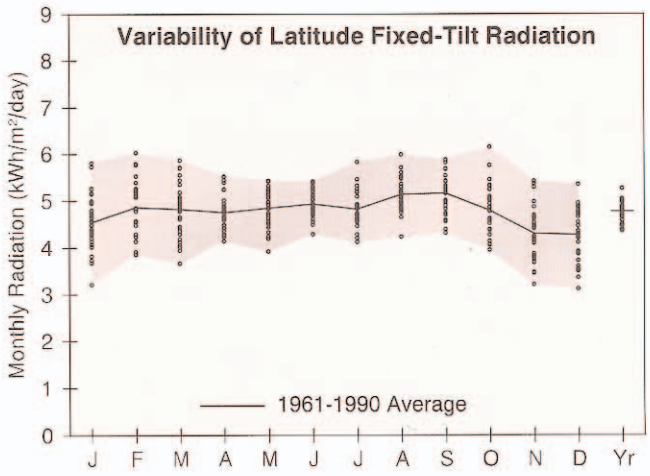


Hilo, HI

WBAN NO. 21504

LATITUDE: 19.72° N
LONGITUDE: 155.07° W
ELEVATION: 11 meters
MEAN PRESSURE: 1015 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	3.8	4.3	4.6	4.8	5.2	5.4	5.2	5.3	5.0	4.3	3.7	3.5	4.6
	Min/Max	2.8/4.6	3.5/5.1	3.5/5.5	4.2/5.6	4.2/5.8	4.6/5.9	4.4/6.4	4.4/6.2	4.2/5.7	3.7/5.4	2.9/4.5	2.8/4.2	4.2/5.0
Latitude -15	Average	4.0	4.4	4.7	4.8	5.1	5.3	5.1	5.3	5.1	4.5	3.9	3.7	4.7
	Min/Max	2.9/4.9	3.6/5.4	3.6/5.6	4.2/5.6	4.1/5.8	4.6/5.8	4.4/6.3	4.4/6.2	4.3/5.8	3.8/5.6	3.0/4.7	2.9/4.5	4.3/5.1
Latitude	Average	4.5	4.9	4.8	4.7	4.8	4.9	4.8	5.1	5.2	4.8	4.3	4.3	4.8
	Min/Max	3.2/5.8	3.8/6.0	3.7/5.9	4.1/5.5	3.9/5.4	4.3/5.4	4.1/5.8	4.2/6.0	4.3/5.9	4.0/6.2	3.2/5.4	3.1/5.3	4.4/5.3
Latitude +15	Average	4.9	5.0	4.7	4.4	4.3	4.3	4.3	4.7	5.0	4.8	4.5	4.6	4.6
	Min/Max	3.3/6.3	3.9/6.3	3.6/5.8	3.9/5.2	3.5/4.8	3.8/4.7	3.7/5.1	3.9/5.4	4.1/5.7	4.0/6.3	3.3/5.8	3.2/5.9	4.2/5.1
90	Average	3.8	3.4	2.6	1.8	1.4	1.4	1.4	1.6	2.3	3.0	3.3	3.7	2.5
	Min/Max	2.5/5.1	2.6/4.3	2.0/3.1	1.7/2.0	1.4/1.5	1.3/1.5	1.3/1.5	1.5/1.7	2.0/2.5	2.5/3.9	2.3/4.4	2.4/4.8	2.1/2.7

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	4.9	5.5	5.6	5.8	6.2	6.5	6.3	6.6	6.3	5.5	4.6	4.5	5.7
	Min/Max	3.3/6.5	4.1/7.1	3.9/7.0	4.8/7.2	4.7/7.3	5.3/7.4	5.1/8.1	5.1/8.0	5.0/7.6	4.4/7.4	3.3/6.0	3.1/5.9	5.1/6.5
Latitude -15	Average	5.1	5.6	5.7	5.8	6.2	6.5	6.2	6.6	6.4	5.6	4.8	4.7	5.8
	Min/Max	3.3/6.8	4.2/7.3	4.0/7.1	4.8/7.2	4.7/7.2	5.3/7.3	5.1/8.1	5.1/8.0	5.1/7.7	4.5/7.5	3.3/6.2	3.2/6.1	5.2/6.6
Latitude	Average	5.5	5.9	5.8	5.7	6.0	6.2	6.0	6.5	6.4	5.8	5.1	5.1	5.8
	Min/Max	3.6/7.4	4.3/7.7	4.0/7.3	4.8/7.2	4.5/7.0	5.1/7.0	4.9/7.8	5.0/7.9	5.1/7.7	4.6/7.9	3.5/6.7	3.4/6.7	5.2/6.7
Latitude +15	Average	5.7	6.0	5.8	5.5	5.6	5.8	5.6	6.1	6.3	5.9	5.3	5.4	5.7
	Min/Max	3.7/7.8	4.4/7.9	4.0/7.2	4.6/6.9	4.3/6.6	4.7/6.5	4.6/7.2	4.7/7.5	5.0/7.6	4.6/8.0	3.6/7.0	3.5/7.1	5.1/6.6

