

Flagstaff, AZ

WBAN NO. 03103

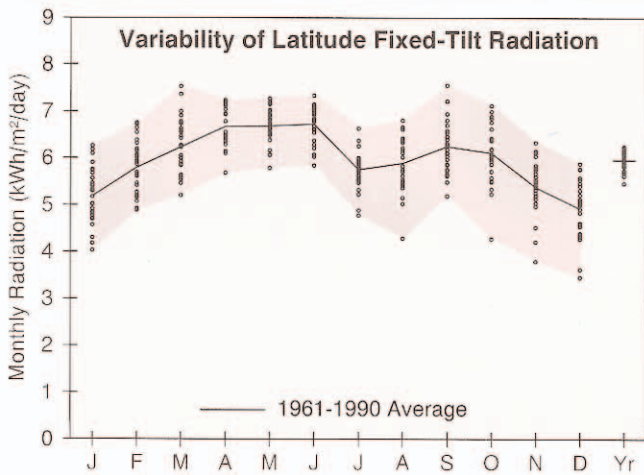
LATITUDE: 35.13° N

LONGITUDE: 111.67° W

ELEVATION: 2135 meters

MEAN PRESSURE: 788 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	3.1	4.0	5.1	6.3	7.2	7.7	6.4	5.9	5.4	4.4	3.3	2.8	5.1
	Min/Max	2.7/3.5	3.5/4.5	4.3/6.0	5.4/6.8	6.2/7.8	6.6/8.4	5.2/7.4	4.4/6.8	4.6/6.4	3.4/5.0	2.6/3.7	2.2/3.2	4.8/5.4
Latitude -15	Average	4.4	5.2	5.9	6.8	7.2	7.4	6.2	6.1	6.1	5.6	4.7	4.2	5.8
	Min/Max	3.5/5.3	4.4/6.0	5.0/7.1	5.8/7.3	6.2/7.8	6.4/8.1	5.2/7.2	4.5/7.1	5.1/7.4	4.0/6.5	3.4/5.4	3.0/4.9	5.4/6.1
Latitude	Average	5.2	5.8	6.2	6.7	6.7	6.7	5.8	5.9	6.3	6.1	5.4	4.9	6.0
	Min/Max	4.0/6.3	4.9/6.8	5.2/7.5	5.7/7.2	5.8/7.3	5.8/7.3	4.8/6.6	4.3/6.8	5.2/7.6	4.3/7.1	3.8/6.3	3.5/5.9	5.5/6.2
Latitude +15	Average	5.6	6.1	6.2	6.2	5.9	5.7	5.0	5.4	6.0	6.3	5.8	5.4	5.8
	Min/Max	4.3/6.9	5.1/7.1	5.2/7.5	5.3/6.8	5.1/6.4	5.0/6.2	4.2/5.8	3.9/6.2	5.0/7.3	4.3/7.3	4.0/6.8	3.7/6.5	5.3/6.1
90	Average	5.3	5.3	4.6	3.6	2.6	2.2	2.2	2.8	3.9	4.9	5.1	5.1	4.0
	Min/Max	4.1/6.5	4.3/6.2	3.8/5.4	3.0/4.6	2.4/2.8	2.1/2.3	2.0/2.4	2.1/3.1	3.2/4.6	3.3/5.8	3.4/6.1	3.5/6.4	3.6/4.3

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	4.8	6.0	7.4	9.1	10.1	10.8	8.6	8.2	7.9	6.8	5.2	4.4	7.5
	Min/Max	3.8/5.8	4.9/7.1	5.8/9.2	7.4/10.2	8.4/11.3	8.9/12.1	6.7/10.3	5.7/9.8	6.4/9.8	4.6/8.0	3.5/6.2	3.1/5.3	6.7/7.9
Latitude -15	Average	5.8	6.9	8.0	9.5	10.2	10.7	8.6	8.4	8.5	7.6	6.2	5.4	8.0
	Min/Max	4.4/7.1	5.6/8.2	6.3/10.1	7.7/10.6	8.5/11.4	8.9/12.0	6.7/10.3	5.8/10.0	6.9/10.6	5.1/9.1	4.2/7.4	3.7/6.4	7.1/8.4
Latitude	Average	6.4	7.4	8.3	9.4	9.9	10.3	8.3	8.3	8.6	8.0	6.7	6.0	8.1
	Min/Max	4.8/7.9	5.9/8.8	6.5/10.4	7.7/10.6	8.3/11.1	8.5/11.5	6.4/9.9	5.7/9.9	6.9/10.7	5.3/9.6	4.5/8.1	4.1/7.2	7.2/8.6
Latitude +15	Average	6.8	7.6	8.2	9.1	9.4	9.6	7.8	7.9	8.4	8.1	7.0	6.4	8.0
	Min/Max	5.1/8.4	6.1/9.0	6.4/10.3	7.4/10.2	7.8/10.5	7.9/10.8	6.0/9.3	5.5/9.4	6.8/10.5	5.3/9.7	4.6/8.5	4.3/7.7	7.1/8.5

