

## Off Grid Cabin Package A 130W PV



List Price: \$3,721.14

Our Price: **\$3,158.80** Save: **\$562.34**

Our Code: KITBLKBS

This item is a package made up of the following components. Please call to speak to a sales representative to learn about other options which may be available.

- 2 x [Kyocera KC65T 65W 12V Solar Panel with J-Box](#)
- 4 x [AEE Grounding Lugs With Set Screws Qty-1](#)
- 4 x [1/2" Strain Relief with 1 Round Hole](#)
- 1 x [Ready Watt Pass-Thru Box](#)
- 20 x [USE-2/RHW-2, 1 conductor 10awg per foot](#)
- 1 x [Midnite Solar MNDC250 Mini 250 Amp DC Disconnect](#)
- 1 x [MNDC-GFP 63 Amp DC Ground Fault Protector](#)
- 1 x [Morningstar Sunsaver MPPT Charge Controller](#)
- 2 x [Outback 15 Amp Din Rail Mount Breaker](#)
- 1 x [IronRidge Uni-Gr/02A Gr/Rf W/55" Support](#)
- 2 x [8AGC2 AGM 6V, 190 Amp-Hour \(20 Hr\) Sealed Battery](#)
- 1 x [Sunwize Battery Interconnect Cable 4/0 8" Blk](#)
- 1 x [Inverter to Battery Cable Set 4/0 10Ft](#)
- 1 x [Sunwize Battery Interconnect Cable 4/0 36" Black](#)
- 1 x [Sunwize Battery Interconnect Cable 4/0 36" Red](#)
- 1 x [Samlex S-2012 2000W Pure Sine Inverter-Charger](#)
- 1 x [500A, 50Mv Shunt](#)

### 130W Cabin Packaged System

Solar Panel Package (Photovoltaic) for the Energy-Efficient Remote Cabin

#### Description

This a DC system kit for an energy-efficient remote cabin. The output of this system varies depending upon where you live and what time of the year it is. Use the map at the bottom of the page to get an idea of how many Watt\*Hours you can expect from your system on average during a typical year. Expect more output in the summer (highest output period) and less in the winter (lowest output period). Please consult the [Photovoltaic Power Systems And the 2005 National Electrical Code: Suggested Practices Photovoltaic Power Systems](#) publication for information regarding electrical wiring requirements.

## **Components:**

### **1. Photovoltaic Modules (aka solar panels, solar electric panels)**

The PV modules are the individual building blocks for providing power from the sun. They are typically made from silicon cells, glass, tedlar, and aluminum. PV modules can vary in type, size, shape, and color. The common nominal voltages for modules are 12V and 24V, but newer modules that are intended for grid tie systems, often now have much higher voltages to accommodate the voltage windows of grid tie inverters. Costs for PV modules are currently ranging between \$4.40 and \$5.40 USD per rated watt.

### **2. Racking/Mounting System for PV modules**

The mounting system for the PV modules includes the hardware to permanently affix the array to either a roof, a pole, or the ground. These systems are typically made of aluminum and are customized to the mounting surface and the model of module used. It is important to consider distance from roof for flush-type roof mount installations. Restricting airflow under the modules results in higher module operating temperatures that reduce power output. With pole mounts wind loading must be considered and proper civil works must be done with the foundation for the pole as well as the possible addition of supplementary wind supports for the array frame. The cost of a mounting system can vary drastically based upon the number of modules and type of mount. The average cost is between \$250 and \$1000 USD.

### **3. Combiner Box**

A combiner box is an electrical box where series strings of PV modules are then spliced in parallel. This is also the place where the PV series string fuses or circuit breakers are located. This allows the installer to bring the separate strings together and combine them into one positive and one negative conductor, change wire types and leave the area of the modules in conduit. They are usually outside and weather rated, so they can be right next to the array. Combiner boxes usually cost between \$80 and \$140 USD.

### **4. Charge Controller**

A charge controller is a device that regulates the amount of current the PV modules feed into a battery bank. Their main function is to prevent over-charging of the batteries, but charge controllers also block reverse current from a battery bank from leaking backwards into the photovoltaic array. There are a few varieties of charge controllers, but the two main types are PWM (pulse width modulated) and MPPT (maximum power point tracking). PWM technology is older and more common on smaller solar arrays. With PWM, the controller is sized based on nominal PV voltage (which must match battery bank nominal voltage) and the total solar array output current. PWM controllers typically have two to three stages for battery charging and maintenance. MPPT controllers can typically take much higher voltages (but not lower) than the battery bank that they are charging. They “track” the performance of the solar array and can find the maximum power point from a module even when converting excess voltage to usable current. MPPT charge controllers can allow for a 10% to 25% increase in power sent to the batteries over a standard PWM controller. Charge controllers typically cost between \$50 and \$500 USD depending on size and type.