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	5.8	6.1	5.9	5.8	6.2	6.6	6.3	6.6	6.4	5.9	5.3	5.4	6.0
	Min/Max	3.7/7.9	4.4/8.0	4.0/7.3	4.8/7.3	4.7/7.3	5.4/7.5	5.2/8.2	5.1/8.1	5.1/7.8	4.7/8.0	3.6/7.1	3.5/7.3	5.4/6.9

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	3.2	3.1	2.5	2.3	2.7	3.0	2.8	3.0	3.0	2.8	2.6	2.9	2.8
	Min/Max	1.5/5.0	1.5/4.7	1.4/3.8	1.5/3.4	1.5/3.6	2.0/3.9	1.7/4.5	1.9/4.4	1.9/4.0	1.8/4.6	1.4/4.2	1.2/4.5	2.4/3.6
1-Axis, N-S Horiz Axis	Average	3.1	3.5	3.2	3.0	3.4	3.8	3.5	4.0	3.9	3.3	2.7	2.8	3.3
	Min/Max	1.4/5.1	1.7/5.3	1.7/4.7	1.9/4.6	1.9/4.7	2.5/4.9	2.1/5.8	2.4/5.7	2.5/5.3	2.1/5.4	1.4/4.3	1.1/4.3	2.8/4.3
1-Axis, N-S Tilt=Latitude	Average	3.6	3.8	3.4	3.0	3.3	3.5	3.3	3.9	4.0	3.5	3.1	3.3	3.5
	Min/Max	1.6/5.8	1.9/5.9	1.8/5.0	1.9/4.6	1.8/4.4	2.4/4.6	2.0/5.4	2.4/5.5	2.5/5.4	2.3/5.9	1.6/4.9	1.3/5.1	2.9/4.5
2-Axis	Average	3.9	3.9	3.4	3.1	3.5	3.8	3.6	4.0	4.0	3.6	3.2	3.5	3.6
	Min/Max	1.8/6.2	2.0/6.1	1.8/5.0	2.0/4.6	1.9/4.7	2.6/5.0	2.2/5.8	2.5/5.7	2.5/5.4	2.3/5.9	1.6/5.2	1.4/5.5	3.1/4.7

Average Climatic Conditions

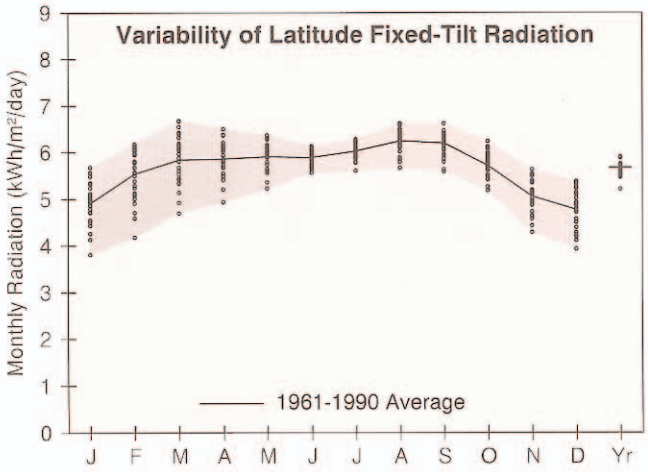
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	22.1	22.1	22.2	22.6	23.3	24.0	24.3	24.6	24.6	24.3	23.4	22.4	23.3
Daily Minimum Temp	17.6	17.6	18.0	18.6	19.2	19.8	20.3	20.5	20.3	20.1	19.3	18.2	19.1
Daily Maximum Temp	26.6	26.6	26.4	26.6	27.3	28.2	28.3	28.7	28.8	28.4	27.4	26.7	27.5
Record Minimum Temp	12.2	11.7	12.2	13.3	14.4	15.6	16.7	17.2	16.1	16.7	14.4	12.8	11.7
Record Maximum Temp	32.8	33.3	33.9	31.7	34.4	32.2	31.7	33.9	33.3	32.8	32.2	33.9	34.4
HDD, Base 18.3°C	0	0	0	0	0	0	0	0	0	0	0	0	0
CDD, Base 18.3°C	116	104	121	128	153	170	186	194	187	184	153	127	1824
Relative Humidity (%)	77	76	78	80	79	77	80	80	79	80	80	79	79
Wind Speed (m/s)	3.5	3.6	3.6	3.6	3.5	3.4	3.3	3.2	3.2	3.2	3.3	3.4	3.4

