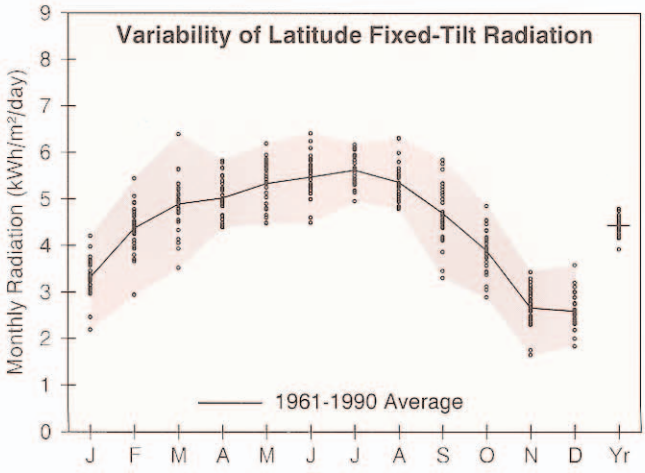
# Eau Claire, WI

## WBAN NO. 14991

LATITUDE: 44.87° N
LONGITUDE: 91.48° W
ELEVATION: 273 meters
MEAN PRESSURE: 983 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 | 2.7 | 3.7 | 4.6 | 5.6 | 6.1 | 6.1 | 5.2 | 3.9 | 2.7 | 1.6 | 1.4 | 3.8 |
| | Min/Max | 1.4/2.0 | 2.2/3.0 | 3.0/4.5 | 4.2/5.2 | 4.8/6.4 | 5.1/7.1 | 5.4/6.6 | 4.7/6.0 | 3.1/4.6 | 2.2/3.1 | 1.3/1.9 | 1.1/1.7 | 3.5/4.1 |
| Latitude -15 | Average | 2.9 | 4.0 | 4.7 | 5.1 | 5.7 | 6.0 | 6.1 | 5.6 | 4.7 | 3.7 | 2.4 | 2.3 | 4.4 |
| | Min/Max | 2.0/3.6 | 2.8/4.8 | 3.5/6.0 | 4.5/5.9 | 4.8/6.6 | 4.9/7.0 | 5.3/6.7 | 5.0/6.6 | 3.4/5.8 | 2.8/4.5 | 1.6/3.1 | 1.7/3.1 | 4.0/4.8 |
| Latitude | Average | 3.3 | 4.4 | 4.9 | 5.0 | 5.3 | 5.5 | 5.6 | 5.4 | 4.7 | 3.9 | 2.7 | 2.6 | 4.4 |
| | Min/Max | 2.2/4.2 | 2.9/5.4 | 3.5/6.4 | 4.4/5.8 | 4.5/6.2 | 4.5/6.4 | 4.9/6.2 | 4.8/6.3 | 3.3/5.8 | 2.9/4.8 | 1.6/3.4 | 1.8/3.6 | 3.9/4.8 |
| Latitude +15 | Average | 3.6 | 4.6 | 4.8 | 4.6 | 4.7 | 4.7 | 4.9 | 4.8 | 4.5 | 3.9 | 2.8 | 2.8 | 4.2 |
| | Min/Max | 2.3/4.6 | 3.0/5.8 | 3.4/6.5 | 4.0/5.4 | 4.0/5.4 | 3.9/5.5 | 4.3/5.4 | 4.3/5.7 | 3.1/5.6 | 2.8/4.9 | 1.6/3.6 | 1.9/3.9 | 3.7/4.5 |
| 90 | Average | 3.5 | 4.3 | 4.1 | 3.3 | 2.9 | 2.8 | 2.9 | 3.2 | 3.3 | 3.3 | 2.5 | 2.7 | 3.2 |
| | Min/Max | 2.2/4.5 | 2.8/5.4 | 2.8/5.7 | 2.8/3.8 | 2.5/3.3 | 2.4/3.1 | 2.6/3.1 | 2.8/3.7 | 2.3/4.2 | 2.4/4.2 | 1.4/3.3 | 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 | 2.6 | 3.9 | 5.1 | 6.2 | 7.4 | 7.9 | 8.1 | 7.1 | 5.3 | 3.8 | 2.2 | 2.0 | 5.1 |
| | Min/Max | 1.8/3.2 | 2.7/4.8 | 3.7/6.8 | 5.3/7.3 | 5.9/8.9 | 6.1/9.9 | 7.0/9.1 | 6.1/8.6 | 3.6/6.7 | 2.7/4.7 | 1.4/2.9 | 1.4/2.7 | 4.5/5.7 |
| Latitude -15 | Average | 3.5 | 4.9 | 5.9 | 6.6 | 7.5 | 8.0 | 8.2 | 7.4 | 5.9 | 4.5 | 2.8 | 2.6 | 5.7 |
| | Min/Max | 2.3/4.4 | 3.2/6.2 | 4.1/7.9 | 5.6/7.9 | 6.0/9.1 | 6.1/9.9 | 7.1/9.3 | 6.4/9.1 | 3.8/7.6 | 3.2/5.7 | 1.7/3.8 | 1.9/3.7 | 4.9/6.3 |
| Latitude | Average | 3.8 | 5.2 | 6.1 | 6.5 | 7.3 | 7.7 | 7.9 | 7.3 | 6.0 | 4.7 | 3.0 | 2.9 | 5.7 |
| | Min/Max | 2.4/4.9 | 3.3/6.7 | 4.1/8.2 | 5.5/7.8 | 5.8/8.9 | 5.8/9.6 | 6.8/9.0 | 6.3/8.9 | 3.8/7.7 | 3.3/6.0 | 1.7/4.1 | 2.0/4.1 | 4.9/6.3 |
| Latitude +15 | Average | 4.0 | 5.4 | 6.0 | 6.3 | 6.9 | 7.2 | 7.4 | 6.9 | 5.8 | 4.7 | 3.1 | 3.1 | 5.6 |
| | Min/Max | 2.5/5.2 | 3.3/6.9 | 4.1/8.2 | 5.2/7.5 | 5.5/8.4 | 5.4/9.0 | 6.4/8.5 | 5.9/8.5 | 3.6/7.5 | 3.3/6.0 | 1.7/4.2 | 2.1/4.4 | 4.7/6.2 |

