

Power n

Solar & Energy Storage

SOLAR POWERED SYSTEMS (SPS)



RELIABLE, COST EFFECTIVE SOLAR POWERED SYSTEMS

Developed from more than three decades of industry experience, the SPS product line has been engineered for reliability and durability, using only trusted, quality components. By incorporating photovoltaics with the latest battery and controls technology, our affordable SPS Series can autonomously support a variety of AC and DC outputs and is quickly deployed. All of our systems are factory tested and carefully packaged prior to delivery ensuring that the Micro SPS arrives ready for deployment. Our team of engineers and project managers will work closely with you to ensure that you have the right solution for your operations.



SPS COMPARISON

SPS COMPARISON	3	6	12	24	36	48-144
AVG. CONTINUOUS LOAD	12 Watts	35 Watts	50 - 150 Watts	155 - 222 Watts	245 - 350 Watts	400 - 2000 Watts
BATTERY CAPACITY	3 kWh	6 kWh	12 kWh	24 kWh	36 kWh	48 - 144 kWh
WEIGHT	750 lbs.	1500 lbs.	2000 - 2500 lbs.	4300 - 4600 lbs.	6000 - 6300 lbs.	Varies
(USABLE) DIMENSIONS	38"W 48"H 24"D	38"W 60"H 36"D	48"W 60"H 36"D	48"W 72"H 36"D	72"W 72"H 36"D	Custom
PV ARRAY SIZE	Dependent on location		1550 - 2300 Watts	1700 - 2600 Watts	3120 - 3900 Watts	4000 - 11,700 Watts
SYSTEM CONTROLLER	SC-50		Load dependant	SC-100		
INTERNAL EQUIPMENT RACK	N/A		19" rack for customer equipment			
OPERATING TEMPERATURE	~ Minimum: -40°F ~ Maximum: 120°F					
BATTERY AUTONOMY	5 - 7 days (for obstruction lighting Custom autonomy options available					

BENEFITS

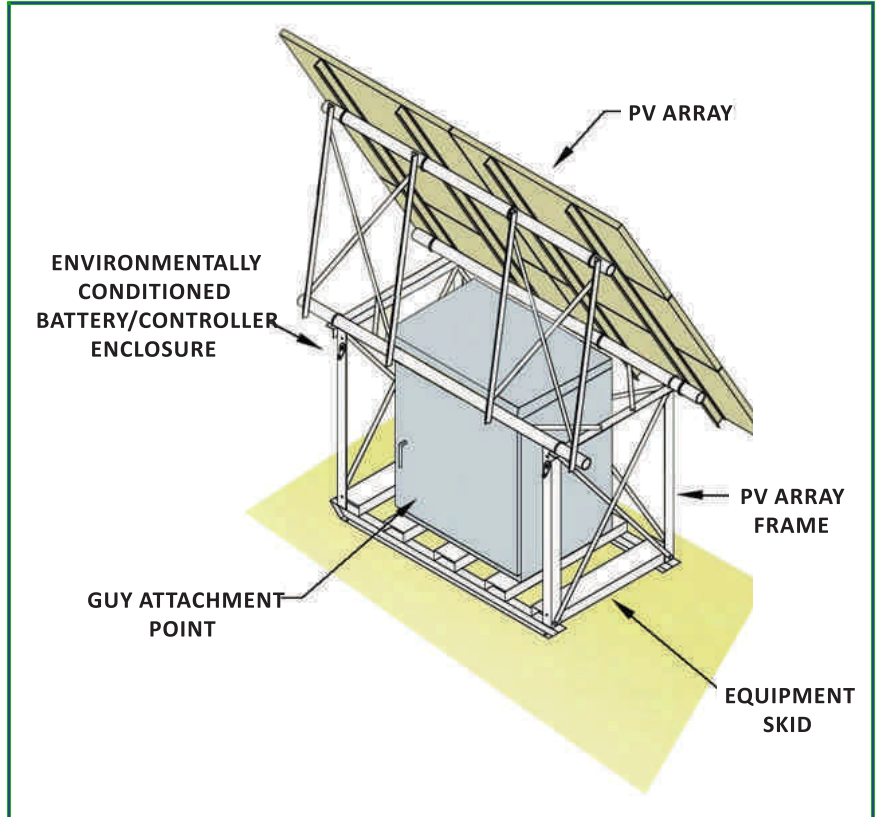
- Reliable components and construction*
- Cost effective solution*
- Easy integration and installation*
- Compact, modular design*
- Long lasting autonomy and battery life*