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	6.8	7.6	8.3	9.5	10.3	11.0	8.7	8.5	8.6	8.1	7.1	6.5	8.4
	Min/Max	5.1/8.5	6.1/9.0	6.5/10.4	7.8/10.7	8.6/11.6	9.1/12.3	6.8/10.5	5.9/10.1	6.9/10.7	5.3/9.7	4.6/8.5	4.3/7.9	7.5/8.9

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	4.4	4.4	4.4	5.1	5.7	6.3	4.4	4.3	4.6	4.9	4.6	4.3	4.8
	Min/Max	2.5/6.0	2.9/6.0	2.7/6.4	3.8/6.1	4.2/6.8	4.7/7.7	2.8/6.0	2.3/5.6	3.4/6.4	2.5/6.3	2.6/6.1	2.3/5.7	3.9/5.3
1-Axis, N-S Horiz Axis	Average	3.6	4.4	5.4	6.9	7.9	8.6	6.0	5.9	6.0	5.4	4.1	3.4	5.6
	Min/Max	2.1/5.0	2.8/5.9	3.3/7.8	5.1/8.4	5.8/9.4	6.3/10.3	3.7/8.1	3.3/7.7	4.4/8.4	2.7/6.9	2.2/5.4	1.8/4.5	4.6/6.2
1-Axis, N-S Tilt=Latitude	Average	4.9	5.5	6.1	7.2	7.6	8.0	5.7	5.9	6.5	6.4	5.4	4.7	6.2
	Min/Max	2.9/6.8	3.5/7.4	3.7/8.9	5.2/8.7	5.7/9.1	5.9/9.7	3.5/7.7	3.3/7.8	4.8/9.1	3.3/8.3	2.9/7.2	2.5/6.3	5.0/6.8
2-Axis	Average	5.3	5.7	6.1	7.3	8.1	8.7	6.1	6.1	6.6	6.5	5.7	5.1	6.4
	Min/Max	3.0/7.3	3.6/7.6	3.7/8.9	5.3/8.8	6.0/9.6	6.4/10.5	3.7/8.2	3.4/8.0	4.8/9.2	3.3/8.4	3.1/7.6	2.8/6.8	5.2/7.1

Average Climatic Conditions

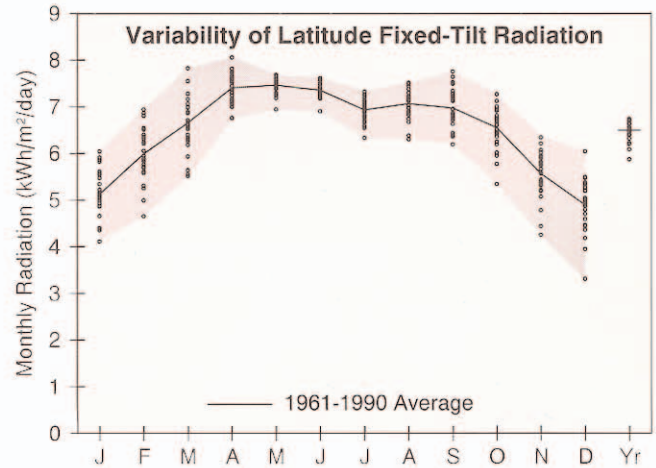
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-1.8	-0.3	1.8	5.7	10.2	15.4	19.1	17.8	14.1	8.4	2.7	-1.3	7.7
Daily Minimum Temp	-9.3	-7.9	-5.9	-2.9	0.7	5.2	10.3	9.4	5.1	-0.6	-5.3	-9.0	-0.8
Daily Maximum Temp	5.7	7.4	9.6	14.3	19.7	25.7	27.7	26.3	22.9	17.4	10.6	6.3	16.1
Record Minimum Temp	-30.0	-30.6	-26.7	-18.9	-10.0	-5.6	0.0	-4.4	-5.0	-18.9	-25.0	-30.6	-30.6
Record Maximum Temp	18.9	21.7	22.8	26.7	30.6	35.6	36.1	33.3	32.2	29.4	23.3	20.0	36.1
HDD, Base 18.3°C	625	521	512	378	252	104	16	36	132	307	470	609	3962
CDD, Base 18.3°C	0	0	0	0	0	17	39	21	3	0	0	0	81
Relative Humidity (%)	62	60	56	47	40	33	51	58	55	53	57	61	53
Wind Speed (m/s)	2.9	2.8	3.1	3.3	3.2	3.0	2.3	2.0	2.3	2.4	2.8	2.6	2.7