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

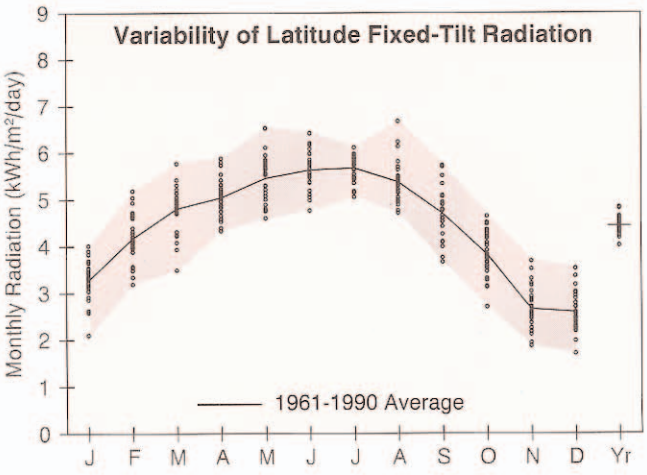
| Tracker | | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2-Axis | Average | 4.1 | 5.4 | 6.1 | 6.6 | 7.7 | 8.2 | 8.3 | 7.5 | 6.0 | 4.7 | 3.1 | 3.1 | 5.9 |
| | Min/Max | 2.5/5.2 | 3.3/6.9 | 4.1/8.2 | 5.6/7.9 | 6.1/9.3 | 6.3/10.2 | 7.2/9.5 | 6.4/9.1 | 3.8/7.7 | 3.3/6.1 | 1.7/4.2 | 2.1/4.4 | 5.1/6.5 |

### 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 | 2.2 | 2.7 | 2.7 | 2.9 | 3.4 | 3.7 | 3.8 | 3.4 | 2.8 | 2.4 | 1.6 | 1.7 | 2.8 |
| | Min/Max | 1.0/3.2 | 1.0/4.1 | 1.5/4.1 | 2.0/3.9 | 2.1/4.6 | 2.1/5.2 | 2.8/4.7 | 2.6/4.6 | 1.2/4.0 | 1.4/3.5 | 0.5/2.5 | 1.0/2.5 | 2.1/3.3 |
| 1-Axis, N-S Horiz Axis | Average | 1.4 | 2.2 | 2.9 | 3.7 | 4.5 | 4.8 | 5.0 | 4.4 | 3.3 | 2.3 | 1.2 | 1.0 | 3.1 |
| | Min/Max | 0.7/2.0 | 0.8/3.4 | 1.6/4.3 | 2.5/4.9 | 2.9/6.1 | 2.8/7.0 | 3.7/6.4 | 3.4/6.1 | 1.4/4.7 | 1.2/3.3 | 0.3/1.9 | 0.6/1.5 | 2.4/3.8 |
| 1-Axis, N-S Tilt=Latitude | Average | 2.3 | 3.2 | 3.6 | 4.0 | 4.5 | 4.6 | 4.9 | 4.6 | 3.8 | 3.1 | 1.8 | 1.7 | 3.5 |
| | Min/Max | 1.1/3.4 | 1.2/4.9 | 1.9/5.4 | 2.7/5.3 | 2.9/6.1 | 2.7/6.7 | 3.6/6.2 | 3.5/6.4 | 1.6/5.4 | 1.6/4.4 | 0.6/2.8 | 1.0/2.6 | 2.7/4.2 |
| 2-Axis | Average | 2.5 | 3.3 | 3.6 | 4.1 | 4.7 | 5.0 | 5.2 | 4.8 | 3.8 | 3.1 | 1.9 | 1.9 | 3.7 |
| | Min/Max | 1.2/3.6 | 1.2/5.0 | 1.9/5.4 | 2.7/5.4 | 3.0/6.4 | 2.9/7.2 | 3.9/6.6 | 3.6/6.6 | 1.6/5.5 | 1.7/4.4 | 0.6/3.0 | 1.1/2.9 | 2.8/4.4 |

### Average Climatic Conditions

| Element | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature (°C) | -11.8 | -8.7 | -1.3 | 7.2 | 14.1 | 19.1 | 21.9 | 20.3 | 15.0 | 8.6 | 0.2 | -8.4 | 6.3 |
| Daily Minimum Temp | -17.3 | -14.6 | -6.8 | 0.8 | 7.2 | 12.4 | 15.4 | 14.0 | 8.8 | 2.7 | -4.6 | -13.2 | 0.4 |
| Daily Maximum Temp | -6.4 | -2.9 | 4.1 | 13.6 | 20.8 | 25.7 | 28.4 | 26.7 | 21.1 | 14.6 | 4.9 | -3.7 | 12.3 |
| Record Minimum Temp | -38.3 | -33.9 | -36.1 | -13.3 | -5.0 | 1.1 | 6.7 | 3.9 | -3.9 | -11.1 | -25.6 | -35.0 | -38.3 |
| Record Maximum Temp | 11.7 | 15.0 | 28.9 | 31.7 | 33.3 | 37.2 | 40.0 | 39.4 | 35.6 | 31.1 | 21.7 | 17.2 | 40.0 |
| HDD, Base 18.3°C | 935 | 758 | 609 | 333 | 154 | 33 | 8 | 16 | 107 | 302 | 543 | 830 | 4628 |
| CDD, Base 18.3°C | 0 | 0 | 0 | 0 | 21 | 56 | 120 | 78 | 7 | 0 | 0 | 0 | 282 |
| Relative Humidity (%) | 73 | 73 | 71 | 63 | 63 | 68 | 70 | 73 | 75 | 71 | 76 | 77 | 71 |
| Wind Speed (m/s) | 4.0 | 3.9 | 4.4 | 4.6 | 4.2 | 4.0 | 3.6 | 3.4 | 3.7 | 3.9 | 4.1 | 4.0 | 4.0 |




