



## A Performance Calculator for Grid-Connected PV Systems

### Attention Previous Users:

The PVWATTS system size input has been changed from an AC kW rating to a DC kW rating and a DC to AC derate factor. See [PVWATTS Revision History](#) for more information about this and other changes.

PVWATTS calculates electrical energy produced by a grid-connected photovoltaic (PV) system. Researchers at the National Renewable Energy Laboratory developed PVWATTS to permit non-experts to quickly obtain performance estimates for grid-connected PV systems within the United States and its territories.

In a grid-connected PV system, PV modules, wired together to form a PV array, pass DC electricity through an inverter to convert it into AC power. If the PV system AC power is greater than the owner's needs, the inverter sends the surplus to the utility grid for use by others. The utility provides AC power to the owner at night and during times when the owner's requirements exceed the capability of the PV system.

- [More About PVWATTS](#)
- [PVWATTS: System Parameters](#)
- [PVWATTS: Interpreting the Results](#)
- [PVWATTS: Revision History](#)

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- [How Photovoltaics Work](#)
- [PV Manufacturers and Suppliers](#)
- [Consumer's Guides](#)
- [Financial Incentives and Programs](#)
- [Net Metering Information](#)

[http://rredc.nrel.gov/solar/codes\\_algs/PVWATTS/](http://rredc.nrel.gov/solar/codes_algs/PVWATTS/)

Version 1 allows the user to select a location from a map (United States and Territories) or from a text list (U.S. and outside the U.S.) The calculations may be done using the default system parameters, or the user may specify the PV system size, local electric costs, whether a fixed or tracking PV array, and the PV array tilt and azimuth angles. PVWATTS calculates monthly and annual energy production in kWh and savings in dollars. The user may also choose to output hourly AC power data which can be saved to a text file.

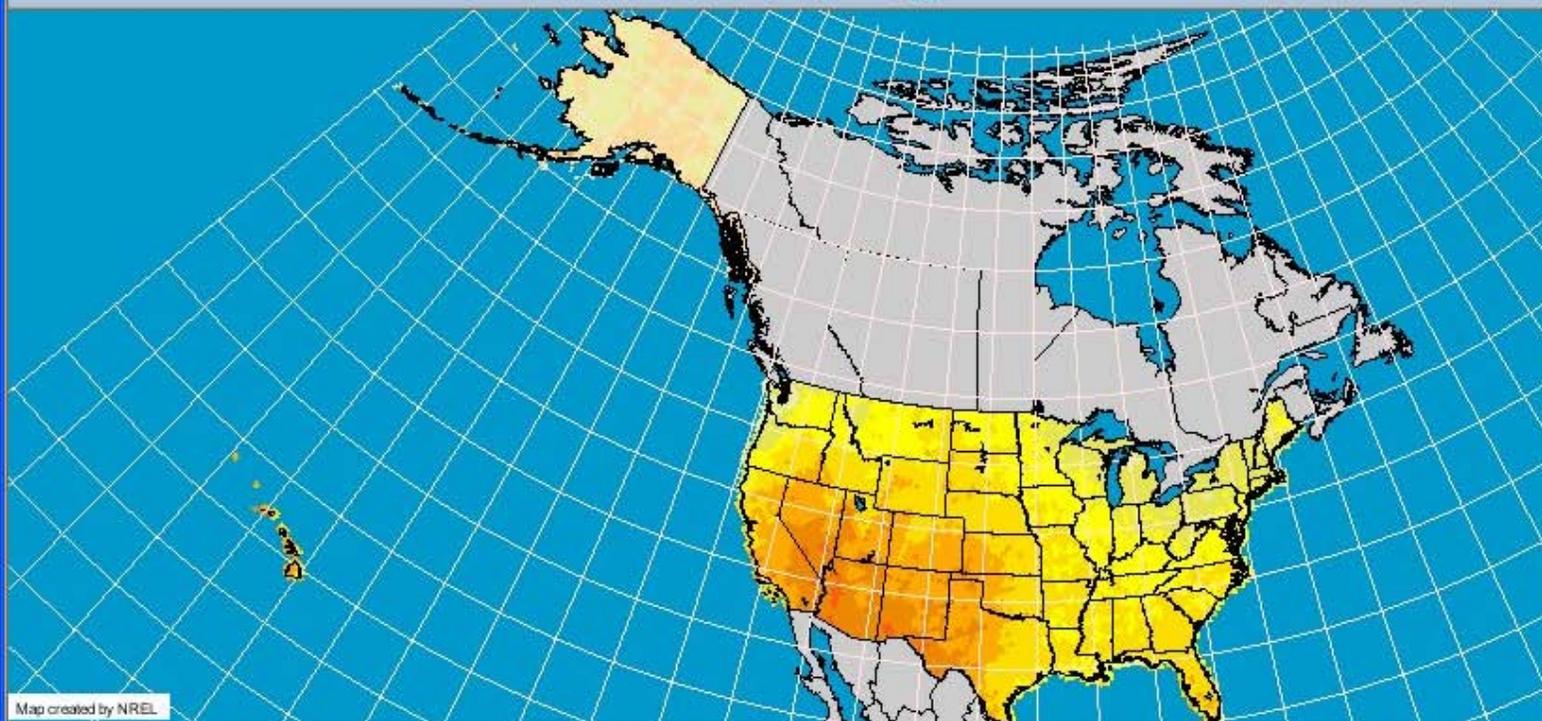
**Version 2 allows the user to select a U.S. location (based on a 40 km grid cell) by using [NREL's Internet Map Server](http://www.nrel.gov/gis) (IMS) at <http://www.nrel.gov/gis>. Because PVWATTS Version 2 uses additional input data, the results may differ slightly from those for PVWATTS Version 1. Version 2 can be run only for the 48 contiguous states, Alaska and Hawaii. The use of the Internet Map Server increases the complexity of PVWATTS, but provides additional information for locations.**



