SunWize Power & Battery

Seven Key Benefits of a Solar Hybrid Power System

Solar is a highly cost-effective power supply for small-to-modest loads in remote locations removed from a source of commercial grid power. However, as the load requirement increases, there is a point where the cost of solar may be too high for the proposed site budget and the system may be physically too large for the ground area.

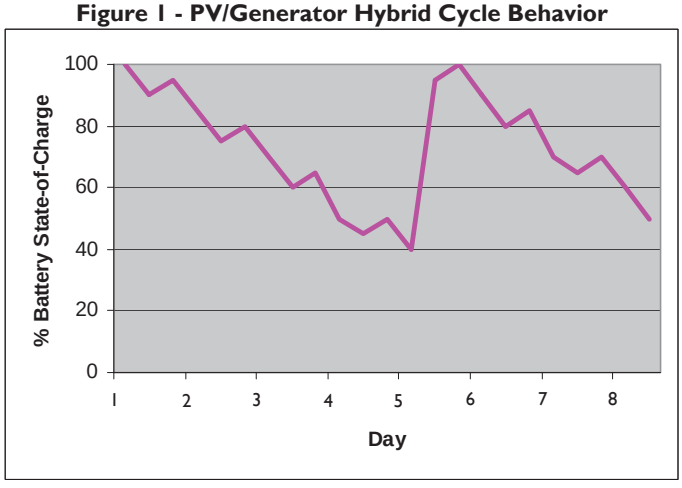
Solar engineers can consider a hybrid system. A hybrid system uses two generation sources working in conjunction to supply power to the equipment over the course of the year, with each source contributing on a daily or weekly basis. The hybrid concept optimizes the features of each power generation source.

Let's consider a solar/propane generator hybrid system where the generator is capable of operating "on demand". When the solar array is reduced in size to below what it would be for standalone solar system, the result is a daily loss of battery capacity relative to the load demand. Since we can accurately predict the output of the solar array over time, we know on average what this loss rate will be. We can then determine the engine operation necessary to offset that loss.

If we use a control software to start the on-demand generator at a set battery level, we can use the engine to rapidly recharge the battery bank while simultaneously providing power to the load. A typical cycle might be an engine start every 5 days, running for 10 hours each event. The engine then shuts off and the solar array is once again operating in a mode where it is losing ground to the load on an average daily basis. Five days later the battery reaches the state-of-charge point where the controller starts the engine, and the cycle repeats. Refer to Figure 1.

Because the engine capacity in this hybrid is greater than the load requirement., the engine is able to recharge the battery and power the load in a relatively short amount of time. The engine runs less than 10% of the time while contributing 50% or more of the annual energy to the load.

Figure 1 - PV/Generator Hybrid Cycle Behavior



The back of a SunWize® Power Station solar array showing generator and propane tanks powering 2 BTS radios and a microwave radio in California.

What are the key benefits of PV/hybrid technology?

1) A hybrid system can cost-effectively power loads from 300 to 3,000 watts.
2) The PV array is reduced in size from what it would be for a standalone system which drops the cost of the array.
3) Since the battery bank does not exclusively carry the load through inclement periods of weather, it is also smaller, reducing battery costs.
4) By carefully selecting the generator and rectifier sizes, we can optimize the loading on the generator. Optimal loading assures the highest efficiency operation, minimizes fuel consumption and maximizes intervals between required maintenance.
5) By operating periodically, and for relatively brief periods, the engine consumes a modest amount of fuel, with regular refueling trips of 2 to 4 times per year. Consumption is in the range of hundreds of gallons per year.
6) When multiple sites are deployed over a large geographic area, such as a microwave backbone system, we can standardize a single hybrid system design. The only variability is the engine contribution with the subsequent run intervals and fuel consumption. The physical and electrical designs of the power system are identical across the network so that the installation steps are the same at all sites.
7) The PV array is no longer sized for the worst-case solar levels creating excess energy which cannot be stored during the rest of the year. In the PV/hybrid system the array is intentionally undersized relative to the load, so nearly all the energy generated by the array is used for battery charging and load energy. You are not paying for excess PV energy.

Generator maintenance and refueling are minimized in a PV/hybrid system, making it an effective means of powering a large load in a remote location.

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