Phoenix, AZ

WBAN NO. 23183

LATITUDE: 33.43° N
 LONGITUDE: 112.02° W
 ELEVATION: 339 meters
 MEAN PRESSURE: 974 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	3.2	4.3	5.5	7.1	8.0	8.4	7.6	7.1	6.1	4.9	3.6	3.0	5.7
	Min/Max	2.8/3.7	3.5/4.8	4.7/6.4	6.4/7.8	7.5/8.3	7.8/8.7	6.9/8.1	6.3/7.5	5.4/6.7	4.2/5.3	3.0/4.0	2.2/3.5	5.3/5.9
Latitude -15	Average	4.4	5.4	6.4	7.5	8.0	8.1	7.5	7.3	6.8	6.0	4.9	4.2	6.4
	Min/Max	3.6/5.1	4.3/6.2	5.3/7.4	6.8/8.2	7.4/8.2	7.6/8.4	6.8/8.0	6.5/7.8	6.1/7.6	5.0/6.6	3.8/5.5	2.9/5.1	5.8/6.6
Latitude	Average	5.1	6.0	6.7	7.4	7.5	7.3	6.9	7.1	7.0	6.5	5.6	4.9	6.5
	Min/Max	4.1/6.0	4.7/6.9	5.5/7.8	6.8/8.1	6.9/7.7	6.9/7.6	6.3/7.3	6.3/7.5	6.2/7.8	5.3/7.3	4.3/6.3	3.3/6.0	5.9/6.7
Latitude +15	Average	5.5	6.2	6.6	6.9	6.6	6.3	6.0	6.4	6.7	6.7	5.9	5.3	6.3
	Min/Max	4.4/6.6	4.8/7.3	5.4/7.8	6.2/7.5	6.1/6.8	5.9/6.5	5.5/6.3	5.7/6.8	5.9/7.5	5.4/7.4	4.4/6.8	3.5/6.7	5.6/6.5
90	Average	4.9	5.0	4.5	3.7	2.7	2.3	2.4	3.1	4.2	5.1	5.1	4.8	4.0
	Min/Max	3.8/5.9	3.8/5.9	3.7/5.3	3.3/3.9	2.6/2.8	2.1/2.4	2.2/2.5	2.8/3.3	3.7/4.6	4.1/5.7	3.7/6.0	3.1/6.2	3.5/4.2

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	4.7	6.2	7.8	9.9	11.0	11.4	10.0	9.6	8.6	7.1	5.3	4.4	8.0
	Min/Max	3.8/5.6	4.6/7.3	6.2/9.5	8.9/11.4	9.9/11.8	10.3/12.2	8.8/11.1	8.0/10.5	7.4/9.9	5.6/8.1	4.0/6.2	2.9/5.5	7.1/8.4
Latitude -15	Average	5.6	7.1	8.5	10.3	11.1	11.3	10.0	9.8	9.2	8.0	6.3	5.3	8.5
	Min/Max	4.4/6.7	5.2/8.3	6.7/10.3	9.2/11.9	9.9/11.8	10.2/12.1	8.8/11.1	8.2/10.8	7.9/10.5	6.2/9.1	4.6/7.3	3.4/6.7	7.6/8.9
Latitude	Average	6.2	7.5	8.7	10.3	10.7	10.8	9.6	9.6	9.3	8.4	6.8	5.8	8.6
	Min/Max	4.8/7.4	5.5/8.9	6.8/10.6	9.1/11.8	9.6/11.5	9.8/11.6	8.4/10.7	8.1/10.6	8.0/10.7	6.5/9.5	4.9/8.0	3.8/7.4	7.6/9.0
Latitude +15	Average	6.5	7.7	8.6	9.9	10.1	10.1	9.0	9.2	9.1	8.5	7.1	6.2	8.5
	Min/Max	5.0/7.8	5.6/9.1	6.8/10.5	8.8/11.4	9.1/10.8	9.1/10.8	7.9/10.0	7.7/10.1	7.8/10.5	6.6/9.7	5.1/8.3	4.0/7.9	7.5/8.9