### **5. DC and AC Disconnects**

The DC and AC disconnects are manual switch units that are capable of cutting off power to and from the inverter. Some inverters have disconnects integrated into the unit with switches, others can have them integrated into a power panel assembly, and some inverters leave you on your own to provide suitable disconnecting means. The disconnects are used by service personnel or authorized persons (fire/police/electric workers) to disable power from a renewable energy system (in this case PV) so that there are no live electrical parts associated with the inverter, and that no current is going to the grid that could harm utility employees in the event that they are working in your area. Homeowners or authorized personnel can use the disconnects to de-energize a system for maintenance or service. Disconnects can range in cost from \$100 to \$300 USD.

## 6. Inverter

An inverter takes current from batteries (DC) and turns it to alternating current (AC) to run any common loads. Some inverters have integrated AC chargers so that they can use AC power from the grid to charge the batteries during periods of low sun. Inverters with integrated AC chargers can also be used in conjunction with petrol-based generators for battery charging or running very large loads. Off grid inverters meant for whole home usage must have appropriate conduit boxes and accessories that enclose live wiring. Usually, whole home inverters are rated at 2000 watts continuous power or more. Off-Grid inverters can be modified sine wave or pure sine wave. Some appliances and many sensitive electronic devices (computers, stereos, etc) will not function properly on modified sine wave inverters. Off grid inverters can cost anywhere between \$100 to \$3000 USD depending on size and type.

## 7. Batteries

Batteries store the energy in renewable energy systems. Batteries can come in different voltages, but the most common varieties are 6 volt and 12 volt. The three types of batteries that are most common to renewable energy systems are Flooded Lead Acid, Sealed Absorbed Glass Mat (AGM), and Sealed Gel Cell. Flooded lead acid batteries are the most cost effective variety of batteries. They require maintenance that involves monitoring voltage, adding water, and equalize charging. Flooded lead acid batteries vent hydrogen under heavy charging and they must be stored in a ventilated enclosure. Sealed AGM batteries do not require maintenance. Since they are sealed, they do not require watering, nor do they typically vent gasses. AGM batteries cost slightly more and are more sensitive to overcharging. Gel Cell batteries are also sealed and therefore do not require maintenance and they do not typically vent gasses. Gel batteries are the most expensive of the three most typical types. Depending upon size, batteries can cost anywhere from \$20 to \$1200 USD each.

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## Frequently Asked Questions

### 1. How do I find my total energy usage or the "loads" of my appliances?

Step 1: Calculate loads of household appliances (in watts):

- You can find a listing of common appliance wattage ratings [here](#).
- You can also use a [Kill-A-Watt](#) meter, which gives readings of how much instantaneous power and energy an appliance is using.

Step 2: Calculate total energy usage (in *watt hours* per day)

- Use the load information you just assembled with our [load calculator](#) to find out how many watt-hours you use per day.

### 2. The label on my appliance does not list Watts, it only lists Amps. How do I find the wattage?

Converting from Amps to Watts is a simple calculation:  $\text{Watts} = \text{Amps} \times \text{Volts}$

Our household voltage is 120 Volts AC. If we have a television that lists 1.5 Amps, we calculate the wattage as follows:

$$1.5 \text{ Amps} \times 120 \text{ Volts} = 180 \text{ Watts}$$

### 3. My refrigerator lists kilowatt hours per year. What wattage do I enter in my load calculator?

Convert kilowatt hours per year to watt hours per day by the following calculation:

$$\text{Kwh} \times 1000 = \text{watt hours per year}$$

$$\text{Watt hours per year} / 365 \text{ days per year} = \text{watt hours per day}$$

### 4. How do I know what size PhotoVoltaic system I need for my energy usage?

To get a better idea of system size, take the data from your load calculator and use it in one of our [system calculators](#), either for on-grid or off-grid applications.

5. How do I figure out the likely energy production of a given system which lists rated Watts of PV?

Step 1: Look at the solar insolation map below to find your average sun hours per day.

Step 2: Multiply the rated Watts of your system by the amount of sun hours per day to get the average Watt-hour production number.

Step 3: Decrease the calculated amount by about 20% to take into account system inefficiencies. This will provide a more realistic view of the system production. (\*\*The 20% reduction is to be conservative. That way your production should not fall short of your usage.)

Here is an example:

Calculate the predicted energy production of a 1 kW PV system in Pittsburgh, PA.

1. The solar insolation for the Pittsburgh area appears to be about 4 hours.
2.  $4 \text{ sun hours} \times 1000\text{w} = 4000 \text{ watt-hours}$
3. Decrease that number by 20% (or multiply by 0.8):  $4000 \times 0.8 = 3200 \text{ watt-hours per day} = 3.2 \text{ kilowatt-hours per day}$ .

