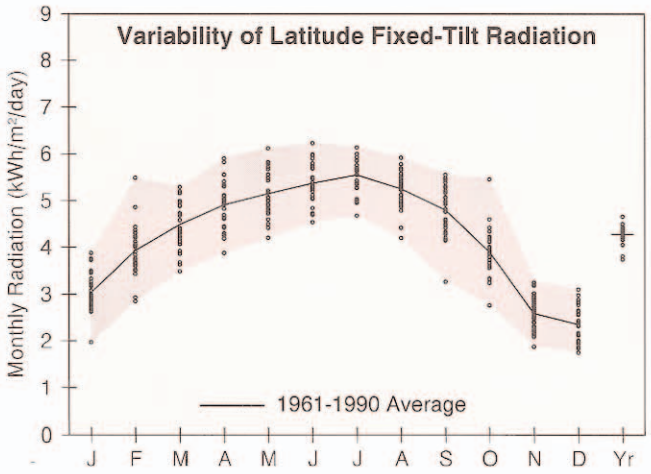
Albany, NY

WBAN NO. 14735

LATITUDE: 42.75° N
LONGITUDE: 73.80° W
ELEVATION: 89 meters
MEAN PRESSURE: 1006 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	1.8	2.6	3.6	4.7	5.5	6.0	6.1	5.2	4.1	2.8	1.7	1.4	3.8
	Min/Max	1.2/2.1	2.1/3.3	3.1/4.1	3.9/5.4	4.5/6.4	5.1/6.9	5.4/6.6	4.6/5.8	3.2/4.6	2.2/3.6	1.4/2.0	1.2/1.6	3.6/4.1
Latitude -15	Average	2.7	3.6	4.4	5.0	5.5	5.8	6.0	5.5	4.8	3.7	2.4	2.1	4.3
	Min/Max	1.8/3.4	2.6/4.9	3.4/5.1	4.0/6.0	4.5/6.5	4.9/6.8	5.0/6.6	4.4/6.2	3.3/5.5	2.6/5.1	1.8/2.9	1.6/2.7	3.7/4.7
Latitude	Average	3.0	3.9	4.5	4.9	5.1	5.4	5.5	5.2	4.8	3.9	2.6	2.4	4.3
	Min/Max	2.0/3.9	2.8/5.5	3.5/5.3	3.9/5.9	4.2/6.1	4.5/6.2	4.7/6.1	4.2/5.9	3.3/5.6	2.8/5.5	1.9/3.3	1.8/3.1	3.7/4.7
Latitude +15	Average	3.2	4.1	4.4	4.5	4.6	4.6	4.8	4.8	4.6	3.9	2.7	2.5	4.1
	Min/Max	2.1/4.2	2.9/5.8	3.4/5.2	3.6/5.5	3.8/5.4	4.0/5.4	4.1/5.3	3.8/5.4	3.1/5.3	2.7/5.5	1.9/3.4	1.9/3.3	3.5/4.4
90	Average	3.1	3.7	3.5	3.1	2.7	2.6	2.8	3.0	3.3	3.2	2.4	2.4	3.0
	Min/Max	2.0/4.1	2.5/5.4	2.6/4.2	2.4/3.8	2.3/3.1	2.2/2.9	2.3/3.0	2.4/3.3	2.3/3.9	2.3/4.6	1.6/3.0	1.8/3.2	2.6/3.3

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	3.6	4.8	6.0	6.9	7.5	7.7	6.7	5.4	3.8	2.2	1.9	4.9
	Min/Max	1.6/3.2	2.7/5.2	3.8/5.7	4.6/7.4	5.2/8.5	5.8/8.9	6.5/8.7	5.3/8.0	3.6/6.3	2.6/5.3	1.6/2.7	1.4/2.4	4.4/5.4
Latitude -15	Average	3.2	4.4	5.4	6.4	7.0	7.5	7.7	7.0	6.0	4.5	2.7	2.4	5.4
	Min/Max	2.1/4.1	3.2/6.4	4.3/6.4	4.7/7.9	5.3/8.7	5.8/8.9	6.6/8.8	5.6/8.3	3.9/7.0	3.1/6.4	1.9/3.5	1.8/3.2	4.8/5.9
Latitude	Average	3.5	4.6	5.5	6.3	6.8	7.2	7.5	6.9	6.0	4.6	2.9	2.6	5.4
	Min/Max	2.2/4.5	3.3/6.8	4.3/6.6	4.6/7.8	5.1/8.4	5.5/8.6	6.3/8.5	5.4/8.2	3.9/7.0	3.2/6.8	2.0/3.7	1.9/3.6	4.8/5.9
Latitude +15	Average	3.6	4.7	5.4	6.0	6.4	6.7	7.0	6.5	5.9	4.6	3.0	2.7	5.2
	Min/Max	2.3/4.8	3.4/7.0	4.2/6.6	4.4/7.6	4.7/7.9	5.1/8.0	5.9/7.9	5.2/7.8	3.8/6.9	3.2/6.8	2.0/3.8	2.0/3.8	4.7/5.7

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

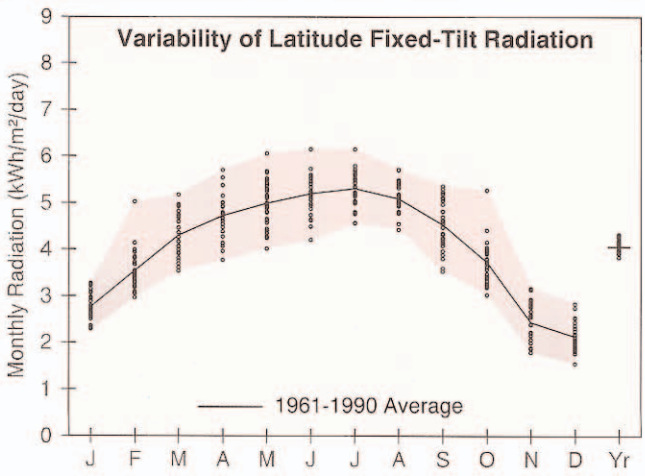
Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	3.7	4.7	5.5	6.4	7.1	7.7	7.9	7.1	6.1	4.7	3.0	2.8	5.6
	Min/Max	2.4/4.8	3.4/7.0	4.3/6.6	4.7/7.9	5.3/8.8	5.9/9.1	6.7/9.0	5.6/8.4	4.0/7.1	3.2/6.8	2.1/3.8	2.0/3.8	5.0/6.1

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	1.9	2.2	2.4	2.7	3.0	3.3	3.4	3.0	2.8	2.3	1.5	1.4	2.5
	Min/Max	1.1/2.6	1.5/3.8	1.6/3.3	1.5/3.7	1.7/4.3	2.0/4.4	2.4/4.3	2.3/3.9	1.7/3.6	1.5/4.0	0.8/2.1	0.7/2.3	2.2/2.8
1-Axis, N-S Horiz Axis	Average	1.3	1.9	2.7	3.5	3.9	4.4	4.5	3.9	3.3	2.2	1.1	0.9	2.8
	Min/Max	0.8/1.8	1.3/3.4	1.8/3.6	2.0/4.8	2.1/5.6	2.5/5.8	3.1/5.6	3.0/5.2	2.0/4.2	1.4/3.8	0.6/1.6	0.4/1.5	2.5/3.2
1-Axis, N-S Tilt=Latitude	Average	2.0	2.7	3.2	3.7	3.9	4.1	4.3	4.1	3.7	2.9	1.6	1.4	3.2
	Min/Max	1.2/2.8	1.8/4.6	2.2/4.3	2.1/5.1	2.1/5.5	2.4/5.5	3.0/5.4	3.1/5.3	2.3/4.8	1.9/5.0	0.9/2.4	0.8/2.4	2.8/3.6
2-Axis	Average	2.2	2.7	3.2	3.8	4.1	4.5	4.7	4.2	3.8	3.0	1.7	1.6	3.3
	Min/Max	1.3/3.0	1.8/4.7	2.2/4.3	2.1/5.2	2.2/5.8	2.6/5.9	3.2/5.8	3.2/5.5	2.3/4.8	1.9/5.1	0.9/2.5	0.8/2.6	2.9/3.7