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	6.6	7.7	8.7	10.4	11.2	11.6	10.1	9.8	9.3	8.5	7.1	6.3	8.9
	Min/Max	5.1/7.9	5.6/9.1	6.9/10.6	9.2/11.9	10.1/12.0	10.5/12.4	8.9/11.3	8.3/10.9	8.0/10.7	6.6/9.7	5.1/8.4	4.0/8.1	7.9/9.4

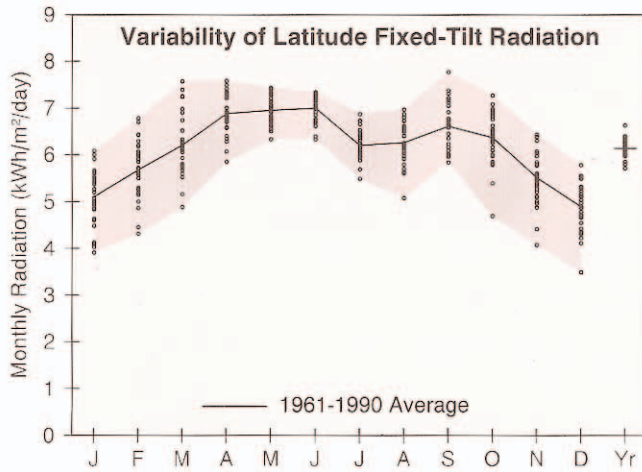
Direct Beam Solar Radiation for Concentrating Collectors (kWh/m²/day), Uncertainty ±8%

Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
1-Axis, E-W Horiz Axis	Average	4.2	4.6	4.8	5.7	6.4	6.8	5.6	5.3	5.2	5.0	4.5	4.1	5.2
	Min/Max	3.0/5.4	3.0/5.9	3.4/6.3	4.8/7.1	5.2/7.1	6.0/7.5	4.5/6.7	4.4/6.3	4.1/6.3	3.5/6.0	2.6/5.8	2.5/5.8	4.5/5.6
1-Axis, N-S Horiz Axis	Average	3.4	4.6	5.8	7.6	8.5	8.9	7.2	7.0	6.5	5.4	4.0	3.2	6.0
	Min/Max	2.4/4.5	2.8/5.9	4.0/7.7	6.5/9.8	7.0/9.7	7.9/10.0	5.7/8.8	5.6/8.4	5.1/8.1	3.6/6.6	2.2/5.1	1.8/4.5	5.2/6.5
1-Axis, N-S Tilt=Latitude	Average	4.7	5.7	6.5	7.8	8.2	8.3	6.8	7.0	7.1	6.5	5.2	4.5	6.5
	Min/Max	3.3/6.1	3.6/7.3	4.5/8.6	6.6/10.1	6.7/9.4	7.3/9.3	5.4/8.3	5.6/8.4	5.5/8.7	4.4/7.8	3.0/6.7	2.6/6.3	5.6/7.1
2-Axis	Average	5.0	5.8	6.5	8.0	8.7	9.1	7.3	7.2	7.1	6.5	5.5	4.8	6.8
	Min/Max	3.5/6.5	3.7/7.5	4.5/8.6	6.7/10.3	7.1/9.9	8.0/10.1	5.8/9.0	5.7/8.6	5.5/8.7	4.4/7.9	3.1/7.1	2.8/6.8	5.8/7.4