# PVWATTS Version 2



Zoom In



- ### LAYERS
- All Layers
  - PVWATTS
    - Launch PVWA1
    - Annual Solar Resource C
      - Flat Plate Tilted
      - Zoomed in Grid fo
    - Reference Data
      - Counties
      - Major Roads
      - Places
      - Zip Codes

**Refresh Map**  
 Auto Refresh

### Help:

- A closed group, click to open.
- An open group, click to close.
- A map layer.
- A visible group/layer, click to hide.
- A visible layer, but not at this scale.
- An inactive layer, click to make active.
- The active layer.

Launch PVWATTS Version 2 is now the Active Layer

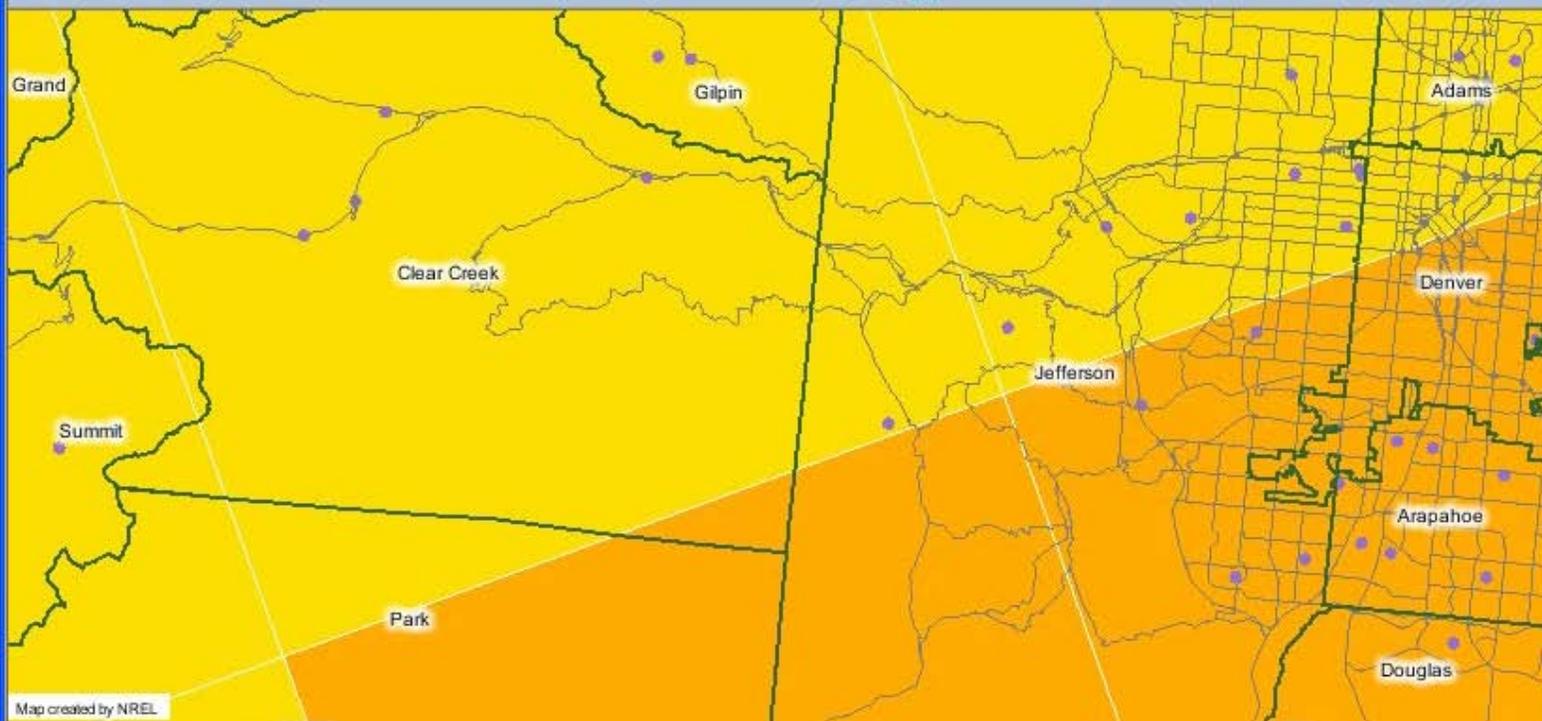
Find Location - By A 5 Digit Zip Code:

By Latitude/Longitude (in decimal degrees):

**NREL** PVWATTS Version 2



Zoom In



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**Zip Codes**

Rec	Zip Code	Post Office Name
1	80439	EVERGREEN

Find Location - By A 5 Digit Zip Code:

By Latitude/Longitude (in decimal degrees):



Click on **Calculate** if default values are acceptable, or after selecting your system specifications. Click on **Help** for information about system specifications. To use a DC to AC derate factor other than the default, click on **Derate Factor Help** for information.

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**Site Location:**