# Green Bay, WI

## WBAN NO. 14898

LATITUDE: 44.48° N
LONGITUDE: 88.13° W
ELEVATION: 214 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 | 1.7 | 2.6 | 3.7 | 4.7 | 5.7 | 6.3 | 6.1 | 5.2 | 3.9 | 2.7 | 1.6 | 1.4 | 3.8 |
| | Min/Max | 1.3/2.0 | 2.3/3.0 | 3.0/4.1 | 4.2/5.3 | 4.9/6.8 | 5.4/7.1 | 5.5/6.6 | 4.7/6.3 | 3.4/4.6 | 2.2/3.0 | 1.4/1.9 | 1.1/1.7 | 3.6/4.1 |
| Latitude -15 | Average | 2.9 | 3.8 | 4.6 | 5.2 | 5.8 | 6.1 | 6.1 | 5.6 | 4.7 | 3.6 | 2.4 | 2.3 | 4.4 |
| | Min/Max | 1.9/3.5 | 3.0/4.7 | 3.4/5.5 | 4.5/6.0 | 4.9/7.0 | 5.2/7.0 | 5.4/6.6 | 4.9/6.9 | 3.7/5.6 | 2.6/4.3 | 1.8/3.3 | 1.5/3.0 | 4.1/4.8 |
| Latitude | Average | 3.3 | 4.2 | 4.8 | 5.0 | 5.4 | 5.6 | 5.7 | 5.4 | 4.7 | 3.8 | 2.6 | 2.6 | 4.4 |
| | Min/Max | 2.1/4.0 | 3.2/5.2 | 3.5/5.8 | 4.3/5.9 | 4.6/6.5 | 4.8/6.4 | 5.1/6.1 | 4.7/6.7 | 3.7/5.7 | 2.7/4.6 | 1.9/3.7 | 1.7/3.5 | 4.0/4.8 |
| Latitude +15 | Average | 3.5 | 4.3 | 4.7 | 4.7 | 4.8 | 4.9 | 4.9 | 4.9 | 4.5 | 3.8 | 2.7 | 2.8 | 4.2 |
| | Min/Max | 2.2/4.3 | 3.3/5.4 | 3.4/5.8 | 4.0/5.5 | 4.1/5.8 | 4.1/5.5 | 4.4/5.3 | 4.3/6.1 | 3.4/5.5 | 2.6/4.7 | 1.9/3.9 | 1.8/3.8 | 3.8/4.6 |
| 90 | Average | 3.4 | 4.0 | 4.0 | 3.2 | 3.0 | 2.8 | 2.9 | 3.2 | 3.3 | 3.2 | 2.5 | 2.7 | 3.2 |
| | Min/Max | 2.1/4.3 | 3.0/5.1 | 2.8/4.9 | 2.7/3.8 | 2.6/3.5 | 2.5/3.1 | 2.6/3.1 | 2.8/3.9 | 2.5/4.2 | 2.2/3.9 | 1.6/3.6 | 1.6/3.8 | 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 | 2.6 | 3.8 | 5.1 | 6.2 | 7.5 | 8.2 | 8.1 | 7.0 | 5.4 | 3.7 | 2.2 | 2.0 | 5.1 |
| | Min/Max | 1.7/3.1 | 2.8/4.7 | 3.6/6.2 | 5.2/7.3 | 6.1/9.3 | 6.6/9.8 | 7.1/8.9 | 6.0/9.0 | 4.1/6.6 | 2.7/4.6 | 1.6/2.9 | 1.3/2.6 | 4.6/5.7 |
| Latitude -15 | Average | 3.4 | 4.7 | 5.8 | 6.6 | 7.7 | 8.2 | 8.2 | 7.4 | 6.0 | 4.4 | 2.8 | 2.6 | 5.7 |
| | Min/Max | 2.1/4.2 | 3.4/5.9 | 4.0/7.2 | 5.4/7.9 | 6.1/9.6 | 6.6/9.9 | 7.2/9.0 | 6.2/9.6 | 4.4/7.5 | 3.0/5.6 | 1.9/3.9 | 1.7/3.6 | 5.0/6.3 |
| Latitude | Average | 3.8 | 5.0 | 6.0 | 6.5 | 7.4 | 7.9 | 7.9 | 7.2 | 6.0 | 4.6 | 3.0 | 2.9 | 5.7 |
| | Min/Max | 2.3/4.7 | 3.6/6.3 | 4.1/7.4 | 5.3/7.8 | 5.9/9.3 | 6.3/9.5 | 6.9/8.7 | 6.1/9.4 | 4.4/7.6 | 3.1/5.8 | 2.0/4.3 | 1.8/4.0 | 5.0/6.3 |
| Latitude +15 | Average | 3.9 | 5.1 | 5.9 | 6.3 | 7.0 | 7.4 | 7.4 | 6.9 | 5.8 | 4.6 | 3.1 | 3.1 | 5.5 |
| | Min/Max | 2.4/4.9 | 3.7/6.5 | 4.0/7.4 | 5.1/7.5 | 5.6/8.8 | 5.8/8.9 | 6.5/8.2 | 5.8/9.0 | 4.2/7.4 | 3.0/5.8 | 2.0/4.4 | 1.9/4.3 | 4.8/6.2 |

### 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 | 4.0 | 5.1 | 6.0 | 6.6 | 7.8 | 8.4 | 8.4 | 7.4 | 6.0 | 4.6 | 3.1 | 3.1 | 5.9 |
| | Min/Max | 2.4/5.0 | 3.7/6.5 | 4.1/7.4 | 5.4/7.9 | 6.2/9.7 | 6.7/10.2 | 7.3/9.2 | 6.3/9.6 | 4.4/7.6 | 3.1/5.8 | 2.1/4.5 | 1.9/4.3 | 5.2/6.5 |

### 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 | 2.2 | 2.6 | 2.7 | 2.9 | 3.5 | 3.9 | 3.9 | 3.3 | 2.8 | 2.3 | 1.6 | 1.7 | 2.8 |
| | Min/Max | 1.0/3.0 | 1.4/3.6 | 1.4/3.8 | 2.1/4.0 | 2.2/5.0 | 2.5/5.4 | 2.9/4.5 | 2.6/5.0 | 1.5/4.0 | 1.2/3.3 | 0.7/2.8 | 0.9/2.6 | 2.3/3.3 |
| 1-Axis, N-S Horiz Axis | Average | 1.4 | 2.1 | 2.9 | 3.7 | 4.6 | 5.2 | 5.1 | 4.4 | 3.3 | 2.2 | 1.2 | 1.0 | 3.1 |
| | Min/Max | 0.6/2.0 | 1.1/3.0 | 1.5/4.1 | 2.6/4.9 | 3.0/6.6 | 3.4/7.1 | 3.9/6.0 | 3.4/6.6 | 1.7/4.7 | 1.1/3.2 | 0.5/2.0 | 0.5/1.6 | 2.5/3.7 |
| 1-Axis, N-S Tilt=Latitude | Average | 2.3 | 3.1 | 3.6 | 4.0 | 4.6 | 4.9 | 5.0 | 4.6 | 3.8 | 2.9 | 1.8 | 1.8 | 3.5 |
| | Min/Max | 1.1/3.3 | 1.6/4.3 | 1.8/5.0 | 2.8/5.4 | 3.0/6.5 | 3.2/6.8 | 3.7/5.8 | 3.5/6.8 | 2.0/5.5 | 1.5/4.2 | 0.8/3.1 | 1.0/2.8 | 2.8/4.2 |
| 2-Axis | Average | 2.5 | 3.1 | 3.6 | 4.1 | 4.8 | 5.3 | 5.3 | 4.7 | 3.8 | 3.0 | 1.9 | 1.9 | 3.7 |
| | Min/Max | 1.1/3.5 | 1.7/4.4 | 1.8/5.0 | 2.8/5.5 | 3.1/6.9 | 3.5/7.4 | 4.0/6.3 | 3.6/7.0 | 2.0/5.6 | 1.5/4.3 | 0.9/3.2 | 1.1/3.0 | 2.9/4.4 |