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-6.3	-4.7	1.3	8.0	14.2	19.4	22.1	20.9	16.3	10.1	4.3	-3.1	8.6
Daily Minimum Temp	-11.7	-10.1	-4.2	1.7	7.4	12.6	15.3	14.3	9.7	3.7	-0.7	-7.7	2.6
Daily Maximum Temp	-1.0	0.7	6.7	14.2	20.9	26.1	28.9	27.4	22.9	16.6	9.3	1.6	14.5
Record Minimum Temp	-33.3	-29.4	-29.4	-12.2	-3.3	2.2	4.4	1.1	-4.4	-8.9	-15.0	-30.0	-33.3
Record Maximum Temp	16.7	19.4	30.0	33.3	34.4	37.2	37.8	37.2	37.8	31.7	27.8	21.7	37.8
HDD, Base 18.3°C	764	646	529	310	137	19	0	7	78	255	422	663	3830
CDD, Base 18.3°C	0	0	0	0	10	51	118	86	17	0	0	0	282
Relative Humidity (%)	71	68	65	61	66	70	71	74	76	72	73	74	70
Wind Speed (m/s)	4.2	4.4	4.7	4.6	3.9	3.6	3.3	3.1	3.3	3.4	4.1	4.2	3.9



Binghamton, NY

WBAN NO. 04725

LATITUDE: 42.22° N
LONGITUDE: 75.98° W
ELEVATION: 499 meters
MEAN PRESSURE: 957 millibars

STATION TYPE: Secondary

Solar Radiation for Flat-Plate Collectors Facing South at a Fixed Tilt (kWh/m²/day), Uncertainty ±11%

Tilt (°)		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
0	Average	1.7	2.5	3.5	4.5	5.3	5.8	5.8	5.0	3.9	2.7	1.7	1.4	3.7
	Min/Max	1.5/2.0	2.2/3.1	3.1/4.0	3.8/5.3	4.4/6.3	4.8/6.8	5.0/6.6	4.4/5.5	3.2/4.4	2.4/3.5	1.4/2.0	1.2/1.6	3.5/3.8
Latitude -15	Average	2.5	3.3	4.2	4.8	5.3	5.6	5.7	5.3	4.5	3.5	2.3	1.9	4.1
	Min/Max	2.1/2.9	2.8/4.5	3.5/5.0	3.9/5.8	4.3/6.5	4.6/6.7	4.9/6.6	4.6/5.9	3.6/5.3	2.9/4.9	1.7/2.9	1.5/2.5	3.9/4.3
Latitude	Average	2.8	3.5	4.3	4.7	5.0	5.2	5.3	5.1	4.5	3.7	2.4	2.1	4.1
	Min/Max	2.3/3.3	3.0/5.0	3.5/5.2	3.8/5.7	4.0/6.1	4.2/6.2	4.6/6.2	4.4/5.7	3.5/5.4	3.0/5.3	1.8/3.2	1.5/2.8	3.8/4.3
Latitude +15	Average	2.9	3.6	4.2	4.4	4.4	4.5	4.6	4.6	4.3	3.7	2.5	2.2	3.8
	Min/Max	2.4/3.5	3.0/5.3	3.4/5.1	3.5/5.3	3.6/5.3	3.7/5.3	4.0/5.4	4.0/5.2	3.3/5.1	3.0/5.3	1.8/3.3	1.5/3.0	3.6/4.1
90	Average	2.8	3.3	3.4	2.9	2.6	2.5	2.6	2.9	3.1	3.0	2.2	2.1	2.8
	Min/Max	2.2/3.4	2.7/4.9	2.6/4.2	2.5/3.6	2.2/3.0	2.2/2.8	2.3/3.0	2.6/3.3	2.4/3.7	2.4/4.4	1.5/3.0	1.4/2.9	2.6/3.0

Solar Radiation for 1-Axis Tracking Flat-Plate Collectors with a North-South Axis (kWh/m²/day), Uncertainty ±11%

Axis Tilt (°)		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
0	Average	2.3	3.3	4.6	5.8	6.7	7.3	7.4	6.5	5.2	3.7	2.1	1.7	4.7
	Min/Max	2.0/2.7	2.8/4.7	3.8/5.7	4.5/7.2	5.0/8.6	5.4/8.9	6.1/8.6	5.6/7.5	3.9/6.2	3.0/5.3	1.6/2.8	1.3/2.2	4.4/5.1
Latitude -15	Average	2.9	3.9	5.1	6.1	6.8	7.3	7.5	6.8	5.7	4.3	2.6	2.2	5.1
	Min/Max	2.4/3.5	3.3/5.8	4.2/6.5	4.7/7.6	5.1/8.8	5.3/8.9	6.1/8.8	5.8/7.9	4.2/6.9	3.4/6.3	1.8/3.5	1.5/2.9	4.7/5.5
Latitude	Average	3.1	4.1	5.2	6.0	6.6	7.0	7.2	6.7	5.7	4.4	2.7	2.3	5.1
	Min/Max	2.5/3.8	3.4/6.2	4.2/6.6	4.6/7.6	4.8/8.6	5.1/8.5	5.9/8.4	5.6/7.8	4.2/6.9	3.5/6.6	1.9/3.7	1.6/3.2	4.7/5.5
Latitude +15	Average	3.2	4.2	5.2	5.7	6.2	6.5	6.7	6.3	5.5	4.4	2.8	2.4	4.9
	Min/Max	2.6/4.0	3.4/6.3	4.1/6.6	4.4/7.3	4.5/8.1	4.7/8.0	5.5/7.9	5.3/7.4	4.0/6.8	3.5/6.7	1.9/3.8	1.6/3.4	4.6/5.3

Solar Radiation for 2-Axis Tracking Flat-Plate Collectors (kWh/m²/day), Uncertainty ±11%

Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	3.3	4.2	5.2	6.1	6.9	7.5	7.6	6.8	5.7	4.5	2.8	2.4	5.3
	Min/Max	2.6/4.0	3.5/6.3	4.3/6.7	4.7/7.7	5.1/8.9	5.5/9.1	6.2/8.9	5.8/7.9	4.2/6.9	3.6/6.7	1.9/3.8	1.6/3.4	4.9/5.7

Direct Beam Solar Radiation for Concentrating Collectors (kWh/m²/day), Uncertainty ±11%

Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
1-Axis, E-W Horiz Axis	Average	1.4	1.7	2.1	2.5	2.8	3.1	3.2	2.9	2.5	2.2	1.2	1.0	2.2
	Min/Max	0.9/2.0	1.1/3.4	1.4/3.3	1.3/3.6	1.4/4.4	1.5/4.6	2.1/4.3	2.0/3.8	1.4/3.4	1.4/3.9	0.5/2.0	0.3/1.8	1.8/2.6
1-Axis, N-S Horiz Axis	Average	1.0	1.5	2.4	3.2	3.8	4.1	4.3	3.8	3.0	2.1	0.9	0.7	2.6
	Min/Max	0.7/1.4	1.0/3.0	1.6/3.8	1.8/4.6	1.9/5.9	2.0/5.9	2.8/5.6	2.7/4.9	1.6/4.0	1.4/3.8	0.4/1.6	0.2/1.1	2.1/3.0
1-Axis, N-S Tilt=Latitude	Average	1.6	2.1	2.8	3.4	3.7	3.9	4.1	3.9	3.4	2.7	1.4	1.1	2.8
	Min/Max	1.0/2.2	1.4/4.1	1.9/4.6	1.9/4.9	1.9/5.8	1.9/5.6	2.7/5.4	2.8/5.1	1.9/4.6	1.8/4.9	0.6/2.4	0.3/1.9	2.4/3.3
2-Axis	Average	1.7	2.1	2.8	3.5	3.9	4.3	4.4	4.0	3.4	2.8	1.5	1.2	3.0
	Min/Max	1.1/2.3	1.5/4.2	1.9/4.6	2.0/5.0	2.0/6.1	2.0/6.1	2.9/5.8	2.9/5.2	1.9/4.6	1.8/5.0	0.6/2.5	0.3/2.0	2.4/3.5

Average Climatic Conditions

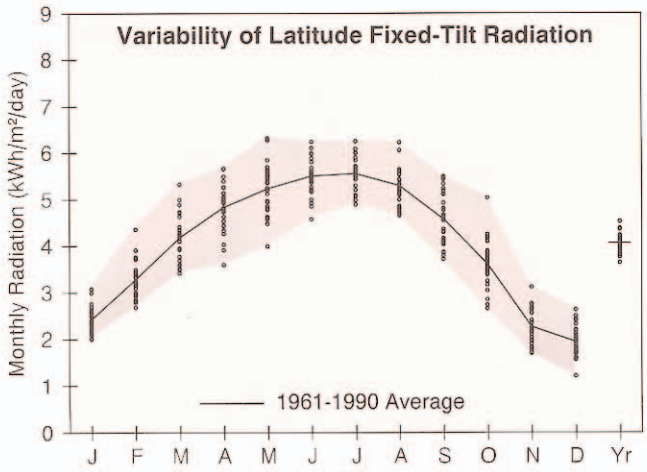
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-6.1	-5.2	0.3	6.9	13.2	17.9	20.7	19.6	15.3	9.3	3.5	-3.1	7.7
Daily Minimum Temp	-9.8	-9.3	-4.1	1.8	7.9	12.6	15.4	14.4	10.3	4.6	-0.2	-6.5	3.1
Daily Maximum Temp	-2.3	-1.1	4.7	11.9	18.6	23.2	25.9	24.7	20.3	14.1	7.2	0.4	12.3
Record Minimum Temp	-28.9	-26.1	-21.1	-12.8	-3.9	0.6	3.9	2.8	-3.9	-8.3	-16.1	-27.8	-28.9
Record Maximum Temp	17.2	18.9	27.8	31.1	31.7	34.4	36.7	34.4	35.6	27.8	25.0	18.3	36.7
HDD, Base 18.3°C	756	658	558	343	169	41	9	19	100	279	445	663	4041
CDD, Base 18.3°C	0	0	0	0	11	27	82	57	10	0	0	0	187
Relative Humidity (%)	74	72	69	65	67	72	72	75	78	74	76	78	73
Wind Speed (m/s)	5.0	4.9	5.2	5.1	4.5	4.1	3.7	3.7	3.9	4.3	4.9	5.0	4.5

Buffalo, NY

WBAN NO. 14733

LATITUDE: 42.93° N
LONGITUDE: 78.73° W
ELEVATION: 215 meters
MEAN PRESSURE: 991 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	1.6	2.4	3.4	4.5	5.5	6.1	6.0	5.2	3.9	2.6	1.6	1.3	3.7
	Min/Max	1.4/1.8	2.0/2.8	3.0/4.0	3.6/5.2	4.3/6.5	5.1/6.9	5.4/6.7	4.6/5.9	3.4/4.5	2.2/3.3	1.3/1.9	1.1/1.5	3.4/4.0
Latitude -15	Average	2.2	3.1	4.1	5.0	5.6	6.0	6.0	5.5	4.6	3.4	2.1	1.8	4.1
	Min/Max	1.9/2.7	2.5/4.0	3.4/5.1	3.7/5.8	4.3/6.7	5.0/6.8	5.3/6.7	4.8/6.4	3.8/5.4	2.6/4.7	1.6/2.8	1.2/2.3	3.7/4.5
Latitude	Average	2.4	3.3	4.2	4.8	5.2	5.5	5.5	5.3	4.6	3.6	2.3	1.9	4.1
	Min/Max	2.0/3.1	2.7/4.4	3.4/5.3	3.6/5.7	4.0/6.3	4.6/6.2	4.9/6.2	4.7/6.2	3.7/5.5	2.7/5.0	1.7/3.1	1.2/2.6	3.6/4.5
Latitude +15	Average	2.5	3.4	4.1	4.5	4.6	4.8	4.8	4.8	4.3	3.6	2.3	2.0	3.8
	Min/Max	2.1/3.3	2.7/4.6	3.3/5.2	3.3/5.3	3.5/5.6	4.0/5.4	4.3/5.4	4.2/5.7	3.5/5.3	2.6/5.1	1.7/3.2	1.2/2.8	3.4/4.3
90	Average	2.4	3.0	3.3	3.0	2.7	2.6	2.8	3.0	3.2	3.0	2.0	1.9	2.7
	Min/Max	1.9/3.2	2.3/4.2	2.5/4.1	2.3/3.6	2.2/3.2	2.3/2.9	2.5/3.0	2.7/3.6	2.5/3.8	2.1/4.2	1.4/2.9	1.0/2.7	2.4/3.1

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	2.0	3.1	4.4	5.9	7.1	7.9	7.9	6.8	5.2	3.5	1.9	1.6	4.8
	Min/Max	1.7/2.5	2.5/4.1	3.6/5.7	4.3/7.2	5.1/8.9	6.1/9.4	6.8/8.9	5.9/8.1	4.2/6.4	2.6/5.0	1.5/2.6	1.1/2.0	4.3/5.4
Latitude -15	Average	2.5	3.6	5.0	6.3	7.2	7.9	7.9	7.2	5.8	4.1	2.4	1.9	5.2
	Min/Max	2.1/3.2	2.9/5.0	4.0/6.6	4.4/7.7	5.1/9.1	6.1/9.4	6.8/9.0	6.1/8.5	4.5/7.1	2.9/6.0	1.7/3.3	1.2/2.7	4.6/5.8
Latitude	Average	2.7	3.8	5.1	6.2	7.0	7.6	7.7	7.0	5.8	4.3	2.5	2.1	5.1
	Min/Max	2.2/3.5	3.0/5.3	4.0/6.7	4.3/7.7	4.9/8.9	5.9/9.1	6.5/8.7	6.0/8.4	4.4/7.2	3.0/6.2	1.8/3.5	1.2/2.9	4.5/5.8
Latitude +15	Average	2.8	3.8	5.0	6.0	6.6	7.1	7.2	6.7	5.6	4.3	2.5	2.2	5.0
	Min/Max	2.3/3.7	3.1/5.4	3.9/6.6	4.2/7.4	4.6/8.4	5.4/8.5	6.1/8.2	5.7/8.0	4.3/7.0	2.9/6.3	1.8/3.7	1.2/3.1	4.4/5.7

