



Solar and Battery Backup

Since 1985, BPVS has fielded and serviced Solar + Storage or Hybrid PV systems. We have off grid PV systems across New England that have been in operation for many years and our founder has lived off grid since 1980. We also have many homeowners with hybrid PV systems that interact with the grid, a battery bank, and an electric vehicle (EV).

If like many of our customers in mountain towns you live along utility circuits subject to frequent outages, then solar and storage and/or owning a back-up generator makes sense. You'll know a two-to-five day outage can be common and battery storage of this capacity, not just a few hours, may be needed until full restoration of utility power. If outages are rare, wait until safer and more durable batteries are in the wings.

Most Homeowners want continuous and automatic electric service during an outage for lights, refrigeration, cooking, heating and cooling, water and sump and sewage pumps, entertainment equipment and more. Traditionally, backup power needs have been met by a fossil fuel generator with an automatic transfer switch sized to the electric service. In recent years, Solar + Storage systems have gained popularity.

Before investing in a Solar + Storage system, it is important for you to understand what you really want from battery backup features, what you really need, and what is affordable.

What Does BPVS offer?

First, we carefully look at your situation and back-up power needs. One size & type does not fit all sites. If you already own a PV system designed by BPVS, storage readiness is already built in so expanding with batteries does not mean a new solar array or re-wiring an existing array. Adding battery capacity to an existing array is replete with options from \$5k on up. Equipment takes up space so issues of proximity to your electrical panel, load transfer, or the need to build special structures can come into play.

Second, we feature the highest quality, environmentally benign manufacturing techniques and recyclable batteries. We recommend lead acid Absorbed Glass Mat (AGM) batteries for most homes. There are no harsh labor or extraction and recycling practices involved and these batteries are safer than Lithium Ion (LI) based units. AGM batteries, however, have a shorter life cycle than LI. Even with their lesser capital cost AGM batteries do not make up for the extra cycle life of reputedly manufactured and warrantied LI units. We believe that by the time your first set of AGM batteries wears out, one of the promising, environmentally careful battery products in research & development will supplant Lithium Ion in lifecycle cost and performance and safety.

BPVS does supply and design with LI based batteries for some circumstances and uses a LI chemistry and brands like *KiloVault* that do not source from the Congo but likely uses Lithium extracted in South America. For some types of LI battery technology and brands, environmental degradation for resource extraction and severe injustice to indigenous populations as well as factory workers is in their legacy. A portion of our profits from the sale of LI Battery systems goes to *Amnesty International*, the most active, advocacy group working to remedy the plight of indigenous peoples in battery resource extraction areas of Chile, Bolivia, Argentina, Ecuador and the Congo.

BPVS Designs

Our Solar + Storage customers rely on their working and ready systems, many decades old. Costs have ranged from \$2k for a 1kWh (kilowatt hour) kit to over \$500k for a complex installation we monitor and maintain at a Berkshire estate. Our average residential back up or off-grid Solar + Storage system ranges in price from \$25k-\$45k. Your decision and the cost are all about how much power you'll need over how much time.



©BPVS 2023: Original SMA Solar Utility Interactive Inverters on left. Six years later a CONEXT XW Battery Based Inverter and Controls at center were added by the homeowner. The laptop in the photo sits on the battery bank cabinet.



©BPVS 2023: American Made AGM batteries in NEC/NFPA code approved Battery Cabinet. Quality battery banks like this can last 15-20 years in a backup application. For off grid sites, where the solar and battery bank capacity is used every day and night of the year, a battery bank like this can last eight to ten years. BPVS has over 60 installations that rely on batteries.

The system above cost \$42k and is ideal for weeks of solar assisted back up capacity for a busy home with refrigerators, heating system, clothes washing, lights entertainment, and a water pump. Some loads are not powered, such as on demand electric hot water heaters, an electric oven, and the EV car fast charger.

Homeowners can save money on their back up system costs by reducing necessary loads. All our larger systems feature monitoring on a secure internet channel.

Almost all our larger designs will involve a back-up fossil fuel generator because people want power no matter what the weather. One advantage to Solar + Storage with a fossil fuel generator is that a battery bank can be recharged by automatically starting the generator and automatically shutting it off when completed. This saves on emissions and fuel and on maintenance and noise and does not require a sunny period to recharge the batteries, which can be rare during the winter. Between Halloween and Groundhogs Day it is common for our off grid customers to run a generator for a few hours every three days during a long stretch of cloudy weather.

If you want to go weeks on end through an outage with a limited fuel supply and average amounts of sunshine, a Solar +Storage with a fuel generator type of design is perfect and the most popular choice of our customers. All the system settings and controls are on site and not at the whim of internet control by a utility program.

Massachusetts Utility and DOER Programs

The Massachusetts' *Connected Solutions Program* incentive is for a select group of Solar Storage products that provide limited back up capacity during an outage. The off the shelf models of *Connected Solutions* products will typically supply just a couple of hours' worth of power or only run a water pump a couple of times before being fully discharged. Some brands offer expandable battery packs to lengthen service. We prefer different equipment and designs so do not offer the Program to our customers.

Connected Solutions customers may be accepted into the *Clean Peak Certificate* program for an incentive. Eligibility for the *SMART* program storage adder is unknown as of March 2023.

The *SMART* Program Solar & Storage designs couple low storage capacity (just a few hours) with high current discharge and utility control. They are controlled (charged or discharged) through the internet by the utility or its program sponsor to help meet grid demand requirements in late afternoon and evening hours. The *Connected Solutions Program* is a way to shift solar availability away from

daylight hours. The initial incentives for this type of PV system proved insufficient to justify the expense for most residential consumers, even with the modest SMART program incentive adder. The new Clean Peak incentive is now added but still the best-case financial analysis shows a ten year payback.

The hype for this program emphasizes the *value-added* feature of these Solar + Storage products, promising backup electricity for your home during an outage and an assurance from the utility that they would not discharge your battery bank if there were a risk of a storm and potential outages, and that during a prolonged outage your Solar PV system will recharge the battery bank. The incentives seem attractive and generous but are not guaranteed and the fine details on monitoring and extra costs not presented.

The lure of Solar + Storage functions on the level of environmental conscientiousness; sustainable backup power. Here too, let the buyer beware. To participate in the Massachusetts programs means you have ceded the environmental attributes for payment of the utility incentive.

We will continue to advise most people to avoid this type of battery or Energy Storage System (ESS) product and utility program unless the incentive is exponentially increased, multiple technical issues are resolved with both the products and utility control, and durable service over time is guaranteed & warrantied.

Conclusion

Solar + Storage is one of the most important considerations when planning for your site; get it right the first time. Please beware of the hype about Solar + Storage and back-up power supply from batteries. If an offer sounds too good to be true that is because there are hidden costs or failings. Financing schemes are built around customers believing that if you don't install a Solar & Storage system right away, you'll be missing out on huge savings in the future. That goes for the utility sanctioned program in Massachusetts too. Sales talk is just talk

For straight answers on Solar +Storage and real performance you can count on BPVS.