### Average Climatic Conditions

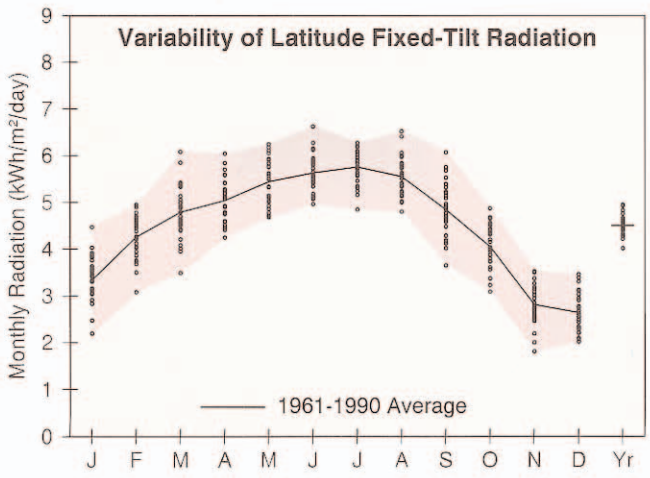
| Element | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature (°C) | -9.8 | -7.6 | -1.1 | 6.7 | 13.1 | 18.1 | 20.9 | 19.5 | 15.0 | 8.9 | 1.3 | -6.6 | 6.6 |
| Daily Minimum Temp | -14.6 | -12.5 | -5.9 | 1.1 | 6.5 | 11.9 | 14.9 | 13.8 | 9.3 | 3.6 | -2.9 | -10.8 | 1.2 |
| Daily Maximum Temp | -5.1 | -2.7 | 3.6 | 12.2 | 19.6 | 24.2 | 26.9 | 25.3 | 20.6 | 14.1 | 5.6 | -2.4 | 11.8 |
| Record Minimum Temp | -35.0 | -32.2 | -33.9 | -13.9 | -6.1 | 0.0 | 4.4 | 3.3 | -4.4 | -9.4 | -22.8 | -32.8 | -35.0 |
| Record Maximum Temp | 10.0 | 12.8 | 25.0 | 31.7 | 32.8 | 36.7 | 37.2 | 37.2 | 35.0 | 31.1 | 22.2 | 16.7 | 37.2 |
| HDD, Base 18.3°C | 873 | 727 | 603 | 350 | 177 | 52 | 9 | 24 | 105 | 293 | 510 | 772 | 4494 |
| CDD, Base 18.3°C | 0 | 0 | 0 | 0 | 13 | 43 | 91 | 60 | 5 | 0 | 0 | 0 | 212 |
| Relative Humidity (%) | 74 | 74 | 73 | 67 | 66 | 69 | 71 | 75 | 76 | 74 | 77 | 77 | 73 |
| Wind Speed (m/s) | 4.8 | 4.6 | 4.8 | 4.9 | 4.4 | 4.0 | 3.5 | 3.4 | 3.8 | 4.2 | 4.6 | 4.6 | 4.3 |

# La Crosse, WI

## WBAN NO. 14920

LATITUDE: 43.87° N
LONGITUDE: 91.25° W
ELEVATION: 205 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 | 2.7 | 3.7 | 4.7 | 5.7 | 6.3 | 6.2 | 5.4 | 4.0 | 2.8 | 1.7 | 1.4 | 3.9 |
| | Min/Max | 1.4/2.1 | 2.3/3.0 | 3.0/4.4 | 4.1/5.4 | 4.9/6.5 | 5.6/7.3 | 5.3/6.7 | 4.8/6.2 | 3.4/4.8 | 2.4/3.2 | 1.4/2.0 | 1.2/1.7 | 3.6/4.2 |
| Latitude -15 | Average | 2.9 | 3.9 | 4.6 | 5.2 | 5.8 | 6.1 | 6.2 | 5.8 | 4.8 | 3.8 | 2.6 | 2.3 | 4.5 |
| | Min/Max | 2.0/3.8 | 2.9/4.5 | 3.5/5.8 | 4.4/6.2 | 5.0/6.7 | 5.4/7.2 | 5.2/6.8 | 5.0/6.8 | 3.7/6.0 | 3.0/4.5 | 1.7/3.1 | 1.8/3.0 | 4.1/4.9 |
| Latitude | Average | 3.3 | 4.3 | 4.8 | 5.0 | 5.4 | 5.6 | 5.8 | 5.5 | 4.8 | 4.1 | 2.8 | 2.6 | 4.5 |
| | Min/Max | 2.2/4.5 | 3.1/4.9 | 3.5/6.1 | 4.3/6.0 | 4.7/6.2 | 5.0/6.6 | 4.8/6.3 | 4.8/6.5 | 3.7/6.1 | 3.1/4.9 | 1.8/3.5 | 2.0/3.5 | 4.0/5.0 |
| Latitude +15 | Average | 3.6 | 4.4 | 4.7 | 4.7 | 4.8 | 4.9 | 5.0 | 5.0 | 4.6 | 4.1 | 2.9 | 2.8 | 4.3 |
| | Min/Max | 2.3/4.9 | 3.1/5.2 | 3.4/6.1 | 3.9/5.6 | 4.2/5.5 | 4.3/5.7 | 4.2/5.4 | 4.3/5.9 | 3.4/5.8 | 3.0/4.9 | 1.8/3.7 | 2.1/3.8 | 3.8/4.7 |
| 90 | Average | 3.5 | 4.1 | 3.9 | 3.2 | 2.9 | 2.8 | 2.9 | 3.2 | 3.4 | 3.4 | 2.6 | 2.7 | 3.2 |
| | Min/Max | 2.2/4.8 | 2.9/4.9 | 2.7/5.1 | 2.7/3.8 | 2.5/3.2 | 2.5/3.1 | 2.5/3.1 | 2.8/3.7 | 2.5/4.3 | 2.5/4.1 | 1.5/3.5 | 1.9/3.7 | 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 | 2.7 | 3.9 | 5.1 | 6.2 | 7.5 | 8.2 | 8.2 | 7.2 | 5.5 | 3.9 | 2.3 | 2.0 | 5.2 |
| | Min/Max | 1.8/3.5 | 2.8/4.5 | 3.6/6.5 | 5.1/7.7 | 6.0/8.9 | 6.8/10.0 | 6.7/9.3 | 6.1/8.8 | 4.0/6.9 | 3.0/4.7 | 1.5/2.9 | 1.5/2.6 | 4.6/5.9 |
| Latitude -15 | Average | 3.5 | 4.8 | 5.8 | 6.6 | 7.6 | 8.2 | 8.3 | 7.6 | 6.1 | 4.7 | 3.0 | 2.7 | 5.7 |
| | Min/Max | 2.3/4.7 | 3.3/5.7 | 4.0/7.5 | 5.4/8.3 | 6.2/9.1 | 6.8/10.1 | 6.7/9.5 | 6.3/9.3 | 4.3/7.8 | 3.5/5.7 | 1.8/3.8 | 2.0/3.6 | 5.0/6.5 |
| Latitude | Average | 3.9 | 5.1 | 5.9 | 6.5 | 7.4 | 7.9 | 8.0 | 7.4 | 6.1 | 4.9 | 3.2 | 3.0 | 5.8 |
| | Min/Max | 2.4/5.3 | 3.4/6.1 | 4.0/7.7 | 5.3/8.3 | 6.0/8.8 | 6.5/9.7 | 6.4/9.1 | 6.2/9.2 | 4.3/7.9 | 3.6/6.0 | 1.9/4.1 | 2.2/4.0 | 5.0/6.5 |
| Latitude +15 | Average | 4.1 | 5.2 | 5.9 | 6.2 | 7.0 | 7.3 | 7.5 | 7.1 | 5.9 | 4.9 | 3.3 | 3.1 | 5.6 |
| | Min/Max | 2.5/5.6 | 3.5/6.2 | 3.9/7.7 | 5.1/7.9 | 5.6/8.3 | 6.1/9.1 | 6.0/8.6 | 5.9/8.8 | 4.1/7.8 | 3.5/6.0 | 1.9/4.3 | 2.3/4.2 | 4.8/6.4 |