FEATURES

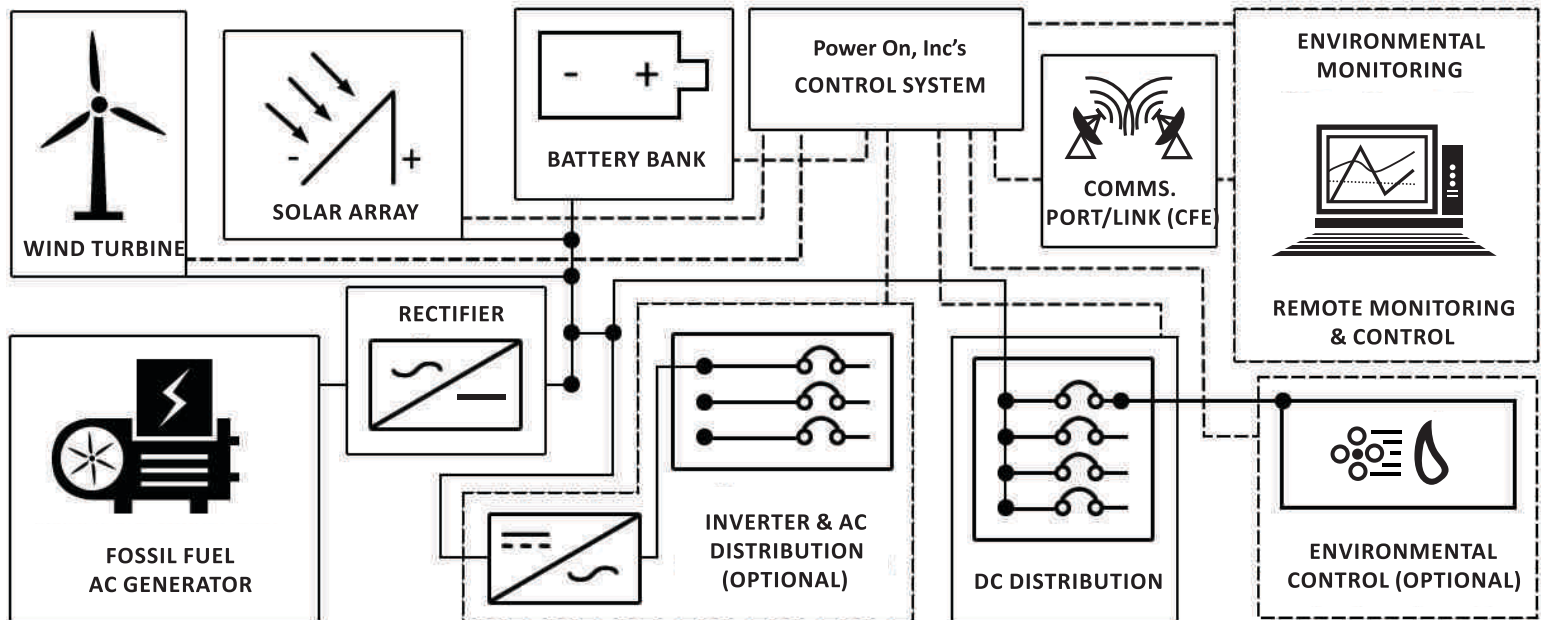
- Environmentally conditioned controller/batteries*
- Weatherproof NEMA 3R cabinet*
- Data logging of system performance*
- Up to 20 year battery life*
- Remote access via web/HMI interface:*
 - System status*
 - Log files*
 - Text+ email alarm notifications*