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	12.0	14.3	16.8	21.1	26.0	31.2	34.2	33.1	29.8	23.6	16.6	12.3	22.6
Daily Minimum Temp	5.1	7.1	9.3	12.9	17.7	22.7	27.2	26.2	22.7	16.0	9.4	5.4	15.2
Daily Maximum Temp	18.8	21.5	24.2	29.2	34.2	39.7	41.1	39.8	36.8	31.2	23.8	19.0	29.9
Record Minimum Temp	-8.3	-5.6	-3.9	0.0	4.4	10.0	16.1	15.6	8.3	1.1	-3.9	-5.6	-8.3
Record Maximum Temp	31.1	33.3	37.8	40.6	45.0	50.0	47.8	46.7	47.8	41.7	33.9	31.1	50.0
HDD, Base 18.3°C	201	126	101	42	4	0	0	0	0	9	74	192	750
CDD, Base 18.3°C	4	12	53	123	242	387	491	457	343	173	23	4	2312
Relative Humidity (%)	51	44	39	28	22	19	32	36	36	37	44	52	37
Wind Speed (m/s)	2.5	2.8	3.2	3.4	3.4	3.2	3.4	3.2	3.0	2.8	2.6	2.5	3.0

LATITUDE: 34.65° N
 LONGITUDE: 112.43° W
 ELEVATION: 1531 meters
 MEAN PRESSURE: 847 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	3.1	3.9	5.1	6.6	7.5	8.0	6.9	6.3	5.7	4.6	3.4	2.8	5.3
	Min/Max	2.6/3.5	3.2/4.5	4.2/6.1	5.7/7.1	6.8/8.0	7.2/8.5	6.1/7.7	5.1/7.0	5.1/6.7	3.6/5.2	2.8/3.9	2.2/3.2	5.1/5.7
Latitude -15	Average	4.4	5.1	5.9	7.0	7.5	7.7	6.7	6.5	6.5	5.8	4.8	4.1	6.0
	Min/Max	3.5/5.1	4.0/6.0	4.7/7.2	6.0/7.7	6.8/8.0	6.9/8.1	5.9/7.5	5.3/7.2	5.7/7.6	4.4/6.6	3.7/5.5	3.0/4.8	5.6/6.5
Latitude	Average	5.1	5.7	6.2	6.9	7.0	7.0	6.2	6.3	6.6	6.4	5.5	4.9	6.1
	Min/Max	3.9/6.1	4.3/6.8	4.9/7.6	5.8/7.6	6.3/7.4	6.3/7.3	5.5/6.9	5.1/7.0	5.8/7.8	4.7/7.3	4.1/6.4	3.5/5.8	5.7/6.6
Latitude +15	Average	5.5	5.9	6.1	6.4	6.1	6.0	5.4	5.7	6.4	6.5	5.9	5.4	5.9
	Min/Max	4.2/6.6	4.4/7.1	4.8/7.5	5.4/7.1	5.6/6.5	5.4/6.3	4.8/5.9	4.6/6.3	5.6/7.5	4.7/7.5	4.3/6.9	3.7/6.4	5.5/6.4
90	Average	5.0	4.9	4.3	3.5	2.6	2.3	2.3	2.9	4.0	5.0	5.2	5.0	3.9
	Min/Max	3.8/6.1	3.6/5.9	3.4/5.2	3.0/3.8	2.5/2.8	2.2/2.3	2.1/2.4	2.4/3.1	3.6/4.7	3.6/5.8	3.6/6.2	3.4/6.0	3.5/4.2

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	4.8	5.9	7.4	9.4	10.6	11.3	9.3	8.8	8.4	7.1	5.4	4.4	7.7
	Min/Max	3.7/5.7	4.4/7.2	5.7/9.5	7.9/10.6	9.4/11.5	9.9/12.0	7.9/10.8	7.0/10.1	7.1/10.2	5.0/8.2	4.0/6.3	3.2/5.2	7.1/8.4
Latitude -15	Average	5.7	6.8	8.1	9.8	10.6	11.2	9.3	9.0	9.0	8.0	6.3	5.4	8.3
	Min/Max	4.3/6.9	5.0/8.3	6.2/10.3	8.2/11.0	9.4/11.6	9.8/11.9	7.8/10.7	7.1/10.4	7.6/10.9	5.6/9.3	4.6/7.5	3.8/6.4	7.5/9.0
Latitude	Average	6.3	7.2	8.3	9.8	10.3	10.7	8.9	8.8	9.1	8.4	6.9	6.0	8.4
	Min/Max	4.7/7.6	5.3/8.8	6.3/10.6	8.1/11.0	9.2/11.3	9.4/11.4	7.6/10.4	7.0/10.2	7.7/11.1	5.8/9.8	4.9/8.2	4.1/7.2	7.6/9.2
Latitude +15	Average	6.6	7.4	8.2	9.4	9.7	10.1	8.4	8.4	8.9	8.5	7.2	6.3	8.3
	Min/Max	4.9/8.1	5.3/9.1	6.2/10.6	7.7/10.6	8.6/10.6	8.8/10.7	7.1/9.7	6.7/9.8	7.5/10.9	5.8/9.9	5.1/8.6	4.3/7.6	7.5/9.0