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

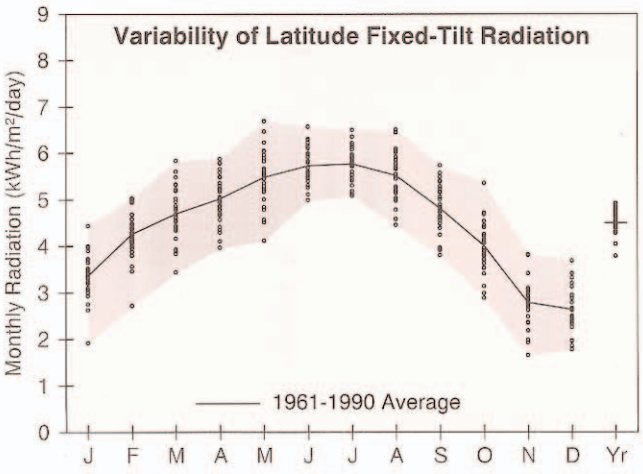
| Tracker | | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2-Axis | Average | 4.1 | 5.2 | 6.0 | 6.6 | 7.7 | 8.4 | 8.5 | 7.6 | 6.1 | 4.9 | 3.3 | 3.2 | 6.0 |
| | Min/Max | 2.5/5.6 | 3.5/6.2 | 4.1/7.7 | 5.4/8.4 | 6.3/9.2 | 7.0/10.4 | 6.8/9.6 | 6.4/9.4 | 4.3/7.9 | 3.6/6.1 | 1.9/4.3 | 2.3/4.3 | 5.2/6.7 |

### 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 | 2.3 | 2.7 | 2.8 | 2.9 | 3.5 | 3.9 | 4.0 | 3.5 | 2.9 | 2.6 | 1.8 | 1.8 | 2.9 |
| Horiz Axis | Min/Max | 1.1/3.5 | 1.1/3.9 | 1.5/3.9 | 2.1/4.4 | 2.4/4.7 | 2.7/5.4 | 2.7/4.8 | 2.6/5.0 | 1.5/4.4 | 1.6/3.5 | 0.7/2.5 | 1.1/2.7 | 2.2/3.5 |
| 1-Axis, N-S | Average | 1.5 | 2.3 | 3.0 | 3.7 | 4.6 | 5.1 | 5.2 | 4.6 | 3.4 | 2.4 | 1.3 | 1.1 | 3.2 |
| Horiz Axis | Min/Max | 0.7/2.3 | 0.9/3.3 | 1.5/4.3 | 2.6/5.6 | 3.1/6.2 | 3.5/7.1 | 3.6/6.5 | 3.4/6.5 | 1.8/5.2 | 1.5/3.3 | 0.5/1.8 | 0.7/1.7 | 2.5/3.9 |
| 1-Axis, N-S | Average | 2.4 | 3.2 | 3.6 | 4.0 | 4.6 | 4.8 | 5.1 | 4.8 | 3.9 | 3.2 | 2.0 | 1.8 | 3.6 |
| Tilt=Latitude | Min/Max | 1.2/3.8 | 1.3/4.6 | 1.9/5.2 | 2.8/6.1 | 3.1/6.2 | 3.4/6.8 | 3.5/6.3 | 3.6/6.8 | 2.0/6.0 | 1.9/4.3 | 0.7/2.8 | 1.1/2.8 | 2.8/4.4 |
| 2-Axis | Average | 2.6 | 3.3 | 3.7 | 4.1 | 4.9 | 5.3 | 5.4 | 4.9 | 3.9 | 3.3 | 2.1 | 2.0 | 3.8 |
| | Min/Max | 1.3/4.1 | 1.4/4.8 | 1.9/5.2 | 2.9/6.2 | 3.3/6.5 | 3.7/7.4 | 3.7/6.7 | 3.7/7.0 | 2.0/6.0 | 2.0/4.4 | 0.8/3.0 | 1.2/3.0 | 2.9/4.6 |

### Average Climatic Conditions

| Element | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature (°C) | -9.8 | -6.7 | 0.4 | 8.7 | 15.3 | 20.3 | 23.1 | 21.6 | 16.6 | 10.1 | 2.0 | -6.5 | 7.9 |
| Daily Minimum Temp | -14.8 | -12.2 | -4.7 | 2.8 | 8.9 | 13.9 | 16.8 | 15.5 | 10.7 | 4.6 | -2.4 | -10.8 | 2.4 |
| Daily Maximum Temp | -4.7 | -1.3 | 5.6 | 14.7 | 21.6 | 26.6 | 29.2 | 27.6 | 22.4 | 15.7 | 6.3 | -2.2 | 13.4 |
| Record Minimum Temp | -38.3 | -37.8 | -33.3 | -13.9 | -3.3 | 2.8 | 0.6 | 4.4 | -2.2 | -10.0 | -22.8 | -34.4 | -38.3 |
| Record Maximum Temp | 13.9 | 17.8 | 28.9 | 33.9 | 34.4 | 38.9 | 40.0 | 40.6 | 37.8 | 33.9 | 23.9 | 17.8 | 40.6 |
| HDD, Base 18.3°C | 872 | 702 | 554 | 288 | 122 | 20 | 4 | 9 | 73 | 258 | 490 | 770 | 4162 |
| CDD, Base 18.3°C | 0 | 0 | 0 | 0 | 28 | 78 | 150 | 109 | 19 | 0 | 0 | 0 | 384 |
| Relative Humidity (%) | 73 | 72 | 71 | 64 | 65 | 70 | 72 | 75 | 77 | 71 | 75 | 77 | 72 |
| Wind Speed (m/s) | 3.9 | 3.7 | 4.1 | 4.4 | 4.0 | 3.7 | 3.4 | 3.3 | 3.6 | 3.9 | 4.1 | 3.8 | 3.8 |




