0	4.9	6.5	7.8	8.5	8.5	7.7	6.3	4.8	3.0	2.4	5.6
	Min/Max	2.0/3.5	3.2/4.9	3.7/6.3	5.2/7.9	5.7/9.5	7.3/10.0	7.5/9.5	6.2/8.7	5.0/7.7	3.6/5.8	2.1/4.1	1.7/3.1	5.2/6.3
Latitude -15	Average	3.8	4.8	5.5	6.9	7.9	8.5	8.5	8.0	6.9	5.6	3.7	3.0	6.1
	Min/Max	2.5/4.5	3.7/5.9	3.9/7.1	5.4/8.4	5.8/9.7	7.3/10.0	7.5/9.6	6.4/9.1	5.4/8.5	4.0/6.8	2.4/5.2	2.1/4.1	5.6/6.9
Latitude	Average	4.1	5.1	5.6	6.8	7.6	8.2	8.2	7.8	7.0	5.9	3.9	3.3	6.1
	Min/Max	2.7/5.0	3.9/6.3	4.0/7.3	5.3/8.4	5.6/9.4	7.0/9.6	7.2/9.2	6.3/9.0	5.4/8.6	4.2/7.2	2.5/5.6	2.3/4.5	5.6/6.9
Latitude +15	Average	4.3	5.2	5.5	6.5	7.2	7.6	7.7	7.5	6.8	5.9	4.1	3.5	6.0
	Min/Max	2.8/5.3	3.9/6.4	3.9/7.2	5.0/8.0	5.2/8.9	6.6/8.9	6.8/8.6	5.9/8.6	5.3/8.4	4.1/7.2	2.5/5.8	2.4/4.8	5.4/6.8

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	4.4	5.2	5.6	6.9	8.0	8.7	8.7	8.0	7.0	5.9	4.1	3.5	6.3
	Min/Max	2.8/5.3	3.9/6.4	4.0/7.3	5.4/8.4	5.8/9.8	7.5/10.2	7.6/9.7	6.4/9.2	5.5/8.6	4.2/7.3	2.5/5.9	2.4/4.9	5.8/7.2

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	2.5	2.7	2.5	3.1	3.7	4.2	4.1	3.8	3.5	3.3	2.3	2.0	3.1
	Min/Max	1.4/3.2	1.6/3.9	1.1/3.9	2.1/4.2	2.2/5.2	3.1/5.5	3.3/5.0	2.6/4.7	2.3/4.7	2.0/4.3	0.9/3.7	1.2/3.0	2.6/3.8
1-Axis, N-S Horiz Axis	Average	1.8	2.4	2.8	4.0	4.9	5.5	5.5	5.0	4.2	3.2	1.8	1.4	3.6
	Min/Max	0.9/2.3	1.5/3.5	1.3/4.4	2.7/5.6	2.9/6.9	4.1/7.2	4.4/6.6	3.4/6.3	2.8/5.7	2.0/4.3	0.7/2.9	0.8/2.0	3.0/4.4
1-Axis, N-S Tilt=Latitude	Average	2.7	3.3	3.4	4.2	4.8	5.2	5.3	5.1	4.7	4.1	2.6	2.1	4.0
	Min/Max	1.5/3.5	2.0/4.7	1.5/5.2	2.8/5.9	2.9/6.8	3.9/6.8	4.2/6.3	3.5/6.4	3.2/6.4	2.5/5.4	1.0/4.2	1.3/3.2	3.3/4.9
2-Axis	Average	2.9	3.3	3.4	4.3	5.1	5.6	5.6	5.3	4.7	4.2	2.7	2.3	4.1
	Min/Max	1.6/3.7	2.0/4.8	1.5/5.2	2.8/6.0	3.0/7.2	4.2/7.4	4.5/6.8	3.6/6.6	3.2/6.4	2.5/5.5	1.1/4.4	1.4/3.4	3.5/5.1

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-4.3	-1.8	4.9	11.8	17.5	22.7	24.7	23.2	19.6	13.1	6.1	-1.3	11.3
Daily Minimum Temp	-8.9	-6.6	-0.2	5.8	11.3	16.6	18.9	17.4	13.3	6.9	1.1	-5.6	5.8
Daily Maximum Temp	0.3	2.9	10.0	17.7	23.7	28.8	30.5	29.0	25.9	19.3	10.9	2.9	16.8
Record Minimum Temp	-29.4	-30.0	-24.4	-7.2	-2.2	4.4	8.9	6.1	0.0	-8.3	-19.4	-29.4	-30.0
Record Maximum Temp	21.7	23.3	30.6	32.2	35.0	39.4	44.4	39.4	38.3	33.9	28.3	23.3	44.4
HDD, Base 18.3°C	703	564	417	201	92	4	0	4	24	174	368	608	3160
CDD, Base 18.3°C	0	0	0	4	67	136	198	154	63	12	0	0	634
Relative Humidity (%)	73	74	71	65	66	67	70	74	72	68	74	78	71
Wind Speed (m/s)	5.5	5.3	5.9	5.6	4.8	4.2	3.7	3.5	4.0	4.6	5.2	5.4	4.8