Note: It is important to know that the sun hours for your area change based on time of year. Average daily sun hours provide an estimate to calculate the approximate size of a system. If you are completely off the grid (not connected to utility power), and rely on PV to produce all of your electricity, you will want to have more accurate calculations. To be more accurate, use data close to your area that is broken down by month, compares the angle of PV modules, and includes information on whether or not you have an active tracker for your array. This data can be found in reference materials like the [Photovoltaics Design and Installation Manual](#).

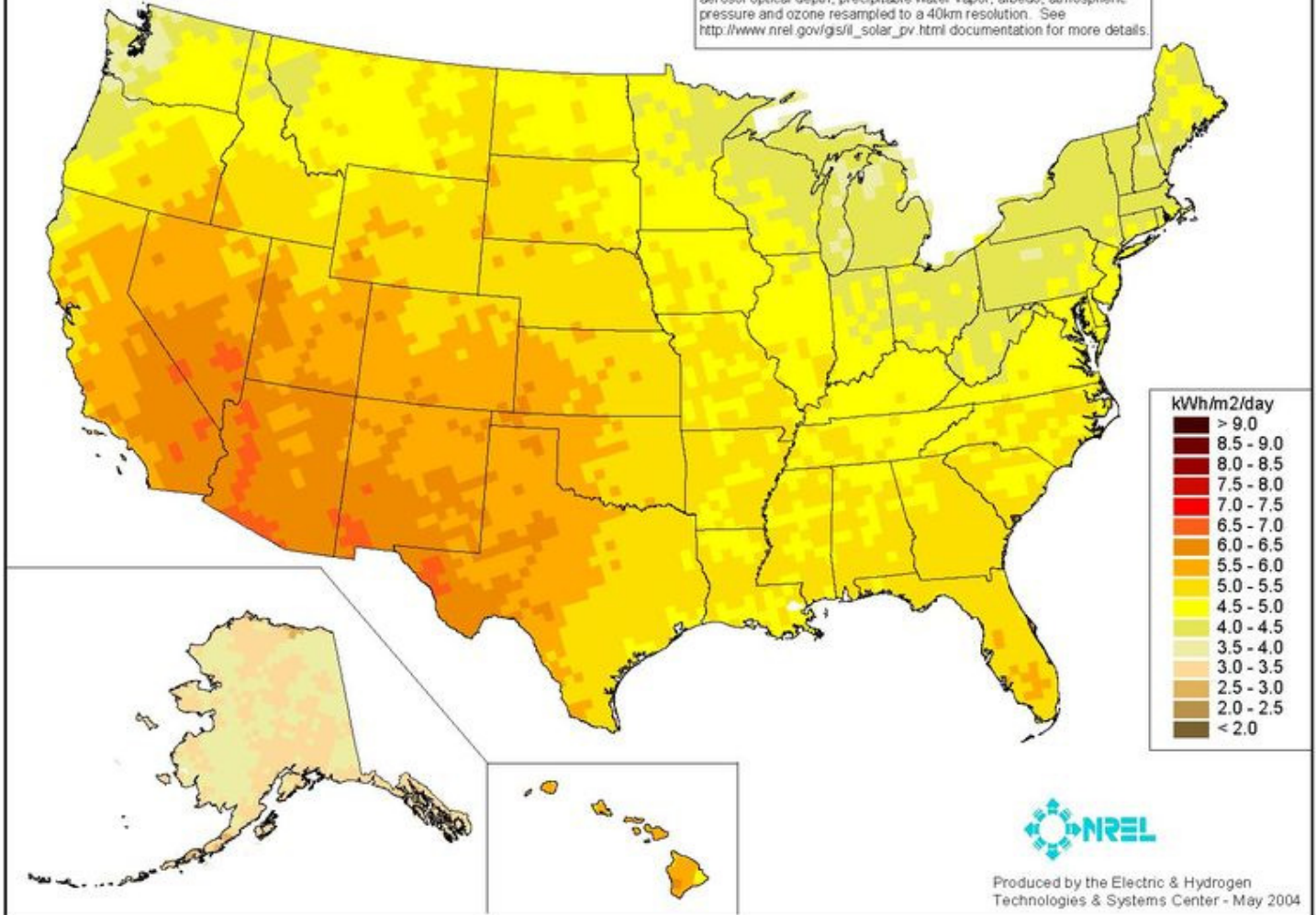
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Find the average annual insolation for your area below.

# PV Solar Radiation (Flat Plate, Facing South, Latitude Tilt)

Annual

Model estimates of monthly average daily total radiation using inputs derived from satellite and/or surface observations of cloud cover, aerosol optical depth, precipitable water vapor, albedo, atmospheric pressure and ozone resampled to a 40km resolution. See [http://www.nrel.gov/gis/il\\_solar\\_pv.html](http://www.nrel.gov/gis/il_solar_pv.html) documentation for more details.



## Shipping

Most products take 10-14 days to be delivered. Batteries, module and mounting systems may be shipped by truck freight and usually take 1-2 weeks to be delivered.

**NOTE: Always consult a licensed electrician before installing your electrical components.**



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