# Madison, WI

## WBAN NO. 14837

LATITUDE: 43.13° N
LONGITUDE: 89.33° W
ELEVATION: 262 meters
MEAN PRESSURE: 985 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 | 2.8 | 3.7 | 4.7 | 5.8 | 6.4 | 6.2 | 5.4 | 4.1 | 2.8 | 1.7 | 1.5 | 3.9 |
| | Min/Max | 1.3/2.2 | 2.2/3.2 | 3.0/4.3 | 3.9/5.4 | 4.3/7.0 | 5.6/7.3 | 5.6/7.0 | 4.4/6.2 | 3.4/4.7 | 2.2/3.5 | 1.2/2.2 | 1.0/1.9 | 3.5/4.3 |
| Latitude -15 | Average | 3.0 | 3.9 | 4.5 | 5.1 | 5.8 | 6.2 | 6.2 | 5.7 | 4.8 | 3.8 | 2.5 | 2.3 | 4.5 |
| | Min/Max | 1.8/3.8 | 2.6/4.5 | 3.4/5.6 | 4.1/6.0 | 4.4/7.1 | 5.4/7.2 | 5.5/7.0 | 4.7/6.8 | 3.8/5.7 | 2.8/5.0 | 1.6/3.4 | 1.6/3.2 | 3.9/4.9 |
| Latitude | Average | 3.4 | 4.3 | 4.7 | 5.0 | 5.5 | 5.7 | 5.8 | 5.5 | 4.8 | 4.0 | 2.8 | 2.6 | 4.5 |
| | Min/Max | 1.9/4.4 | 2.7/5.0 | 3.4/5.8 | 4.0/5.9 | 4.1/6.7 | 5.0/6.6 | 5.1/6.5 | 4.5/6.5 | 3.8/5.7 | 2.9/5.4 | 1.7/3.8 | 1.8/3.7 | 3.8/4.9 |
| Latitude +15 | Average | 3.6 | 4.4 | 4.6 | 4.6 | 4.8 | 4.9 | 5.0 | 5.0 | 4.6 | 4.0 | 2.9 | 2.8 | 4.3 |
| | Min/Max | 2.0/4.8 | 2.7/5.3 | 3.3/5.8 | 3.6/5.5 | 3.7/5.9 | 4.3/5.7 | 4.4/5.7 | 4.0/5.9 | 3.6/5.5 | 2.8/5.4 | 1.7/4.1 | 1.8/4.0 | 3.5/4.7 |
| 90 | Average | 3.5 | 4.0 | 3.7 | 3.2 | 2.9 | 2.8 | 2.9 | 3.2 | 3.4 | 3.3 | 2.6 | 2.7 | 3.2 |
| | Min/Max | 1.8/4.7 | 2.4/4.9 | 2.8/4.7 | 2.5/3.7 | 2.3/3.4 | 2.5/3.1 | 2.6/3.2 | 2.6/3.7 | 2.6/4.0 | 2.3/4.6 | 1.4/3.7 | 1.7/4.0 | 2.6/3.5 |

### 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 | 2.7 | 3.9 | 5.0 | 6.1 | 7.4 | 8.1 | 7.9 | 7.0 | 5.4 | 3.9 | 2.3 | 2.0 | 5.1 |
| | Min/Max | 1.5/3.5 | 2.5/4.6 | 3.5/6.3 | 4.6/7.5 | 5.0/9.2 | 6.8/9.4 | 6.8/9.3 | 5.2/8.5 | 4.2/6.6 | 2.8/5.3 | 1.4/3.2 | 1.4/2.8 | 4.2/5.7 |
| Latitude -15 | Average | 3.5 | 4.8 | 5.6 | 6.5 | 7.5 | 8.1 | 8.0 | 7.3 | 6.0 | 4.6 | 2.9 | 2.7 | 5.6 |
| | Min/Max | 1.9/4.7 | 2.8/5.8 | 3.8/7.3 | 4.8/8.0 | 5.1/9.4 | 6.8/9.4 | 6.8/9.4 | 5.4/9.0 | 4.6/7.4 | 3.2/6.4 | 1.7/4.2 | 1.8/3.8 | 4.5/6.3 |
| Latitude | Average | 3.9 | 5.0 | 5.8 | 6.4 | 7.3 | 7.8 | 7.7 | 7.1 | 6.0 | 4.8 | 3.2 | 3.0 | 5.7 |
| | Min/Max | 2.1/5.2 | 3.0/6.2 | 3.9/7.5 | 4.7/8.0 | 4.9/9.2 | 6.5/9.0 | 6.6/9.1 | 5.3/8.8 | 4.6/7.4 | 3.3/6.7 | 1.8/4.5 | 1.9/4.2 | 4.5/6.3 |
| Latitude +15 | Average | 4.0 | 5.2 | 5.7 | 6.1 | 6.8 | 7.2 | 7.2 | 6.8 | 5.8 | 4.8 | 3.2 | 3.1 | 5.5 |
| | Min/Max | 2.1/5.5 | 3.0/6.3 | 3.8/7.4 | 4.4/7.7 | 4.6/8.6 | 6.1/8.4 | 6.1/8.5 | 4.9/8.4 | 4.4/7.2 | 3.3/6.7 | 1.8/4.7 | 1.9/4.5 | 4.3/6.2 |

### 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 | 4.1 | 5.2 | 5.8 | 6.5 | 7.6 | 8.3 | 8.2 | 7.3 | 6.0 | 4.8 | 3.3 | 3.2 | 5.9 |
| | Min/Max | 2.1/5.6 | 3.0/6.3 | 3.9/7.5 | 4.8/8.1 | 5.1/9.6 | 6.9/9.6 | 7.0/9.6 | 5.4/9.0 | 4.6/7.4 | 3.3/6.8 | 1.8/4.7 | 2.0/4.6 | 4.6/6.5 |

### 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 | 2.3 | 2.6 | 2.6 | 2.8 | 3.3 | 3.7 | 3.6 | 3.2 | 2.7 | 2.5 | 1.7 | 1.7 | 2.7 |
| | Min/Max | 0.8/3.5 | 0.8/3.9 | 1.2/4.1 | 1.6/4.0 | 1.7/4.8 | 2.5/4.8 | 2.6/4.8 | 1.8/4.5 | 1.7/3.8 | 1.4/3.9 | 0.7/2.8 | 0.7/2.6 | 1.8/3.3 |
| 1-Axis, N-S Horiz Axis | Average | 1.5 | 2.2 | 2.8 | 3.5 | 4.4 | 4.8 | 4.7 | 4.0 | 3.2 | 2.3 | 1.3 | 1.1 | 3.0 |
| | Min/Max | 0.5/2.3 | 0.6/3.4 | 1.2/4.4 | 1.9/5.2 | 2.1/6.4 | 3.2/6.3 | 3.3/6.3 | 2.0/5.8 | 2.0/4.5 | 1.4/3.8 | 0.5/2.1 | 0.4/1.6 | 1.9/3.6 |
| 1-Axis, N-S Tilt=Latitude | Average | 2.4 | 3.1 | 3.4 | 3.8 | 4.3 | 4.6 | 4.5 | 4.2 | 3.7 | 3.0 | 1.9 | 1.8 | 3.4 |
| | Min/Max | 0.8/3.8 | 0.9/4.7 | 1.5/5.4 | 2.1/5.6 | 2.1/6.3 | 3.1/6.0 | 3.2/6.1 | 2.1/6.0 | 2.3/5.2 | 1.8/5.0 | 0.8/3.2 | 0.7/2.7 | 2.1/4.1 |
| 2-Axis | Average | 2.6 | 3.1 | 3.4 | 3.9 | 4.6 | 5.0 | 4.9 | 4.3 | 3.7 | 3.1 | 2.0 | 2.0 | 3.5 |
| | Min/Max | 0.9/4.1 | 0.9/4.9 | 1.5/5.4 | 2.1/5.6 | 2.3/6.6 | 3.3/6.5 | 3.4/6.6 | 2.2/6.2 | 2.3/5.2 | 1.8/5.0 | 0.8/3.3 | 0.8/3.0 | 2.2/4.3 |