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

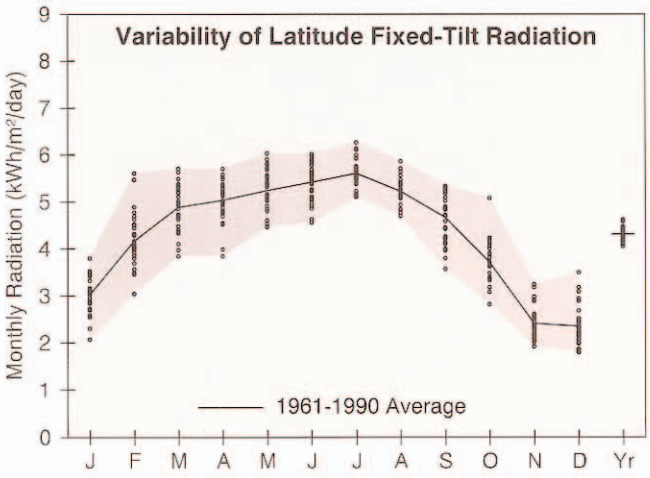
Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	2.8	3.8	5.1	6.3	7.3	8.1	8.1	7.2	5.8	4.3	2.6	2.2	5.3
	Min/Max	2.3/3.7	3.1/5.4	4.0/6.7	4.5/7.8	5.2/9.2	6.3/9.6	6.9/9.2	6.2/8.6	4.5/7.2	3.0/6.3	1.8/3.7	1.2/3.1	4.7/6.0

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	1.1	1.5	2.1	2.7	3.3	3.7	3.7	3.2	2.6	2.1	1.1	0.9	2.3
	Min/Max	0.6/1.7	1.0/2.8	1.4/3.6	1.4/3.7	1.7/4.7	2.4/4.9	2.8/4.7	2.4/4.3	1.6/3.6	1.0/3.6	0.6/2.1	0.1/1.5	1.8/2.9
1-Axis, N-S Horiz Axis	Average	0.7	1.3	2.3	3.5	4.3	4.9	4.9	4.2	3.1	2.0	0.8	0.6	2.7
	Min/Max	0.3/1.1	0.9/2.5	1.6/4.0	1.8/4.8	2.2/6.2	3.1/6.5	3.7/6.1	3.1/5.4	2.0/4.4	1.0/3.5	0.4/1.5	0.1/0.9	2.2/3.4
1-Axis, N-S Tilt=Latitude	Average	1.2	1.8	2.8	3.7	4.2	4.6	4.7	4.3	3.5	2.6	1.3	0.9	3.0
	Min/Max	0.6/1.8	1.2/3.4	1.9/4.8	1.9/5.1	2.2/6.1	2.9/6.1	3.6/5.9	3.2/5.7	2.2/5.0	1.3/4.6	0.6/2.3	0.2/1.6	2.3/3.7
2-Axis	Average	1.3	1.8	2.8	3.8	4.5	5.0	5.0	4.4	3.5	2.6	1.3	1.0	3.1
	Min/Max	0.6/2.0	1.3/3.5	1.9/4.8	1.9/5.2	2.3/6.4	3.2/6.7	3.8/6.3	3.3/5.8	2.2/5.0	1.3/4.6	0.7/2.4	0.2/1.7	2.4/3.9

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-4.7	-4.2	1.0	7.3	13.7	18.8	21.7	20.6	16.6	10.6	4.7	-1.6	8.7
Daily Minimum Temp	-8.3	-8.1	-3.4	2.3	8.3	13.6	16.6	15.6	11.7	5.9	1.1	-5.1	4.2
Daily Maximum Temp	-1.0	-0.2	5.4	12.3	18.9	24.1	26.8	25.5	21.6	15.2	8.4	1.8	13.2
Record Minimum Temp	-26.7	-28.9	-21.7	-11.1	-3.3	1.7	6.1	3.3	0.0	-6.7	-12.8	-23.3	-28.9
Record Maximum Temp	22.2	18.3	27.2	34.4	32.2	35.6	36.1	37.2	36.7	30.6	26.7	23.3	37.2
HDD, Base 18.3°C	713	630	537	330	155	33	3	9	72	239	408	618	3748
CDD, Base 18.3°C	0	0	0	0	11	48	108	78	21	0	0	0	265
Relative Humidity (%)	76	76	73	68	67	69	68	72	74	73	76	78	72
Wind Speed (m/s)	6.2	5.6	5.5	5.3	4.8	4.6	4.3	4.1	4.2	4.6	5.3	5.6	5.0



Massena, NY

WBAN NO. 94725

LATITUDE: 44.93° N
LONGITUDE: 74.85° W
ELEVATION: 63 meters
MEAN PRESSURE: 1008 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	3.7	4.6	5.5	6.0	6.1	5.1	3.9	2.6	1.5	1.3	3.7
	Min/Max	1.3/1.9	2.1/3.2	3.2/4.0	3.8/5.1	4.7/6.3	5.2/6.7	5.5/6.7	4.7/5.6	3.2/4.3	2.2/3.2	1.3/1.8	1.1/1.6	3.6/3.9
Latitude -15	Average	2.7	3.8	4.7	5.2	5.6	5.9	6.0	5.4	4.6	3.5	2.2	2.1	4.3
	Min/Max	1.9/3.3	2.8/5.0	3.8/5.4	4.0/5.8	4.8/6.4	5.0/6.6	5.5/6.8	4.9/6.1	3.6/5.3	2.7/4.7	1.8/2.9	1.6/3.0	4.1/4.6
Latitude	Average	3.0	4.2	4.9	5.0	5.2	5.4	5.6	5.2	4.7	3.7	2.4	2.3	4.3
	Min/Max	2.1/3.8	3.0/5.6	3.8/5.7	3.8/5.7	4.5/6.0	4.6/6.0	5.1/6.3	4.7/5.9	3.6/5.3	2.8/5.1	1.9/3.2	1.8/3.5	4.1/4.6
Latitude +15	Average	3.2	4.3	4.8	4.7	4.6	4.7	4.9	4.7	4.4	3.7	2.5	2.5	4.1
	Min/Max	2.2/4.1	3.1/5.9	3.7/5.8	3.5/5.3	3.9/5.3	4.0/5.2	4.5/5.4	4.2/5.3	3.3/5.1	2.8/5.2	2.0/3.4	1.9/3.8	3.8/4.4
90	Average	3.1	4.0	4.1	3.3	2.9	2.7	2.9	3.1	3.3	3.1	2.2	2.4	3.1
	Min/Max	2.0/4.0	2.8/5.6	3.0/5.1	2.5/4.0	2.5/3.2	2.4/3.0	2.7/3.1	2.8/3.5	2.5/3.8	2.3/4.4	1.7/3.2	1.8/3.8	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	2.4	3.8	5.2	6.3	7.3	7.9	8.1	6.9	5.4	3.6	2.0	1.8	5.1
	Min/Max	1.6/3.0	2.8/5.2	4.1/6.1	4.6/7.2	5.8/8.7	6.3/9.1	6.9/9.3	6.1/7.8	4.1/6.2	2.8/4.9	1.6/2.7	1.4/2.6	4.7/5.4
Latitude -15	Average	3.2	4.7	6.0	6.7	7.4	8.0	8.2	7.2	6.0	4.3	2.5	2.4	5.6
	Min/Max	2.1/4.0	3.3/6.5	4.6/7.1	4.9/7.8	5.9/9.0	6.3/9.1	7.1/9.5	6.4/8.3	4.4/7.0	3.2/6.0	2.0/3.5	1.8/3.6	5.1/6.0
Latitude	Average	3.4	5.0	6.1	6.6	7.2	7.6	7.9	7.1	6.0	4.5	2.7	2.6	5.6
	Min/Max	2.3/4.4	3.5/7.0	4.6/7.3	4.8/7.7	5.7/8.7	6.0/8.8	6.8/9.2	6.2/8.2	4.4/7.0	3.3/6.3	2.1/3.8	2.0/4.0	5.1/6.1
Latitude +15	Average	3.6	5.1	6.1	6.4	6.8	7.2	7.4	6.7	5.8	4.5	2.8	2.8	5.4
	Min/Max	2.3/4.7	3.5/7.2	4.5/7.3	4.5/7.4	5.4/8.2	5.6/8.2	6.3/8.6	5.9/7.8	4.2/6.8	3.2/6.3	2.1/3.9	2.0/4.3	5.0/5.9