Honolulu, HI

WBAN NO. 22521

LATITUDE: 21.33° N
LONGITUDE: 157.92° W
ELEVATION: 5 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	3.9	4.7	5.4	5.9	6.4	6.5	6.6	6.5	5.9	5.0	4.1	3.7	5.4
	Min/Max	3.2/4.4	3.7/5.2	4.4/6.1	5.0/6.5	5.6/6.9	6.2/6.9	6.1/7.0	5.8/6.9	5.4/6.3	4.6/5.4	3.7/4.5	3.2/4.1	5.0/5.6
Latitude -15	Average	4.3	5.0	5.6	5.9	6.3	6.4	6.5	6.5	6.1	5.3	4.5	4.1	5.5
	Min/Max	3.4/4.8	3.9/5.5	4.6/6.3	5.1/6.6	5.6/6.8	6.1/6.7	6.0/6.8	5.9/6.9	5.5/6.5	4.9/5.7	3.9/4.9	3.5/4.6	5.1/5.8
Latitude	Average	4.9	5.5	5.8	5.9	5.9	5.9	6.0	6.2	6.2	5.7	5.1	4.8	5.7
	Min/Max	3.8/5.7	4.2/6.2	4.7/6.7	4.9/6.5	5.2/6.4	5.6/6.1	5.6/6.3	5.7/6.6	5.6/6.6	5.2/6.2	4.3/5.6	3.9/5.4	5.2/5.9
Latitude +15	Average	5.3	5.8	5.8	5.5	5.3	5.1	5.3	5.7	6.0	5.8	5.4	5.2	5.5
	Min/Max	4.0/6.2	4.3/6.5	4.6/6.6	4.6/6.1	4.7/5.6	4.8/5.3	4.9/5.4	5.2/6.0	5.4/6.4	5.3/6.4	4.5/6.0	4.2/5.9	5.0/5.7
90	Average	4.2	4.0	3.2	2.2	1.5	1.4	1.4	1.8	2.8	3.7	4.1	4.3	2.9
	Min/Max	3.1/5.0	2.9/4.6	2.6/3.6	1.9/2.3	1.5/1.6	1.4/1.5	1.4/1.5	1.8/1.9	2.6/3.0	3.3/4.1	3.3/4.7	3.3/4.9	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	5.3	6.4	7.2	7.7	8.3	8.5	8.7	8.7	8.0	6.8	5.6	5.1	7.2
	Min/Max	4.1/6.3	4.7/7.3	5.4/8.4	6.2/8.9	6.9/9.4	7.9/9.3	7.9/9.3	7.4/9.4	7.0/8.7	6.0/7.6	4.5/6.2	4.0/5.9	6.4/7.6
Latitude -15	Average	5.6	6.6	7.3	7.7	8.3	8.5	8.6	8.7	8.1	7.0	5.8	5.3	7.3
	Min/Max	4.2/6.6	4.8/7.6	5.5/8.6	6.2/9.0	6.9/9.3	7.8/9.2	7.9/9.3	7.4/9.4	7.1/8.9	6.2/7.8	4.7/6.5	4.2/6.2	6.5/7.7
Latitude	Average	6.1	7.0	7.5	7.7	8.0	8.1	8.3	8.5	8.2	7.3	6.2	5.9	7.4
	Min/Max	4.5/7.3	5.0/8.1	5.7/8.9	6.1/8.9	6.7/9.0	7.5/8.8	7.6/8.9	7.3/9.2	7.2/9.0	6.4/8.2	5.0/7.0	4.6/6.8	6.6/7.8
Latitude +15	Average	6.3	7.2	7.5	7.4	7.5	7.5	7.7	8.1	8.0	7.4	6.5	6.2	7.3
	Min/Max	4.7/7.6	5.1/8.3	5.6/8.8	5.9/8.6	6.3/8.5	7.0/8.2	7.1/8.3	6.9/8.8	7.0/8.8	6.5/8.3	5.2/7.3	4.8/7.2	6.4/7.7