OPTIONS

- AC or Regulated DC Voltage (12, 24, 48)*
- Remote Telemetry (Comms System)*
- VRLA Lead-Acid (Standard) or Lithium Ion Batteries*
- Hybrid Power Generation:*
 - Generator (Propane, Diesel, Natural Gas)*
 - Wind*
 - Solar*



ELECTRICAL SCHEMATIC FOR SPS HYBRID



THEORY OF OPERATION

Power On's SPS Hybrid line of power solutions are high reliability, low maintenance, and incorporate multiple sources of power generation deployed in a cycle-charge mode of operation. In most cases, the SPS Hybrid System incorporates two or more of the following power generation sources to produce energy:

- Solar Energy from a photovoltaic (PV) array
- On-demand energy from a fossil fuel generator

A fossil fuel power generator is normally one of the sources employed in our SPS-Hybrid products. The generator provides on demand power to supplement variable renewable sources such as solar or wind. Power On, Inc. incorporates the most appropriate generator for the particular application, choosing from among:

- Diesel, Propane or Natural Gas Genset
- Fuel Cell



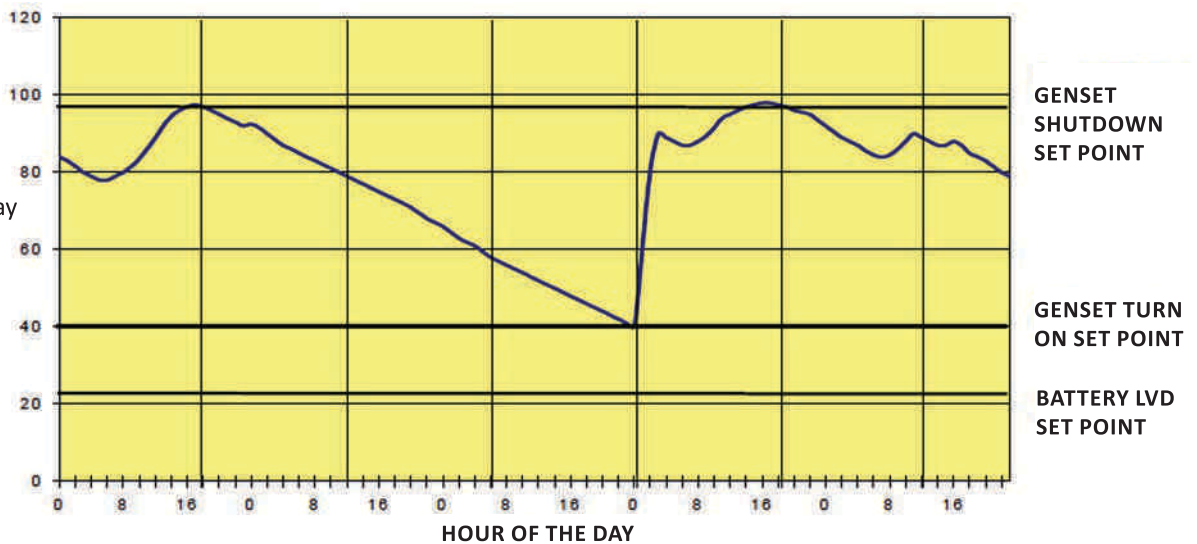
POWER GENERATION & STORAGE SUBSYSTEMS

The advantage of any SPS Hybrid System is its ability to optimize multiple sources of power. The combination of renewable and on demand power can be a compelling way to increase efficiency, reduce environmental impact, and maintain high degrees of reliability. Hybrid power systems allow system owners to take advantage of renewable energy sources where the load is too large or renewable resources are too variable to operate traditional stand-alone renewable configurations. Solar and wind are the two most often renewable resources that are deployed in SPS-Hybrid Systems. Solar is the most common whereas wind resources can be difficult to capture on a small scale. Due to their variability. All SPS-Hybrid systems, regardless of power generation source, are equipped with a battery bank.

Power On normally utilizes Valve Regulated Lead Acid (VRLA) batteries. These completely sealed "maintenance-free" batteries represent the state of the art technology for remote power applications. They are specially designed for deep discharge applications that are often needed for remote systems. Alternative battery chemistries such as lithium-ion and flow can be used if appropriate for the application.