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	5.1	6.1	6.7	7.6	8.2	8.4	7.3	6.0	4.5	2.8	2.8	5.8
	Min/Max	2.3/4.7	3.6/7.2	4.6/7.3	4.9/7.8	6.0/9.1	6.4/9.4	7.2/9.7	6.4/8.4	4.4/7.0	3.3/6.4	2.1/3.9	2.0/4.4	5.3/6.3

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	1.8	2.5	2.8	3.0	3.3	3.7	3.9	3.2	2.7	2.2	1.3	1.4	2.7
	Min/Max	1.1/2.7	1.5/4.1	1.8/3.8	1.8/3.7	2.2/4.6	2.3/4.7	3.0/5.0	2.6/4.2	1.7/3.6	1.3/3.7	0.8/2.2	0.7/2.7	2.4/3.0
1-Axis, N-S Horiz Axis	Average	1.2	2.1	3.0	3.8	4.5	4.9	5.2	4.2	3.3	2.1	1.0	0.8	3.0
	Min/Max	0.7/1.8	1.2/3.6	2.0/4.1	2.2/4.8	3.0/6.1	3.1/6.2	3.9/6.7	3.4/5.4	2.0/4.3	1.3/3.5	0.5/1.6	0.4/1.6	2.7/3.5
1-Axis, N-S Tilt=Latitude	Average	2.0	3.0	3.7	4.1	4.4	4.7	5.0	4.4	3.8	2.8	1.5	1.4	3.4
	Min/Max	1.2/2.9	1.7/5.0	2.4/5.0	2.4/5.2	3.0/6.1	2.9/6.0	3.8/6.5	3.5/5.7	2.4/5.0	1.6/4.6	0.9/2.5	0.8/2.8	3.1/3.9
2-Axis	Average	2.1	3.1	3.7	4.2	4.7	5.1	5.4	4.5	3.8	2.9	1.6	1.6	3.6
	Min/Max	1.3/3.1	1.8/5.1	2.5/5.0	2.5/5.3	3.1/6.4	3.2/6.5	4.1/6.9	3.6/5.8	2.4/5.0	1.7/4.7	0.9/2.6	0.8/3.0	3.2/4.1

Average Climatic Conditions

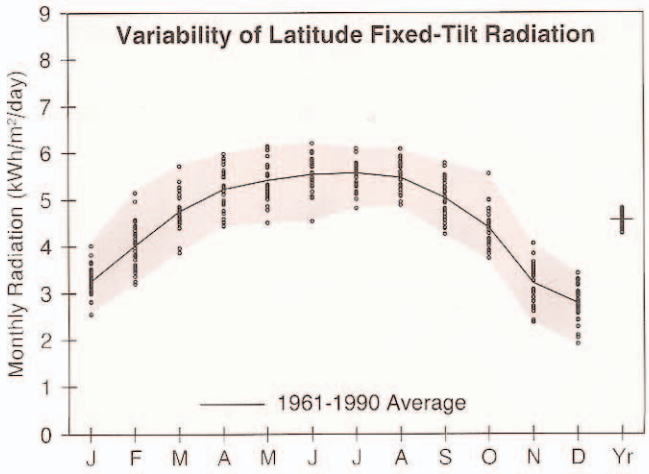
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-9.8	-8.6	-2.1	5.9	12.9	17.7	20.7	19.2	14.4	8.3	1.8	-6.6	6.2
Daily Minimum Temp	-15.4	-14.2	-7.2	0.3	6.6	11.4	14.3	13.1	8.4	2.8	-2.4	-11.3	0.6
Daily Maximum Temp	-4.3	-3.1	3.1	11.5	19.2	24.1	27.0	25.3	20.4	13.8	6.0	-1.8	11.8
Record Minimum Temp	-38.9	-36.7	-31.1	-13.9	-5.6	-0.6	3.3	1.7	-2.8	-8.9	-20.6	-35.6	-38.9
Record Maximum Temp	15.0	16.1	27.8	31.7	34.4	33.9	35.6	37.8	32.8	27.8	23.9	18.3	37.8
HDD, Base 18.3°C	873	754	632	372	177	41	9	29	123	310	495	772	4586
CDD, Base 18.3°C	0	0	0	0	8	22	81	55	6	0	0	0	172
Relative Humidity (%)	76	74	73	68	68	72	72	76	79	77	81	82	75
Wind Speed (m/s)	4.2	4.1	4.2	4.3	3.8	3.4	3.1	2.9	3.0	3.6	4.0	4.0	3.7

New York City, NY

WBAN NO. 94728

LATITUDE: 40.78° N
LONGITUDE: 73.97° W
ELEVATION: 57 meters
MEAN PRESSURE: 1016 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	1.9	2.7	3.8	4.9	5.7	6.1	6.0	5.4	4.3	3.2	2.0	1.6	4.0
	Min/Max	1.7/2.2	2.3/3.3	3.3/4.4	4.3/5.5	4.8/6.5	5.0/6.8	5.3/6.6	4.8/5.9	3.9/4.9	2.9/3.8	1.7/2.4	1.4/1.8	3.7/4.2
Latitude -15	Average	2.9	3.7	4.6	5.3	5.8	6.0	6.0	5.7	5.0	4.1	2.9	2.4	4.5
	Min/Max	2.3/3.5	3.0/4.6	3.8/5.5	4.6/6.1	4.8/6.5	4.9/6.7	5.2/6.6	5.1/6.3	4.3/5.7	3.6/5.1	2.2/3.6	1.8/3.0	4.3/4.8
Latitude	Average	3.2	4.0	4.8	5.2	5.4	5.5	5.6	5.5	5.0	4.4	3.2	2.8	4.6
	Min/Max	2.5/4.0	3.2/5.2	3.9/5.7	4.4/6.0	4.5/6.1	4.5/6.2	4.8/6.1	4.9/6.1	4.3/5.8	3.7/5.6	2.4/4.1	1.9/3.4	4.3/4.8
Latitude +15	Average	3.4	4.1	4.6	4.8	4.8	4.8	4.9	5.0	4.8	4.4	3.3	3.0	4.3
	Min/Max	2.7/4.3	3.3/5.4	3.7/5.6	4.1/5.6	4.0/5.4	4.0/5.3	4.2/5.3	4.4/5.5	4.0/5.5	3.7/5.6	2.4/4.3	2.0/3.7	4.0/4.6
90	Average	3.2	3.6	3.5	3.1	2.7	2.6	2.7	3.0	3.4	3.6	3.0	2.7	3.1
	Min/Max	2.4/4.2	2.8/4.9	2.8/4.3	2.7/3.7	2.4/3.1	2.3/2.8	2.4/2.9	2.8/3.3	2.8/3.9	3.0/4.6	2.1/3.8	1.7/3.5	2.9/3.4