### Average Climatic Conditions

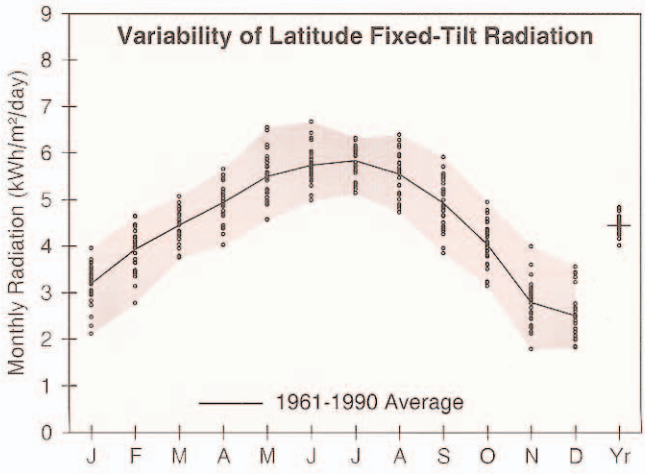
| Element | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature (°C) | -8.9 | -6.3 | 0.2 | 7.4 | 13.6 | 19.0 | 21.7 | 20.2 | 15.4 | 9.4 | 1.9 | -5.7 | 7.3 |
| Daily Minimum Temp | -13.8 | -11.6 | -5.0 | 1.2 | 6.8 | 12.3 | 15.3 | 13.8 | 9.0 | 3.2 | -2.9 | -10.3 | 1.5 |
| Daily Maximum Temp | -4.0 | -1.1 | 5.3 | 13.7 | 20.5 | 25.7 | 28.0 | 26.4 | 21.9 | 15.5 | 6.7 | -1.2 | 13.1 |
| Record Minimum Temp | -38.3 | -33.3 | -33.9 | -17.8 | -7.2 | -0.6 | 2.2 | 1.7 | -3.9 | -10.6 | -23.9 | -31.7 | -38.3 |
| Record Maximum Temp | 13.3 | 16.1 | 27.8 | 34.4 | 33.9 | 38.3 | 40.0 | 38.9 | 37.2 | 32.2 | 24.4 | 16.7 | 40.0 |
| HDD, Base 18.3°C | 844 | 691 | 563 | 327 | 163 | 38 | 7 | 21 | 93 | 277 | 493 | 746 | 4263 |
| CDD, Base 18.3°C | 0 | 0 | 0 | 0 | 17 | 58 | 110 | 78 | 7 | 0 | 0 | 0 | 269 |
| Relative Humidity (%) | 74 | 73 | 71 | 66 | 66 | 68 | 71 | 74 | 77 | 73 | 77 | 78 | 73 |
| Wind Speed (m/s) | 4.6 | 4.5 | 4.9 | 5.0 | 4.3 | 4.0 | 3.6 | 3.4 | 3.8 | 4.2 | 4.6 | 4.5 | 4.3 |

# Milwaukee, WI

## WBAN NO. 14839

LATITUDE: 42.95° N
LONGITUDE: 87.90° W
ELEVATION: 211 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 | 1.8 | 2.6 | 3.5 | 4.6 | 5.8 | 6.4 | 6.3 | 5.4 | 4.1 | 2.9 | 1.8 | 1.4 | 3.9 |
| | Min/Max | 1.4/2.1 | 2.2/3.0 | 3.2/3.9 | 3.9/5.2 | 4.9/6.8 | 5.6/7.4 | 5.6/6.8 | 4.7/6.1 | 3.5/4.8 | 2.4/3.3 | 1.4/2.1 | 1.2/1.7 | 3.7/4.2 |
| Latitude -15 | Average | 2.8 | 3.6 | 4.3 | 5.1 | 5.9 | 6.2 | 6.3 | 5.8 | 4.9 | 3.8 | 2.5 | 2.2 | 4.5 |
| | Min/Max | 1.9/3.4 | 2.7/4.2 | 3.7/4.9 | 4.2/5.8 | 4.9/7.0 | 5.4/7.3 | 5.6/6.8 | 4.9/6.6 | 3.9/5.8 | 3.0/4.6 | 1.7/3.5 | 1.7/3.1 | 4.1/4.8 |
| Latitude | Average | 3.2 | 3.9 | 4.4 | 4.9 | 5.5 | 5.7 | 5.8 | 5.6 | 4.9 | 4.0 | 2.8 | 2.5 | 4.5 |
| | Min/Max | 2.1/4.0 | 2.8/4.7 | 3.8/5.1 | 4.0/5.7 | 4.6/6.6 | 5.0/6.7 | 5.2/6.3 | 4.7/6.4 | 3.8/5.9 | 3.2/4.9 | 1.8/4.0 | 1.8/3.6 | 4.0/4.8 |
| Latitude +15 | Average | 3.4 | 4.1 | 4.4 | 4.6 | 4.9 | 5.0 | 5.1 | 5.0 | 4.7 | 4.0 | 2.9 | 2.7 | 4.2 |
| | Min/Max | 2.2/4.3 | 2.8/4.9 | 3.7/5.0 | 3.7/5.3 | 4.0/5.8 | 4.3/5.7 | 4.5/5.5 | 4.3/5.8 | 3.6/5.7 | 3.1/5.0 | 1.8/4.2 | 1.9/3.8 | 3.8/4.6 |
| 90 | Average | 3.3 | 3.7 | 3.5 | 3.1 | 2.9 | 2.7 | 2.9 | 3.2 | 3.4 | 3.3 | 2.6 | 2.6 | 3.1 |
| | Min/Max | 2.0/4.1 | 2.4/4.5 | 2.8/4.0 | 2.5/3.5 | 2.5/3.3 | 2.5/3.0 | 2.6/3.0 | 2.7/3.7 | 2.6/4.2 | 2.5/4.2 | 1.5/3.9 | 1.8/3.7 | 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 | 2.6 | 3.6 | 4.7 | 6.0 | 7.5 | 8.2 | 8.3 | 7.2 | 5.6 | 3.9 | 2.3 | 2.0 | 5.2 |
| | Min/Max | 1.7/3.1 | 2.6/4.3 | 3.9/5.5 | 4.8/6.9 | 5.9/9.2 | 6.8/10.0 | 7.3/9.1 | 6.0/8.6 | 4.3/6.8 | 3.2/4.8 | 1.6/3.3 | 1.4/2.6 | 4.7/5.7 |
| Latitude -15 | Average | 3.3 | 4.4 | 5.3 | 6.4 | 7.6 | 8.3 | 8.4 | 7.6 | 6.2 | 4.7 | 2.9 | 2.6 | 5.6 |
| | Min/Max | 2.1/4.1 | 3.0/5.3 | 4.3/6.3 | 5.1/7.4 | 6.0/9.5 | 6.8/10.1 | 7.3/9.3 | 6.3/9.0 | 4.7/7.6 | 3.6/5.8 | 1.8/4.3 | 1.8/3.6 | 5.0/6.3 |
| Latitude | Average | 3.7 | 4.6 | 5.4 | 6.3 | 7.4 | 7.9 | 8.1 | 7.4 | 6.2 | 4.9 | 3.2 | 2.8 | 5.7 |
| | Min/Max | 2.3/4.6 | 3.1/5.6 | 4.4/6.4 | 5.0/7.3 | 5.8/9.2 | 6.5/9.7 | 7.1/8.9 | 6.1/8.9 | 4.7/7.7 | 3.7/6.1 | 1.9/4.7 | 2.0/4.1 | 5.0/6.3 |
| Latitude +15 | Average | 3.8 | 4.7 | 5.4 | 6.0 | 6.9 | 7.4 | 7.6 | 7.1 | 6.1 | 4.9 | 3.2 | 3.0 | 5.5 |
| | Min/Max | 2.4/4.8 | 3.1/5.7 | 4.3/6.3 | 4.8/7.0 | 5.4/8.7 | 6.1/9.1 | 6.6/8.4 | 5.8/8.5 | 4.5/7.5 | 3.7/6.1 | 1.9/4.9 | 2.1/4.3 | 4.8/6.1 |