WHAT IF THE SOLAR/WIND IS INSUFFICIENT TO PROVIDE THE REQUIRED POWER?

SPS Hybrid systems are equipped with “on-demand” fossil fuel generator(s) to make up for any deficiencies in solar or wind resources. For most systems, Power On designs the size of the PV array so that during the best case solar months (typically July and August in the Northern Hemisphere) all solar energy produced will be consumed by the load. (The same is true if wind is used.) The system is designed so it will not waste any free energy during best-case conditions. As a result,



during the poorer solar or wind months, the PV or wind will not generate sufficient energy to fully service the load; this is when the fossil fuel generator(s) come into play. The Power On System Controller continually monitors system conditions and commands the genset as required. The key parameter to determine when the genset is to run is the system’s battery bank State of Charge (SOC). Power On typically configures SPS Hybrid systems for genset start when the battery SOC reaches 40% (although the system can be programmed for genset start at any time). Above is a graphic representation of a typical SPS-Hybrid Plus (PV) cycle charge operation. In the summer, when most sites have very good solar resources, the energy produced by the PV array will be directly consumed by the load, or used to charge the battery. Every night, the battery bank discharges to support the load. The process repeats itself the next day. As indicated in the graph, even during summertime operation, a SPS Hybrid PV array can be insufficient to fully support the load. In these situations, the battery’s SOC reaches its prescribed set point, the System Controller will start the genset. Once on-line, the genset will charge the battery back up (while providing additional energy to the load). When the battery reaches a high SOC set point, the System Controller will shut down the genset and the cycle starts again.

HOW DO SPS HYBRID SYSTEMS ACTUALLY WORK?

The baseline source of power is normally from solar or wind. When the sun is shining or the wind is blowing, the system produces energy. If that energy is less than the total the site load, the load consumes it directly. Whenever the power being generated exceeds that being consumed by the loads, excess energy is directed to the system battery bank. The battery is simply an energy storage medium and any excess energy is used for charging. During times when the load is consuming more energy than the solar array and/or wind turbine produces, the system battery bank provides the additional energy required. At these times, the battery is being discharged. SPS Hybrid systems are often referred to as “cycle-charge” systems, since their batteries are always cycling. Whenever the battery cycles (either charges or discharges), a small portion of that energy is lost in the form of heat. For SPS Hybrid systems, this loss is taken into account through a battery cycling efficiency factor. Typically, Power On, Inc. utilizes an efficiency factor of 92%. In other words, whenever the energy gets cycled through the system battery, 8% is lost due to inefficiency. Efficiency factors can vary with the type of battery bank.

Power On’s sizing sheet will confirm the factors being used for any particular system.

WHAT HAPPENS IF THE BATTERY IS FULL AND THERE IS STILL EXCESS ENERGY? BEING PRODUCED BY THE PV ARRAY OR WIND TURBINE?

One of two things happens:

- The energy is simply lost
- Power On, Inc’s System Controller takes advantage of the “free” energy to provide heating or cooling of the shelter.

Micro Solar Power System



APPLICATIONS

Power On, Inc's Micro Solar Power Systems (SPS) deliver reliable power at remote or grid challenged sites for mission critical applications such as:

Aviation obstruction lighting

Oil & Gas SCADA and Cathodic Protection

Remote Monitoring

Off-grid security and surveillance

FEATURES

Accommodates continuous loads up to 60 Watts

Sealed, maintenance-free, deep-cycle gel batteries

Built to NEC standards & factory tested

One year warranty

Pre-assembled for easy deployment

AC and DC voltages available

Class 1, Div II optional

PV MOUNTING

105 MPH Wind Rating

Rugged aluminum construction

Pole, ground or tower mount options

ENCLOSURE

NEMA 3R enclosure + powder-coat finish

Passive ventilation

Optional active ventilation and heating

SYSTEM CONTROLLER

Low voltage disconnect to protect battery

Battery temperature sensor

Optional telemetry for remote monitoring

BENEFITS

Reliable, rugged components and design

Quick and easy deployment, designed by installers

Cost effective approach for difficult energy situations

Compact renewable energy solution