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	3.7	5.1	6.3	7.1	7.5	7.5	6.8	5.7	4.3	2.7	2.2	5.1
	Min/Max	2.1/3.3	3.0/4.9	4.1/6.2	5.2/7.4	5.5/8.4	5.8/8.8	6.2/8.4	5.8/7.7	4.6/6.6	3.7/5.6	2.0/3.4	1.6/2.7	4.7/5.4
Latitude -15	Average	3.4	4.5	5.7	6.7	7.2	7.5	7.5	7.1	6.2	5.1	3.4	2.8	5.6
	Min/Max	2.6/4.3	3.5/5.9	4.5/7.1	5.4/7.9	5.5/8.6	5.8/8.8	6.2/8.5	6.0/8.0	5.0/7.2	4.2/6.6	2.4/4.4	1.9/3.6	5.1/5.9
Latitude	Average	3.7	4.7	5.8	6.6	6.9	7.2	7.2	6.9	6.2	5.3	3.7	3.1	5.6
	Min/Max	2.8/4.7	3.7/6.3	4.5/7.3	5.3/7.9	5.3/8.3	5.5/8.4	5.9/8.2	5.9/7.9	5.0/7.3	4.3/6.9	2.5/4.7	2.0/3.9	5.2/6.0
Latitude +15	Average	3.9	4.8	5.7	6.3	6.5	6.7	6.7	6.6	6.0	5.3	3.8	3.3	5.5
	Min/Max	2.9/5.0	3.8/6.4	4.4/7.2	5.1/7.6	5.0/7.8	5.1/7.8	5.5/7.6	5.6/7.5	4.8/7.1	4.3/7.0	2.6/4.9	2.1/4.2	5.0/5.9

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

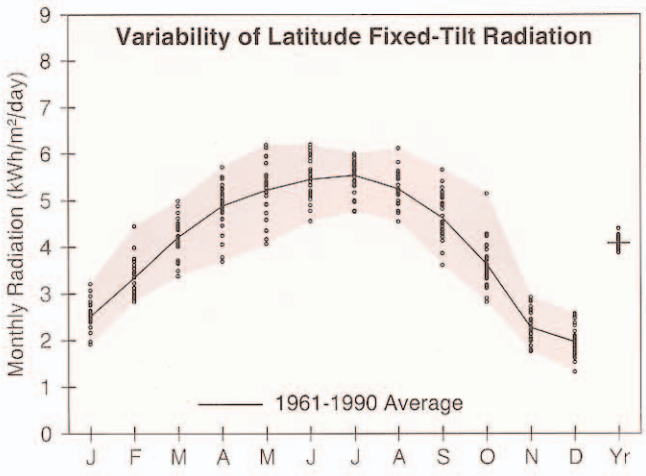
Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	3.9	4.8	5.8	6.7	7.3	7.7	7.6	7.1	6.2	5.3	3.8	3.3	5.8
	Min/Max	2.9/5.0	3.8/6.4	4.5/7.3	5.4/8.0	5.6/8.7	5.9/9.0	6.3/8.6	6.1/8.1	5.0/7.3	4.4/7.0	2.6/4.9	2.1/4.2	5.4/6.2

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	2.2	2.5	2.7	2.9	3.0	3.2	3.2	3.0	2.8	2.7	2.1	1.9	2.7
	Min/Max	1.4/2.9	1.7/3.5	1.7/3.9	2.0/3.8	1.8/4.2	1.9/4.4	2.2/4.0	2.2/3.9	1.9/3.5	2.0/4.1	1.1/3.0	0.9/2.7	2.3/3.0
1-Axis, N-S Horiz Axis	Average	1.5	2.2	3.0	3.7	3.9	4.1	4.1	3.8	3.3	2.6	1.5	1.2	2.9
	Min/Max	0.9/2.1	1.4/3.1	1.8/4.3	2.4/4.9	2.2/5.4	2.4/5.6	2.7/5.2	2.8/4.9	2.2/4.2	1.9/4.0	0.8/2.3	0.6/1.8	2.4/3.3
1-Axis, N-S Tilt=Latitude	Average	2.3	2.9	3.6	3.9	3.9	3.9	3.9	3.9	3.7	3.4	2.3	2.0	3.3
	Min/Max	1.5/3.2	2.0/4.2	2.2/5.2	2.6/5.2	2.2/5.3	2.3/5.3	2.6/5.0	2.8/5.0	2.5/4.8	2.4/5.1	1.2/3.3	0.9/2.8	2.8/3.7
2-Axis	Average	2.5	3.0	3.6	4.0	4.1	4.2	4.2	4.1	3.8	3.4	2.4	2.1	3.5
	Min/Max	1.6/3.4	2.1/4.3	2.2/5.2	2.6/5.3	2.3/5.7	2.5/5.8	2.8/5.3	2.9/5.2	2.5/4.8	2.5/5.1	1.3/3.5	1.0/3.1	2.9/3.8

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-0.3	0.9	5.8	11.4	17.1	22.0	24.9	24.2	20.1	14.2	8.7	2.6	12.6
Daily Minimum Temp	-3.7	-2.8	1.6	6.6	12.1	17.2	20.2	19.6	15.6	9.8	5.1	-0.7	8.4
Daily Maximum Temp	3.1	4.6	10.0	16.2	22.1	26.7	29.6	28.7	24.6	18.5	12.2	5.8	16.8
Record Minimum Temp	-21.1	-26.1	-16.1	-11.1	0.0	6.7	11.1	10.0	3.9	-2.2	-15.0	-25.0	-26.1
Record Maximum Temp	22.2	23.9	30.0	35.6	37.2	38.3	41.1	40.0	38.9	34.4	28.9	22.2	41.1
HDD, Base 18.3°C	577	488	389	208	69	0	0	0	19	139	290	489	2669
CDD, Base 18.3°C	0	0	0	0	30	113	203	181	72	9	0	0	609
Relative Humidity (%)	61	60	60	59	64	65	65	67	67	65	64	63	63
Wind Speed (m/s)	6.1	6.1	6.1	5.8	5.2	4.9	4.7	4.7	5.0	5.1	5.8	6.0	5.5