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

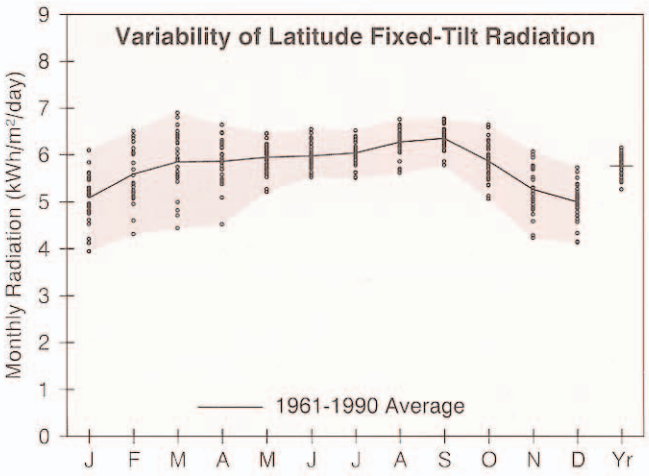
Tracker		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2-Axis	Average	6.4	7.2	7.5	7.8	8.3	8.6	8.8	8.7	8.2	7.4	6.5	6.3	7.7
	Min/Max	4.7/7.8	5.1/8.3	5.7/8.9	6.2/9.0	7.0/9.4	8.0/9.4	8.0/9.4	7.4/9.4	7.2/9.0	6.5/8.3	5.2/7.4	4.8/7.3	6.8/8.1

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	3.5	3.8	3.7	3.6	4.1	4.4	4.6	4.4	4.1	3.8	3.5	3.5	3.9
	Min/Max	2.2/4.8	2.1/4.8	2.3/4.8	2.5/4.7	3.0/5.1	3.9/5.2	3.8/5.3	3.3/5.3	3.2/4.7	2.9/4.5	2.3/4.4	2.2/4.4	3.2/4.3
1-Axis, N-S Horiz Axis	Average	3.5	4.3	4.7	4.9	5.5	5.7	6.0	6.0	5.5	4.5	3.6	3.3	4.8
	Min/Max	2.1/4.7	2.4/5.5	2.9/6.2	3.3/6.4	3.9/6.9	5.0/6.8	5.0/7.0	4.4/7.1	4.3/6.3	3.5/5.5	2.3/4.4	2.0/4.2	3.9/5.3
1-Axis, N-S Tilt=Latitude	Average	4.1	4.8	5.0	4.9	5.2	5.4	5.7	5.9	5.6	4.9	4.1	4.0	4.9
	Min/Max	2.5/5.5	2.7/6.1	3.1/6.5	3.3/6.4	3.7/6.6	4.7/6.4	4.7/6.6	4.3/6.9	4.4/6.5	3.8/5.9	2.7/5.1	2.4/5.0	4.0/5.4
2-Axis	Average	4.3	4.9	5.0	4.9	5.5	5.8	6.1	6.0	5.6	5.0	4.3	4.3	5.2
	Min/Max	2.7/5.9	2.8/6.3	3.1/6.6	3.4/6.5	3.9/7.0	5.1/6.9	5.1/7.1	4.4/7.1	4.4/6.5	3.9/6.0	2.8/5.4	2.6/5.4	4.2/5.6