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	6.7	7.4	8.3	9.9	10.8	11.5	9.4	9.0	9.1	8.5	7.2	6.5	8.7
	Min/Max	4.9/8.2	5.3/9.1	6.3/10.6	8.2/11.1	9.6/11.8	10.0/12.2	8.0/11.0	7.2/10.4	7.7/11.1	5.8/9.9	5.1/8.7	4.4/7.8	7.9/9.5

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	4.4	4.5	4.5	5.4	6.1	6.8	5.0	4.7	5.0	5.2	4.8	4.4	5.1
	Min/Max	2.8/5.8	2.8/6.0	2.8/6.4	4.0/6.4	5.0/6.9	5.3/7.4	3.8/6.3	3.1/5.9	3.9/6.7	3.0/6.4	2.8/6.2	2.5/5.7	4.3/5.8
1-Axis, N-S Horiz Axis	Average	3.7	4.5	5.6	7.3	8.3	9.1	6.7	6.4	6.5	5.7	4.2	3.4	6.0
	Min/Max	2.3/4.8	2.8/6.1	3.5/8.1	5.5/8.9	6.9/9.5	7.2/10.1	5.1/8.6	4.4/8.1	4.9/8.9	3.2/7.1	2.5/5.5	2.0/4.4	5.1/6.8
1-Axis, N-S Tilt=Latitude	Average	5.0	5.6	6.3	7.6	8.0	8.5	6.3	6.4	7.1	6.8	5.6	4.8	6.5
	Min/Max	3.1/6.6	3.5/7.6	3.9/9.1	5.6/9.1	6.7/9.1	6.7/9.4	4.8/8.1	4.4/8.1	5.4/9.6	3.8/8.4	3.3/7.3	2.8/6.2	5.5/7.4
2-Axis	Average	5.4	5.8	6.3	7.7	8.5	9.3	6.8	6.6	7.1	6.9	5.9	5.2	6.8
	Min/Max	3.4/7.1	3.6/7.8	3.9/9.1	5.7/9.3	7.0/9.7	7.3/10.2	5.2/8.7	4.5/8.4	5.4/9.6	3.9/8.5	3.5/7.7	3.0/6.7	5.8/7.8

Average Climatic Conditions

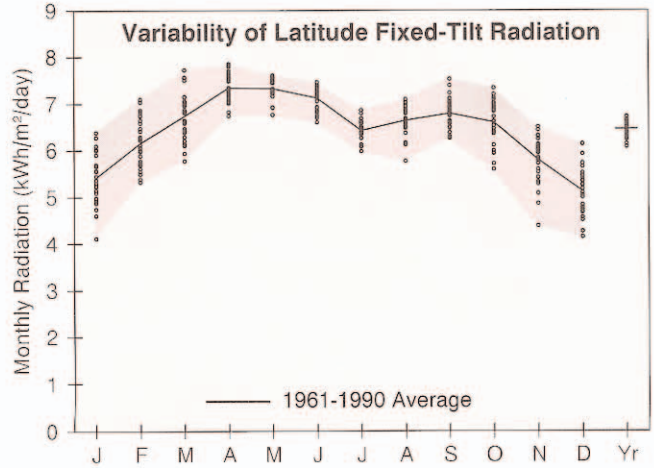
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	2.3	3.9	5.9	9.6	14.2	19.6	22.8	21.3	18.1	12.6	6.7	2.6	11.7
Daily Minimum Temp	-5.6	-4.4	-2.2	0.8	5.1	9.9	14.4	13.2	9.3	3.4	-1.9	-5.4	3.1
Daily Maximum Temp	10.2	12.2	14.1	18.3	23.3	29.2	31.2	29.4	26.7	21.8	15.3	10.6	20.2
Record Minimum Temp	-18.3	-18.3	-13.9	-6.1	-3.3	2.2	8.3	4.4	1.1	-7.2	-13.3	-22.8	-22.8
Record Maximum Temp	23.3	25.0	27.2	30.6	35.0	39.4	38.9	37.2	35.0	32.2	26.1	21.1	39.4
HDD, Base 18.3°C	496	403	384	262	138	32	0	0	41	182	350	489	2775
CDD, Base 18.3°C	0	0	0	0	11	68	139	96	32	4	0	0	351
Relative Humidity (%)	59	53	49	38	33	27	44	51	47	46	51	59	47
Wind Speed (m/s)	3.1	3.5	4.1	4.2	4.3	4.1	3.5	3.1	3.4	3.3	3.3	3.0	3.6