Rochester, NY

WBAN NO. 14768

LATITUDE: 43.12° N
LONGITUDE: 77.67° W
ELEVATION: 169 meters
MEAN PRESSURE: 996 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	1.6	2.4	3.4	4.6	5.5	6.1	6.0	5.2	4.0	2.7	1.6	1.3	3.7
	Min/Max	1.4/1.9	2.1/2.8	3.0/3.8	3.7/5.2	4.5/6.4	5.1/6.9	5.2/6.5	4.6/5.8	3.3/4.6	2.3/3.4	1.4/1.8	1.1/1.5	3.5/3.9
Latitude -15	Average	2.3	3.1	4.1	5.0	5.6	5.9	6.0	5.5	4.6	3.4	2.1	1.8	4.1
	Min/Max	1.8/2.9	2.7/4.0	3.4/4.8	3.9/5.8	4.4/6.6	5.0/6.8	5.2/6.5	4.8/6.3	3.7/5.6	2.8/4.8	1.7/2.6	1.3/2.3	3.9/4.4
Latitude	Average	2.5	3.3	4.2	4.9	5.2	5.4	5.5	5.3	4.6	3.6	2.3	2.0	4.1
	Min/Max	1.9/3.2	2.8/4.4	3.4/5.0	3.7/5.7	4.1/6.2	4.6/6.2	4.8/6.0	4.6/6.1	3.6/5.7	2.8/5.2	1.8/2.9	1.3/2.6	3.9/4.4
Latitude +15	Average	2.6	3.4	4.1	4.5	4.6	4.7	4.8	4.8	4.4	3.6	2.3	2.0	3.8
	Min/Max	2.0/3.4	2.9/4.7	3.3/4.9	3.4/5.3	3.6/5.4	4.0/5.3	4.2/5.2	4.1/5.6	3.4/5.4	2.8/5.2	1.7/3.0	1.3/2.7	3.6/4.2
90	Average	2.5	3.1	3.3	3.1	2.7	2.6	2.8	3.0	3.2	3.0	2.0	1.9	2.8
	Min/Max	1.8/3.3	2.5/4.3	2.5/4.0	2.3/3.5	2.3/3.1	2.3/2.9	2.4/2.9	2.6/3.5	2.4/4.0	2.2/4.4	1.5/2.8	1.1/2.7	2.6/3.0

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	2.1	3.1	4.5	6.0	7.1	7.9	8.0	6.9	5.3	3.6	2.0	1.6	4.8
	Min/Max	1.6/2.6	2.6/4.2	3.7/5.5	4.4/7.1	5.3/8.8	6.3/9.3	6.6/8.7	5.9/8.0	4.1/6.7	2.8/5.2	1.6/2.5	1.2/2.0	4.6/5.3
Latitude -15	Average	2.6	3.7	5.0	6.4	7.3	7.9	8.0	7.2	5.8	4.2	2.4	2.0	5.2
	Min/Max	1.9/3.3	3.0/5.2	4.0/6.2	4.6/7.7	5.3/9.0	6.3/9.3	6.6/8.7	6.1/8.5	4.4/7.4	3.1/6.2	1.8/3.1	1.3/2.6	4.9/5.7
Latitude	Average	2.8	3.9	5.1	6.3	7.1	7.6	7.7	7.0	5.9	4.3	2.5	2.1	5.2
	Min/Max	2.1/3.6	3.1/5.5	4.0/6.4	4.5/7.6	5.1/8.7	6.0/8.9	6.3/8.4	5.9/8.4	4.4/7.5	3.2/6.5	1.8/3.3	1.3/2.9	4.9/5.7
Latitude +15	Average	2.9	3.9	5.0	6.0	6.6	7.1	7.3	6.7	5.7	4.3	2.6	2.2	5.0
	Min/Max	2.1/3.8	3.2/5.6	4.0/6.3	4.3/7.3	4.7/8.2	5.6/8.4	5.9/7.9	5.6/8.0	4.2/7.3	3.2/6.5	1.8/3.4	1.3/3.0	4.8/5.6

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	2.9	3.9	5.1	6.4	7.4	8.1	8.2	7.2	5.9	4.3	2.6	2.2	5.4
	Min/Max	2.1/3.8	3.2/5.6	4.1/6.4	4.6/7.7	5.3/9.1	6.4/9.5	6.7/8.9	6.1/8.5	4.4/7.5	3.2/6.5	1.9/3.5	1.3/3.0	5.1/5.9

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	1.2	1.5	2.1	2.8	3.3	3.7	3.7	3.2	2.6	2.1	1.1	0.9	2.4
	Min/Max	0.8/1.8	1.0/2.9	1.4/3.4	1.4/3.7	1.5/4.8	2.3/4.7	2.5/4.4	2.4/4.2	1.6/3.8	1.2/3.8	0.5/1.8	0.1/1.5	2.1/2.8
1-Axis, N-S Horiz Axis	Average	0.8	1.3	2.3	3.6	4.3	4.9	5.0	4.2	3.2	2.0	0.8	0.6	2.8
	Min/Max	0.5/1.2	0.8/2.6	1.6/3.8	1.8/4.7	2.1/6.3	3.1/6.3	3.4/5.8	3.2/5.4	2.0/4.7	1.1/3.8	0.4/1.4	0.1/0.9	2.5/3.2
1-Axis, N-S Tilt=Latitude	Average	1.3	1.8	2.8	3.8	4.3	4.6	4.8	4.3	3.6	2.6	1.3	0.9	3.0
	Min/Max	0.8/1.9	1.2/3.5	1.9/4.5	1.9/5.1	2.1/6.2	3.0/6.0	3.3/5.5	3.3/5.6	2.2/5.3	1.5/4.9	0.6/2.0	0.1/1.5	2.8/3.6
2-Axis	Average	1.4	1.9	2.8	3.9	4.5	5.0	5.2	4.5	3.6	2.7	1.3	1.0	3.2
	Min/Max	0.9/2.1	1.2/3.6	1.9/4.5	1.9/5.2	2.2/6.5	3.2/6.5	3.5/5.9	3.4/5.8	2.2/5.3	1.5/4.9	0.6/2.2	0.1/1.6	2.9/3.7

Average Climatic Conditions

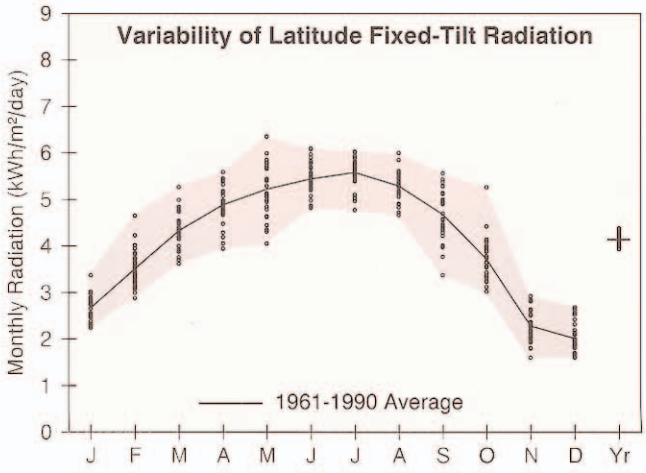
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-4.7	-4.1	1.3	7.7	13.9	18.4	21.2	20.0	16.5	10.6	4.7	-1.6	8.7
Daily Minimum Temp	-8.7	-8.6	-3.5	2.2	7.9	12.4	15.3	14.3	10.9	5.3	0.7	-5.3	3.6
Daily Maximum Temp	-0.6	0.3	5.9	13.3	19.9	24.3	27.1	25.6	22.1	15.8	8.8	2.1	13.7
Record Minimum Temp	-26.7	-28.3	-21.1	-10.6	-3.3	1.7	5.6	2.2	-2.2	-6.7	-15.0	-26.7	-28.3
Record Maximum Temp	23.3	19.4	28.9	33.9	34.4	37.8	36.7	37.2	37.2	32.8	27.2	22.2	37.8
HDD, Base 18.3°C	713	628	529	318	150	34	6	18	76	242	408	618	3741
CDD, Base 18.3°C	0	0	0	0	14	36	95	70	21	0	0	0	236
Relative Humidity (%)	74	74	71	67	67	69	70	74	77	74	76	78	73
Wind Speed (m/s)	5.4	5.0	5.0	5.1	4.3	4.0	3.7	3.6	3.7	4.0	4.6	4.9	4.4