### 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 | 3.9 | 4.7 | 5.5 | 6.4 | 7.7 | 8.5 | 8.5 | 7.6 | 6.3 | 4.9 | 3.3 | 3.0 | 5.9 |
| | Min/Max | 2.4/4.9 | 3.1/5.8 | 4.4/6.4 | 5.1/7.4 | 6.1/9.6 | 7.0/10.4 | 7.5/9.4 | 6.3/9.1 | 4.7/7.7 | 3.7/6.1 | 1.9/4.9 | 2.1/4.4 | 5.2/6.5 |

### 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 | 2.1 | 2.3 | 2.4 | 2.8 | 3.5 | 4.0 | 4.0 | 3.5 | 3.0 | 2.5 | 1.7 | 1.6 | 2.8 |
| | Min/Max | 1.1/2.9 | 1.0/3.4 | 1.5/3.2 | 1.9/3.6 | 2.2/4.9 | 2.8/5.5 | 3.1/4.9 | 2.5/4.5 | 1.8/4.1 | 1.5/3.5 | 0.7/3.1 | 0.9/2.9 | 2.2/3.3 |
| 1-Axis, N-S Horiz Axis | Average | 1.4 | 2.0 | 2.6 | 3.5 | 4.6 | 5.2 | 5.3 | 4.6 | 3.5 | 2.4 | 1.3 | 1.0 | 3.1 |
| | Min/Max | 0.7/1.9 | 0.9/3.0 | 1.6/3.5 | 2.5/4.4 | 2.9/6.4 | 3.7/7.2 | 4.1/6.3 | 3.3/5.9 | 2.2/4.8 | 1.5/3.3 | 0.5/2.2 | 0.6/1.8 | 2.5/3.7 |
| 1-Axis, N-S Tilt=Latitude | Average | 2.3 | 2.8 | 3.2 | 3.8 | 4.5 | 4.9 | 5.1 | 4.7 | 4.0 | 3.1 | 1.9 | 1.7 | 3.5 |
| | Min/Max | 1.1/3.1 | 1.2/4.1 | 2.0/4.3 | 2.6/4.8 | 2.9/6.3 | 3.5/6.9 | 3.9/6.1 | 3.4/6.1 | 2.5/5.5 | 2.0/4.3 | 0.8/3.4 | 0.9/3.0 | 2.8/4.2 |
| 2-Axis | Average | 2.4 | 2.8 | 3.2 | 3.8 | 4.8 | 5.3 | 5.5 | 4.9 | 4.0 | 3.2 | 2.0 | 1.8 | 3.7 |
| | Min/Max | 1.2/3.3 | 1.3/4.2 | 2.0/4.3 | 2.7/4.8 | 3.0/6.7 | 3.8/7.5 | 4.2/6.6 | 3.5/6.3 | 2.5/5.6 | 2.0/4.4 | 0.8/3.6 | 1.0/3.3 | 2.9/4.4 |

### Average Climatic Conditions

| Element | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature (°C) | -7.3 | -5.0 | 0.7 | 6.9 | 12.6 | 18.3 | 21.6 | 20.7 | 16.5 | 10.2 | 3.2 | -4.2 | 7.8 |
| Daily Minimum Temp | -11.3 | -8.9 | -3.2 | 2.1 | 7.1 | 12.8 | 16.7 | 16.0 | 11.6 | 5.4 | -0.7 | -8.1 | 3.3 |
| Daily Maximum Temp | -3.3 | -1.1 | 4.7 | 11.6 | 17.9 | 23.8 | 26.6 | 25.4 | 21.4 | 14.8 | 7.1 | -0.4 | 12.4 |
| Record Minimum Temp | -32.2 | -28.3 | -23.3 | -11.1 | -6.1 | 0.6 | 4.4 | 6.7 | -2.2 | -7.8 | -20.6 | -28.9 | -32.2 |
| Record Maximum Temp | 16.7 | 18.3 | 27.8 | 32.8 | 33.9 | 38.3 | 38.3 | 39.4 | 36.7 | 31.7 | 25.0 | 17.2 | 39.4 |
| HDD, Base 18.3°C | 794 | 653 | 546 | 343 | 188 | 46 | 8 | 15 | 68 | 253 | 455 | 699 | 4069 |
| CDD, Base 18.3°C | 0 | 0 | 0 | 0 | 9 | 46 | 109 | 89 | 13 | 0 | 0 | 0 | 266 |
| Relative Humidity (%) | 72 | 72 | 71 | 69 | 68 | 70 | 72 | 75 | 75 | 72 | 75 | 76 | 72 |
| Wind Speed (m/s) | 5.5 | 5.3 | 5.5 | 5.5 | 4.9 | 4.6 | 4.3 | 4.2 | 4.5 | 5.0 | 5.3 | 5.3 | 5.0 |