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	22.7	22.8	23.6	24.3	25.3	26.3	26.9	27.4	27.2	26.4	25.1	23.4	25.1
Daily Minimum Temp	18.7	18.6	19.6	20.4	21.3	22.3	23.1	23.4	23.1	22.4	21.3	19.4	21.1
Daily Maximum Temp	26.7	26.9	27.6	28.2	29.3	30.3	30.8	31.5	31.4	30.5	28.9	27.3	29.1
Record Minimum Temp	11.7	11.7	12.8	13.9	15.6	18.3	18.9	19.4	18.9	17.8	13.9	12.2	11.7
Record Maximum Temp	30.6	31.1	31.1	31.7	33.9	33.3	33.3	33.9	34.4	34.4	33.9	31.7	34.4
HDD, Base 18.3°C	0	0	0	0	0	0	0	0	0	0	0	0	0
CDD, Base 18.3°C	136	124	162	180	216	240	267	282	267	252	203	157	2486
Relative Humidity (%)	73	71	69	67	66	64	65	64	66	68	70	72	68
Wind Speed (m/s)	4.3	4.3	5.0	5.1	5.1	5.5	5.7	5.4	4.9	4.6	4.6	4.3	4.9



Kahului, HI

WBAN NO. 22516

LATITUDE: 20.90° N
LONGITUDE: 156.43° W
ELEVATION: 15 meters
MEAN PRESSURE: 1013 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	4.0	4.7	5.4	5.9	6.4	6.7	6.7	6.5	6.1	5.1	4.3	3.9	5.5
	Min/Max	3.3/4.7	3.8/5.4	4.2/6.3	4.6/6.7	5.6/7.0	6.2/7.4	6.0/7.3	5.8/7.1	5.6/6.5	4.5/5.7	3.6/4.8	3.3/4.3	5.0/5.8
Latitude -15	Average	4.4	5.0	5.6	5.9	6.4	6.6	6.6	6.5	6.2	5.4	4.6	4.2	5.6
	Min/Max	3.5/5.1	4.0/5.8	4.3/6.5	4.6/6.7	5.6/6.9	6.0/7.3	5.9/7.1	5.8/7.1	5.7/6.6	4.7/6.1	3.8/5.2	3.6/4.8	5.2/6.0
Latitude	Average	5.1	5.6	5.9	5.9	5.9	6.0	6.0	6.3	6.3	5.9	5.3	5.0	5.8
	Min/Max	3.9/6.1	4.3/6.5	4.4/6.9	4.5/6.6	5.2/6.5	5.5/6.6	5.5/6.5	5.6/6.8	5.8/6.8	5.1/6.6	4.2/6.1	4.1/5.7	5.3/6.2
Latitude +15	Average	5.5	5.8	5.8	5.5	5.3	5.1	5.2	5.7	6.1	6.0	5.6	5.5	5.6
	Min/Max	4.2/6.7	4.4/6.8	4.3/6.9	4.2/6.2	4.6/5.7	4.8/5.5	4.8/5.6	5.1/6.1	5.6/6.5	5.2/6.8	4.4/6.6	4.5/6.3	5.1/6.0
90	Average	4.4	4.0	3.1	2.1	1.4	1.3	1.3	1.7	2.8	3.8	4.3	4.5	2.9
	Min/Max	3.3/5.4	3.0/4.8	2.5/3.7	1.8/2.2	1.4/1.5	1.2/1.4	1.2/1.4	1.6/1.8	2.6/2.9	3.3/4.3	3.3/5.1	3.6/5.3	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	5.6	6.5	7.3	7.8	8.6	9.0	9.0	8.9	8.4	7.1	5.9	5.4	7.5
	Min/Max	4.3/6.9	4.7/7.8	5.2/9.0	5.6/9.3	7.2/9.7	8.1/10.5	7.8/10.0	7.5/9.9	7.4/9.2	6.0/8.3	4.5/7.0	4.4/6.4	6.6/8.1
Latitude -15	Average	5.9	6.8	7.5	7.9	8.5	8.9	8.9	8.9	8.5	7.3	6.2	5.7	7.6
	Min/Max	4.4/7.3	4.8/8.1	5.3/9.2	5.6/9.3	7.1/9.7	8.0/10.4	7.8/9.9	7.5/9.9	7.5/9.3	6.2/8.5	4.7/7.3	4.6/6.7	6.7/8.2
Latitude	Average	6.4	7.2	7.7	7.8	8.3	8.5	8.6	8.7	8.6	7.6	6.7	6.2	7.7
	Min/Max	4.8/8.0	5.1/8.6	5.4/9.4	5.5/9.3	6.9/9.4	7.7/9.9	7.5/9.5	7.3/9.8	7.5/9.4	6.4/8.9	5.0/7.9	5.0/7.4	6.8/8.3
Latitude +15	Average	6.7	7.3	7.6	7.5	7.8	7.9	8.0	8.3	8.4	7.7	6.9	6.6	7.6
	Min/Max	4.9/8.4	5.2/8.9	5.3/9.4	5.3/8.9	6.5/8.8	7.1/9.2	7.0/8.9	7.0/9.3	7.4/9.3	6.5/9.1	5.2/8.3	5.3/7.8	6.7/8.2