Syracuse, NY

WBAN NO. 14771

LATITUDE: 43.12° N
LONGITUDE: 76.12° W
ELEVATION: 124 meters
MEAN PRESSURE: 1001 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	2.5	3.5	4.6	5.5	6.1	6.0	5.2	4.0	2.7	1.6	1.3	3.7
	Min/Max	1.5/1.9	2.1/2.9	3.1/4.0	3.9/5.1	4.4/6.6	5.4/6.8	5.3/6.5	4.7/5.7	3.1/4.5	2.3/3.4	1.3/1.8	1.1/1.5	3.6/3.9
Latitude -15	Average	2.4	3.3	4.2	5.0	5.6	5.9	6.0	5.5	4.7	3.5	2.1	1.8	4.2
	Min/Max	2.0/3.0	2.7/4.2	3.6/5.1	4.1/5.7	4.3/6.8	5.2/6.6	5.2/6.5	4.9/6.2	3.4/5.5	2.9/4.9	1.5/2.6	1.5/2.4	4.0/4.4
Latitude	Average	2.7	3.5	4.3	4.9	5.2	5.4	5.6	5.3	4.7	3.7	2.3	2.0	4.1
	Min/Max	2.2/3.4	2.9/4.7	3.6/5.3	3.9/5.6	4.1/6.3	4.8/6.1	4.8/6.0	4.7/6.0	3.4/5.6	3.0/5.3	1.6/2.9	1.6/2.7	3.9/4.4
Latitude +15	Average	2.8	3.6	4.2	4.5	4.6	4.7	4.9	4.8	4.5	3.7	2.3	2.1	3.9
	Min/Max	2.3/3.6	2.9/4.9	3.5/5.2	3.6/5.2	3.6/5.6	4.2/5.2	4.2/5.3	4.2/5.5	3.2/5.3	3.0/5.3	1.6/3.0	1.6/2.9	3.7/4.1
90	Average	2.7	3.3	3.5	3.1	2.7	2.6	2.8	3.1	3.2	3.1	2.0	2.0	2.8
	Min/Max	2.2/3.5	2.5/4.5	2.7/4.2	2.5/3.5	2.3/3.2	2.4/2.9	2.5/3.0	2.7/3.5	2.3/3.9	2.5/4.5	1.3/2.8	1.5/2.8	2.6/3.1

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	3.2	4.6	6.0	7.1	7.9	8.0	6.9	5.4	3.6	2.0	1.6	4.9
	Min/Max	1.9/2.8	2.7/4.4	3.8/5.8	4.6/7.2	5.0/8.9	6.6/9.1	6.7/8.8	6.1/7.9	3.8/6.4	3.0/5.2	1.4/2.5	1.3/2.1	4.6/5.2
Latitude -15	Average	2.8	3.9	5.2	6.4	7.3	7.9	8.0	7.2	5.9	4.3	2.4	2.0	5.3
	Min/Max	2.3/3.5	3.1/5.3	4.2/6.6	4.8/7.7	5.0/9.1	6.6/9.1	6.7/8.9	6.3/8.4	4.1/7.1	3.5/6.2	1.6/3.1	1.6/2.7	5.0/5.6
Latitude	Average	3.0	4.1	5.3	6.3	7.0	7.6	7.8	7.1	5.9	4.4	2.5	2.2	5.3
	Min/Max	2.5/3.9	3.3/5.7	4.3/6.8	4.7/7.6	4.8/8.9	6.3/8.7	6.4/8.6	6.2/8.2	4.1/7.2	3.6/6.5	1.7/3.3	1.7/3.0	5.0/5.7
Latitude +15	Average	3.1	4.1	5.2	6.1	6.6	7.1	7.3	6.7	5.8	4.4	2.6	2.3	5.1
	Min/Max	2.5/4.1	3.3/5.8	4.1/6.7	4.5/7.3	4.5/8.4	5.8/8.2	6.0/8.1	5.9/7.8	3.9/7.0	3.5/6.6	1.7/3.4	1.7/3.2	4.8/5.5

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	3.1	4.1	5.3	6.4	7.4	8.1	8.2	7.2	6.0	4.5	2.6	2.3	5.4
	Min/Max	2.5/4.1	3.3/5.8	4.3/6.8	4.8/7.7	5.1/9.3	6.7/9.3	6.8/9.1	6.4/8.4	4.1/7.2	3.6/6.6	1.7/3.5	1.8/3.2	5.2/5.8

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	1.4	1.7	2.2	2.8	3.3	3.7	3.8	3.2	2.7	2.2	1.1	1.0	2.4
	Min/Max	0.6/2.0	0.9/3.0	1.5/3.6	1.7/3.7	1.4/4.8	2.5/4.7	2.6/4.6	2.5/4.1	1.4/3.7	1.5/3.9	0.5/1.9	0.4/1.8	2.1/2.8
1-Axis, N-S Horiz Axis	Average	0.9	1.4	2.4	3.6	4.3	4.9	5.0	4.2	3.2	2.1	0.8	0.6	2.8
	Min/Max	0.4/1.3	0.7/2.7	1.7/4.0	2.0/4.8	1.9/6.3	3.4/6.3	3.5/6.2	3.4/5.3	1.7/4.4	1.4/3.7	0.3/1.4	0.3/1.1	2.5/3.3
1-Axis, N-S Tilt=Latitude	Average	1.5	2.0	2.9	3.9	4.3	4.6	4.9	4.4	3.7	2.8	1.3	1.0	3.1
	Min/Max	0.7/2.1	1.0/3.7	2.1/4.8	2.2/5.2	1.9/6.2	3.2/5.9	3.4/6.0	3.5/5.6	1.9/5.1	1.8/4.9	0.5/2.1	0.4/1.9	2.7/3.6
2-Axis	Average	1.6	2.1	2.9	3.9	4.5	5.0	5.2	4.5	3.7	2.8	1.3	1.1	3.2
	Min/Max	0.7/2.3	1.0/3.8	2.1/4.8	2.2/5.2	2.0/6.5	3.5/6.5	3.7/6.4	3.6/5.7	1.9/5.1	1.9/4.9	0.6/2.2	0.5/2.0	2.8/3.7

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-5.3	-4.4	1.1	7.6	13.9	18.5	21.3	20.2	16.4	10.4	4.7	-2.1	8.6
Daily Minimum Temp	-9.9	-9.2	-3.8	1.9	7.8	12.1	15.0	14.3	10.8	5.1	0.6	-6.1	3.2
Daily Maximum Temp	-0.8	0.3	5.9	13.3	20.2	24.8	27.6	26.1	22.0	15.7	8.9	1.9	13.8
Record Minimum Temp	-32.2	-32.2	-26.7	-12.8	-3.9	1.7	7.2	4.4	-2.2	-7.2	-15.0	-30.0	-32.2
Record Maximum Temp	21.1	20.6	30.6	33.3	35.6	36.7	36.1	36.1	36.1	30.6	27.2	21.1	36.7
HDD, Base 18.3°C	734	638	536	322	149	34	6	16	77	246	408	632	3797
CDD, Base 18.3°C	0	0	0	0	13	39	99	74	19	0	0	0	243
Relative Humidity (%)	73	72	70	65	67	70	71	75	76	74	75	77	72
Wind Speed (m/s)	4.8	4.8	4.8	4.6	4.0	3.6	3.5	3.4	3.6	3.8	4.5	4.7	4.2