Tucson, AZ

WBAN NO. 23160

LATITUDE: 32.12° N
 LONGITUDE: 110.93° W
 ELEVATION: 779 meters
 MEAN PRESSURE: 925 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	3.4	4.4	5.6	7.1	7.9	8.1	7.1	6.7	6.0	5.0	3.8	3.2	5.7
	Min/Max	2.8/3.9	3.9/4.9	5.0/6.3	6.5/7.6	7.3/8.2	7.4/8.6	6.5/7.6	5.8/7.2	5.5/6.6	4.4/5.4	3.1/4.2	2.7/3.6	5.5/5.9
Latitude -15	Average	4.6	5.5	6.4	7.5	7.8	7.8	6.9	6.9	6.6	6.1	5.0	4.3	6.3
	Min/Max	3.6/5.4	4.8/6.3	5.6/7.3	6.8/8.0	7.2/8.1	7.2/8.3	6.4/7.4	6.0/7.4	6.1/7.3	5.2/6.7	3.9/5.6	3.6/5.1	6.0/6.5
Latitude	Average	5.4	6.2	6.7	7.3	7.3	7.1	6.4	6.6	6.8	6.6	5.8	5.1	6.5
	Min/Max	4.1/6.4	5.3/7.1	5.8/7.7	6.7/7.8	6.8/7.6	6.6/7.5	6.0/6.9	5.8/7.1	6.3/7.5	5.6/7.3	4.4/6.5	4.1/6.1	6.1/6.7
Latitude +15	Average	5.9	6.4	6.6	6.8	6.4	6.1	5.6	6.0	6.6	6.8	6.2	5.6	6.3
	Min/Max	4.4/7.0	5.5/7.5	5.7/7.7	6.3/7.3	6.0/6.7	5.7/6.3	5.3/6.0	5.3/6.4	6.0/7.3	5.7/7.5	4.6/7.0	4.5/6.8	5.8/6.5
90	Average	5.2	5.1	4.4	3.5	2.5	2.1	2.2	2.8	4.0	5.1	5.3	5.1	3.9
	Min/Max	3.8/6.3	4.3/6.0	3.7/5.1	3.3/3.6	2.4/2.6	2.0/2.1	2.1/2.2	2.6/3.0	3.6/4.3	4.2/5.7	3.8/6.1	4.0/6.2	3.6/4.1

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	5.2	6.6	8.1	10.1	11.0	11.2	9.2	9.0	8.5	7.4	5.8	4.8	8.1
	Min/Max	3.9/6.2	5.5/7.7	6.7/9.6	9.1/11.2	9.9/11.6	9.7/12.2	8.4/10.1	7.6/10.0	7.6/9.8	6.2/8.4	4.2/6.6	3.8/5.8	7.5/8.5
Latitude -15	Average	6.1	7.4	8.7	10.4	11.1	11.1	9.1	9.2	9.0	8.2	6.7	5.6	8.6
	Min/Max	4.5/7.3	6.2/8.7	7.2/10.3	9.4/11.6	9.9/11.6	9.6/12.0	8.4/10.1	7.7/10.2	8.1/10.4	6.8/9.3	4.8/7.6	4.5/6.9	7.9/9.0
Latitude	Average	6.7	7.8	9.0	10.4	10.7	10.6	8.8	9.1	9.1	8.6	7.3	6.2	8.7
	Min/Max	4.9/8.1	6.6/9.3	7.3/10.6	9.3/11.5	9.6/11.3	9.1/11.5	8.1/9.7	7.6/10.0	8.1/10.5	7.1/9.8	5.2/8.3	4.9/7.7	8.0/9.2
Latitude +15	Average	7.0	8.0	8.9	10.0	10.1	9.9	8.2	8.6	9.0	8.7	7.6	6.6	8.6
	Min/Max	5.1/8.5	6.7/9.6	7.3/10.6	9.0/11.1	9.1/10.6	8.5/10.8	7.5/9.1	7.2/9.5	7.9/10.3	7.2/10.0	5.3/8.7	5.2/8.1	7.9/9.0