Cell ID: 0207363  
State\*: Colorado  
Latitude\*: 39.61  
Longitude\*: -104.928

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**PV System Specifications:**

DC Rating (kW):   
DC to AC Derate Factor:  **DERATE FACTOR HELP**  
Array Type:    
Fixed Tilt or 1-Axis Tracking System:  
Array Tilt (degrees):  (Default = Latitude)  
Array Azimuth (degrees):  (Default = South)

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**Energy Data:**

Cost of Electricity (cents/kWh):

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# AC Energy & Cost Savings



## Station Identification

Cell ID:	0207363
State:	Colorado
Latitude:	39.6 ° N
Longitude:	104.9 ° W

## PV System Specifications

DC Rating:	4.00 kW
DC to AC Derate Factor:	0.770
AC Rating:	3.08 kW
Array Type:	Fixed Tilt
Array Tilt:	39.6 °
Array Azimuth:	180.0 °

## Energy Specifications

Cost of Electricity:	8.6 ¢/kWh
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## Results

Month	Solar Radiation (kWh/m <sup>2</sup> /day)	AC Energy (kWh)	Energy Value (\$)
1	4.82	463	39.61
2	5.04	428	36.62
3	5.65	527	45.09
4	5.76	501	42.87
5	5.94	519	44.41
6	6.17	507	43.38
7	6.28	520	44.49
8	6.24	519	44.41
9	6.11	508	43.46
10	5.62	499	42.69
11	4.42	403	34.48
12	4.40	419	35.85
Year	5.54	5813	497.36