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	7.4	7.7	7.9	8.7	9.1	9.1	9.0	8.6	7.7	7.0	6.7	8.0
	Min/Max	5.0/8.5	5.2/8.9	5.4/9.5	5.6/9.4	7.2/9.8	8.2/10.7	7.9/10.1	7.5/10.0	7.6/9.4	6.5/9.1	5.2/8.4	5.4/8.0	7.0/8.6

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	4.0	4.1	4.0	4.0	4.6	5.1	5.1	4.9	4.7	4.3	4.0	4.1	4.4
	Min/Max	2.5/5.7	2.3/5.6	2.1/5.5	2.4/5.3	3.3/5.7	4.2/6.6	3.8/6.1	3.7/5.9	3.8/5.4	3.2/5.5	2.4/5.3	2.8/5.3	3.6/5.0
1-Axis, N-S Horiz Axis	Average	4.0	4.7	5.2	5.4	6.2	6.7	6.7	6.7	6.3	5.2	4.2	3.9	5.4
	Min/Max	2.5/5.7	2.5/6.4	2.7/7.3	3.2/7.2	4.3/7.8	5.4/8.8	5.1/8.1	4.9/8.2	5.2/7.4	3.8/6.7	2.5/5.6	2.7/5.1	4.4/6.2
1-Axis, N-S Tilt=Latitude	Average	4.6	5.2	5.4	5.4	5.9	6.2	6.4	6.6	6.5	5.6	4.8	4.6	5.6
	Min/Max	3.0/6.6	2.8/7.1	2.9/7.6	3.1/7.2	4.1/7.4	5.1/8.2	4.8/7.6	4.8/8.0	5.3/7.6	4.2/7.2	2.8/6.4	3.2/5.9	4.5/6.4
2-Axis	Average	5.0	5.4	5.5	5.5	6.3	6.8	6.8	6.8	6.5	5.7	5.1	5.0	5.8
	Min/Max	3.2/7.1	2.9/7.3	2.9/7.7	3.2/7.3	4.3/7.8	5.5/8.9	5.1/8.2	4.9/8.3	5.3/7.6	4.2/7.3	3.0/6.7	3.5/6.4	4.7/6.7

Average Climatic Conditions

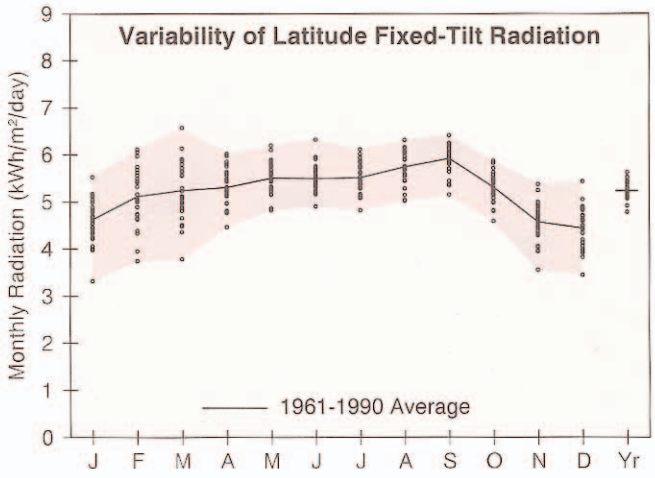
Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	22.1	22.1	22.8	23.4	24.3	25.3	25.9	26.3	26.0	25.5	24.3	22.8	24.2
Daily Minimum Temp	17.6	17.4	18.1	18.9	19.4	20.6	21.4	21.6	21.0	20.7	19.8	18.4	19.6
Daily Maximum Temp	26.6	26.7	27.3	27.9	29.0	29.9	30.4	30.9	30.9	30.2	28.7	27.3	28.8
Record Minimum Temp	8.9	10.0	12.8	12.2	13.9	14.4	14.4	16.1	15.6	14.4	12.8	11.1	8.9
Record Maximum Temp	31.7	31.1	32.2	32.8	33.3	33.9	34.4	35.6	35.0	35.6	33.9	32.2	35.6
HDD, Base 18.3°C	0	0	0	0	0	0	0	0	0	0	0	0	0
CDD, Base 18.3°C	116	106	138	153	184	208	236	246	230	222	178	139	2157
Relative Humidity (%)	75	74	72	71	70	68	69	69	69	71	73	74	71
Wind Speed (m/s)	5.2	5.4	5.7	6.3	6.7	7.1	7.4	7.1	6.2	5.5	5.7	5.0	6.1