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	7.1	8.1	9.0	10.5	11.2	11.3	9.3	9.2	9.2	8.7	7.6	6.7	9.0
	Min/Max	5.2/8.6	6.7/9.6	7.3/10.7	9.4/11.6	10.1/11.8	9.8/12.3	8.5/10.2	7.8/10.2	8.1/10.5	7.2/10.0	5.4/8.7	5.3/8.3	8.3/9.5

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	4.7	5.0	5.1	5.9	6.5	6.7	5.0	5.0	5.1	5.3	5.0	4.5	5.3
	Min/Max	3.1/6.0	3.8/6.3	3.6/6.5	4.8/6.9	5.4/7.1	5.3/7.7	4.2/6.0	3.8/5.9	4.3/6.3	4.0/6.4	3.0/6.0	3.1/5.9	4.7/5.7
1-Axis, N-S Horiz Axis	Average	4.0	5.1	6.2	8.0	8.8	8.9	6.5	6.6	6.6	5.9	4.5	3.6	6.2
	Min/Max	2.6/5.2	3.8/6.6	4.4/8.1	6.5/9.5	7.4/9.6	6.9/10.4	5.4/7.8	5.0/7.9	5.4/8.2	4.4/7.2	2.6/5.5	2.5/4.8	5.4/6.8
1-Axis, N-S Tilt=Latitude	Average	5.3	6.2	6.9	8.2	8.5	8.3	6.2	6.6	7.0	6.9	5.8	4.9	6.7
	Min/Max	3.5/6.8	4.6/8.0	4.9/9.0	6.7/9.7	7.1/9.3	6.4/9.6	5.2/7.3	5.0/7.9	5.8/8.8	5.2/8.4	3.4/7.0	3.4/6.5	5.9/7.3
2-Axis	Average	5.7	6.3	6.9	8.3	9.0	9.0	6.6	6.8	7.1	7.0	6.1	5.4	7.0
	Min/Max	3.7/7.3	4.7/8.2	4.9/9.0	6.8/9.9	7.5/9.8	7.0/10.5	5.5/7.9	5.1/8.1	5.8/8.9	5.2/8.5	3.5/7.4	3.7/7.1	6.1/7.6

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	10.7	12.4	14.8	18.8	23.3	28.8	30.3	29.2	26.9	21.3	15.1	11.1	20.2
Daily Minimum Temp	3.7	5.0	7.0	10.2	14.4	19.9	23.1	22.3	19.7	13.7	7.6	4.3	12.6
Daily Maximum Temp	17.7	19.9	22.7	27.3	32.2	37.6	37.4	36.0	34.1	29.1	22.6	17.9	27.9
Record Minimum Temp	-8.9	-6.7	-6.7	-2.8	3.3	8.3	16.7	16.1	6.7	-3.3	-4.4	-8.9	-8.9
Record Maximum Temp	30.6	33.3	37.2	40.0	41.7	47.2	45.6	42.8	41.7	38.3	32.2	28.9	47.2
HDD, Base 18.3°C	236	168	127	54	4	0	0	0	0	15	104	224	932
CDD, Base 18.3°C	0	3	18	67	159	313	372	336	257	108	8	0	1641
Relative Humidity (%)	48	43	37	27	22	21	42	47	42	38	43	50	38
Wind Speed (m/s)	3.8	3.8	4.0	4.3	4.1	4.1	4.0	3.7	3.9	3.8	3.7	3.6	3.9