SunWize Power & Battery

Are Solar Modules Economically Efficient?

Most of today's crystalline solar modules have sunlight-to-electricity conversion efficiencies of 13-14%.

You may conclude solar modules are inefficient. After all, converting 13-14% of the sun's energy means 86-87% of the available energy is not utilized.

However, consider the efficiency of a solar module not by its conversion efficiency but rather its economic efficiency. How effective is your money spent on the deployment of a solar system especially when the load is direct current (DC)?

Cost Discussion

The economic efficiency of a solar module is often compared with grid extension or a fossil-fueled generator set. The use of industrial solar systems over the past 30 plus years has overwhelmingly been as an offset to one of those two technologies. Where grid infrastructure is present, power is obtained by tapping into the grid, often by rectifying it down to a usable DC voltage and powering the load. When the grid infrastructure is a significant distance away, generator sets are used.

It is difficult to determine an exact cost per mile extension of the utility grid, but we know it is seldom less than $10,000 a mile, and very often 5 to 10 times that amount. In addition, there are exceptional circumstances where extending the grid a matter of yards can cost ten's of thousands.

For example, consider the cost to extend the grid from one side of a highway to a median strip, or across an active taxiway or runway at an airport. There is a cost to execute the work and to the inconvenience to land or air traffic. Generally, grid extension costs are between $10,000 and $100,000 per mile.

Turning to generator sets, we know the cost to purchase a small generator (say 5-10kVA) and the fuel supply system might be the same $10,000 we noted above. Then add the cost to operate the generator set. Depending on site access, the cost may be as low as a few dollars per gallon of fuel consumed, up to many times that figure. Consider, for example, a helicopter only access site with fuel flown in periodically. The price per gallon is tremendous when amortized over the cost of the helicopter rental.

Which Technology Makes the Most Economic Sense?

Let's compare the three technologies for a small load, less than 50 watts continuous, powered either by grid extension, a prime power generator set or a SunWize® Power Ready System (a complete, packaged solar system). If the site is a mile from commercial power, we know the cost will be at least $10,000 to extend the grid, perhaps $15,000 a year to operate a diesel, but under $10,000 to purchase a comprehensive Power Ready system to power the load. Even though the SunWize system is "inefficient" at converting all of the sun's energy into electricity, it is significantly more efficient when compared economically to grid extension or a generator set.

The comparative argument in favor of solar gets even stronger when other costs inherent in grid extension and generator set operation are considered. Grid extension requires transforming high voltage AC down to a usable AC voltage, then rectifying it down to a DC voltage for DC loads. In addition, to protect against grid outages, a battery bank is required. Not only is there the cost of grid extension but also costs for local power conditioning and on site backup hardware in order to get the necessary conditioned, protected power to the load.

A generator set represents a fairly large AC power source powering a very small load which is extremely inefficient. This inefficiency increases operational costs in excess fuel consumption and carbonization buildup in the cylinders, adding to the frequency of refueling and maintenance trips. As with the utility grid, there is also an AC source requiring rectification to a DC voltage for a DC load.

However, solar systems directly power a DC load with no conditioning. They don't consume fossil fuel, they are nearly maintenance free and are designed for operation in rugged outdoor environments.

Because SunWize systems recharge a battery bank with multiple days of reserve capacity, they have the inherent ability to power the load through periods of inclement weather. They are pre-assembled for easy deployment and are designed specifically for the load they are powering. They are not oversized and are sized to produce reliable 24/7 power to the load under all local climactic conditions and solar radiation levels.

The success of solar in remote site locations is a testament not only to the technical capability of a well designed PV system, but also to its economic value.

Corporate Headquarters
1337 Main Street, P.O. Box 895, Philomath, OR 97370
1.800.827.6527 | power@sunwize.com | www.sunwizepower.com