Lihue, HI

WBAN NO. 22536

LATITUDE: 21.98° N
LONGITUDE: 159.35° W
ELEVATION: 45 meters
MEAN PRESSURE: 1012 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	3.7	4.3	4.9	5.3	5.9	6.1	6.0	5.9	5.6	4.7	3.8	3.5	5.0
	Min/Max	2.8/4.3	3.4/5.0	3.6/6.0	4.5/6.0	5.1/6.7	5.4/7.1	5.2/6.7	5.2/6.5	5.0/6.1	4.1/5.1	3.1/4.3	2.9/4.1	4.6/5.3
Latitude -15	Average	4.0	4.6	5.0	5.4	5.8	5.9	5.9	5.9	5.8	4.9	4.1	3.8	5.1
	Min/Max	3.0/4.7	3.5/5.4	3.7/6.2	4.6/6.1	5.1/6.6	5.3/6.9	5.1/6.6	5.2/6.5	5.1/6.3	4.3/5.4	3.3/4.7	3.1/4.6	4.7/5.5
Latitude	Average	4.6	5.1	5.2	5.3	5.5	5.5	5.5	5.7	5.9	5.3	4.6	4.4	5.2
	Min/Max	3.3/5.5	3.7/6.1	3.8/6.6	4.5/6.0	4.8/6.2	4.9/6.3	4.8/6.1	5.0/6.3	5.2/6.4	4.6/5.9	3.5/5.4	3.4/5.4	4.8/5.6
Latitude +15	Average	5.0	5.3	5.2	4.9	4.9	4.8	4.8	5.2	5.7	5.4	4.8	4.8	5.1
	Min/Max	3.5/6.0	3.8/6.4	3.7/6.5	4.2/5.6	4.3/5.5	4.3/5.4	4.3/5.3	4.6/5.8	4.9/6.2	4.6/6.0	3.7/5.8	3.6/6.0	4.6/5.4
90	Average	3.9	3.7	2.9	2.1	1.5	1.4	1.4	1.8	2.7	3.5	3.7	3.9	2.7
	Min/Max	2.6/4.9	2.5/4.6	2.2/3.6	1.9/2.2	1.5/1.5	1.3/1.5	1.4/1.5	1.7/1.9	2.5/2.9	2.9/3.9	2.7/4.5	2.8/5.1	2.5/2.9

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	4.9	5.8	6.2	6.7	7.4	7.7	7.6	7.6	7.5	6.1	4.9	4.6	6.4
	Min/Max	3.4/6.1	4.0/7.2	4.1/8.3	5.4/7.8	6.1/8.7	6.4/9.5	6.2/8.7	6.3/8.8	6.2/8.2	5.1/6.9	3.6/5.9	3.5/5.9	5.7/7.0
Latitude -15	Average	5.2	6.0	6.4	6.7	7.4	7.6	7.5	7.7	7.6	6.3	5.1	4.9	6.5
	Min/Max	3.5/6.4	4.1/7.5	4.2/8.5	5.4/7.9	6.1/8.7	6.3/9.4	6.2/8.6	6.3/8.8	6.3/8.3	5.3/7.2	3.8/6.2	3.6/6.3	5.8/7.1
Latitude	Average	5.6	6.4	6.5	6.7	7.2	7.3	7.2	7.5	7.7	6.6	5.5	5.4	6.6
	Min/Max	3.8/7.0	4.3/8.0	4.3/8.7	5.3/7.8	5.9/8.4	6.1/9.0	6.0/8.3	6.2/8.6	6.3/8.5	5.5/7.5	4.0/6.7	3.9/6.9	5.8/7.2
Latitude +15	Average	5.9	6.5	6.5	6.4	6.7	6.7	6.7	7.2	7.5	6.7	5.7	5.6	6.5
	Min/Max	3.9/7.4	4.3/8.2	4.2/8.7	5.1/7.6	5.5/7.9	5.6/8.3	5.6/7.7	5.9/8.2	6.2/8.3	5.5/7.6	4.1/7.0	4.1/7.3	5.7/7.1

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	6.0	6.5	6.5	6.7	7.5	7.8	7.6	7.7	7.7	6.7	5.7	5.7	6.8
	Min/Max	3.9/7.5	4.3/8.2	4.3/8.7	5.4/7.9	6.2/8.8	6.4/9.6	6.3/8.8	6.3/8.8	6.3/8.5	5.5/7.6	4.1/7.0	4.1/7.5	6.0/7.5

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	3.3	3.4	3.1	3.0	3.7	3.9	3.8	3.9	3.9	3.5	3.0	3.2	3.5
	Min/Max	1.7/4.7	1.4/4.9	1.4/5.0	2.0/4.1	2.6/4.8	2.7/5.7	2.6/4.9	2.7/4.8	2.7/4.7	2.6/4.3	1.6/4.2	1.7/4.8	2.8/4.1
1-Axis, N-S Horiz Axis	Average	3.2	3.8	3.9	4.0	4.8	5.0	4.9	5.1	5.1	4.1	3.0	3.0	4.2
	Min/Max	1.6/4.6	1.6/5.6	1.6/6.3	2.6/5.4	3.3/6.3	3.4/7.4	3.3/6.3	3.5/6.5	3.5/6.0	3.0/5.0	1.6/4.2	1.6/4.5	3.3/4.9
1-Axis, N-S Tilt=Latitude	Average	3.8	4.3	4.1	4.0	4.5	4.7	4.6	5.0	5.3	4.4	3.5	3.6	4.3
	Min/Max	1.9/5.4	1.8/6.2	1.7/6.7	2.6/5.4	3.1/6.0	3.2/6.9	3.1/5.9	3.5/6.3	3.6/6.2	3.3/5.5	1.8/4.9	1.9/5.4	3.4/5.0
2-Axis	Average	4.0	4.4	4.1	4.0	4.8	5.1	4.9	5.2	5.3	4.5	3.7	3.9	4.5
	Min/Max	2.0/5.8	1.8/6.4	1.8/6.7	2.7/5.5	3.3/6.3	3.5/7.5	3.3/6.4	3.6/6.5	3.6/6.3	3.4/5.6	1.9/5.2	2.1/5.8	3.6/5.2

Average Climatic Conditions

Element	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	22.0	22.0	22.6	23.3	24.3	25.4	26.1	26.4	26.2	25.3	24.2	22.7	24.2
Daily Minimum Temp	18.5	18.4	19.4	20.3	21.3	22.5	23.2	23.4	23.1	22.2	21.3	19.5	21.1
Daily Maximum Temp	25.5	25.6	25.8	26.4	27.3	28.4	28.9	29.3	29.3	28.4	27.1	25.9	27.3
Record Minimum Temp	10.0	11.1	10.6	13.3	15.0	16.1	16.7	18.9	18.3	16.7	13.9	11.1	10.0
Record Maximum Temp	29.4	30.0	31.1	31.1	31.1	31.7	31.7	32.2	31.7	32.2	30.6	30.0	32.2
HDD, Base 18.3°C	0	0	0	0	0	0	0	0	0	0	0	0	0
CDD, Base 18.3°C	116	104	133	150	186	213	239	250	237	217	175	136	2157
Relative Humidity (%)	76	75	75	75	75	73	74	74	74	76	77	76	75
Wind Speed (m/s)	5.2	5.3	5.9	6.4	6.1	6.1	6.4	5.9	5.4	5.3	5.7	5.2	5.8