

CleanEnergyGroup

Understanding Solar+Storage

Answers to Commonly Asked Questions
About Solar PV and Battery Storage

How do I determine the value of solar+storage?

To find out if solar and energy storage (solar+storage) would be a good investment for your home, community facility, or business, the upfront costs need to be weighed against the long-term benefits. Typically, this is calculated by estimating your expected savings on monthly utility bills and seeing if that is equal to or more than the cost to install and maintain the system over its lifetime. However, it can be difficult to calculate the value of some of the most important benefits of solar+storage, such as avoided power outages, improved public health outcomes, and reduced pollution.

Determining the Economic Value of Solar

The economic value of solar is relatively simple to calculate. Solar panels generate energy that can offset electricity from the grid, thereby lowering electric utility bills. Common solar value streams include:

- **LOWER UTILITY BILLS.** Onsite solar power generation offsets electricity consumption from the grid. Instead of purchasing energy from a utility, some of a customer's electricity needs will be met by electricity produced by a solar array. Using less electricity from the utility translates into lower monthly utility bills throughout the year.
- **NET ENERGY METERING (NEM).** NEM programs allow customers to earn bill credits for the excess electricity generated by their solar array that is not directly consumed onsite. Customers participating in NEM will see a credit on their electric bill indicating how much energy their solar system exported to the grid and how much that electricity earned in bill credits. NEM programs vary by state and utility, with the value of credits for excess generation ranging from the full retail rate of electricity to as little as a few cents per kilowatt-hour. All but three states have some form of NEM.
- **SOLAR RENEWABLE ENERGY CERTIFICATES (SRECs).** SRECs are bill credits for the energy a solar system generates. A solar system earns one SREC for every 1,000 kilowatt-hours of electricity produced. Once a SREC is earned, the system owner can sell it to their electric utility. SREC values vary widely by state; SREC prices in Washington, DC are over \$400 while in Ohio they're around \$4. As of 2025, nine states have dedicated SREC markets, some of which are open to projects located in other states.

Determining the Economic Value of Battery Storage

The value of battery storage can be a bit more complex. Batteries allow users to store electricity for later use and can generate revenue by providing valuable utility and grid services. The incentives, programs, and types of savings available vary by state and utility service territory. They can also depend on what utility rate the property is enrolled in. Common battery storage value streams include:

- **LOWER UTILITY BILLS.** Batteries can lower utility bills in three ways:
 1. **Demand charge management** reduces a customer's demand-related utility charges by deploying stored energy when electricity usage spikes, such as when high-powered devices like air conditioners or water pumps are running. In some areas, demand charges can account for over half of a commercial customer's electricity bill. Residential customers do not usually have demand charges.
 2. **Energy arbitrage** lowers utility bills by charging and discharging the batteries depending on electricity pricing periods throughout the day. Batteries charge when electricity prices are low (off-peak), then discharge stored energy when electricity prices are highest (peak). When there is a large difference between the price of peak and off-peak electricity rates, batteries used for energy arbitrage can be a worthwhile investment.
 3. **Solar self-consumption** aims to maximize onsite consumption of solar electricity and minimize the amount of excess solar generation sent to the grid. By storing solar energy for use later, batteries can improve the value of solar in regions where the value of exported solar is significantly lower than the retail cost of electricity.
- **DEMAND RESPONSE SERVICES.** Demand response programs help utilities reduce costs by avoiding the use of expensive and inefficient power plants, and by avoiding power outages at times when electricity demand is close to exceeding available grid supply. By discharging stored electricity to meet onsite demand or by exporting energy to the grid when the power system is strained, batteries can lower systemwide energy demand and generate revenue for the battery owner.
- **VIRTUAL POWER PLANT (VPP) PROGRAMS.** VPP programs allow utilities to harness and aggregate participating battery storage systems in their service area, deploying stored power to the grid at times of high demand. Other devices like smart thermostats, water heaters, and electric vehicle chargers can also participate in VPP programs to shift energy use when demand on the electrical grid is high. VPP programs not only generate revenue for participating battery owners; they also enable utilities to avoid more expensive and polluting forms of energy generation, like peaker power plants, which can lower energy prices for all ratepayers.

Determining the Harder-to-Monetize Value of Solar+Storage

Solar+storage has many important benefits that don't have an easy-to-calculate value. These include:

- **AVOIDED COST OF POWER OUTAGES.** Power outages can be costly for residents and businesses that lose perishables, and for organizations that must cease providing services. The costs associated with a power outage can be difficult to calculate and monetize. Some critical facilities have been able to include avoided outage costs in their solar+storage value calculations. A leading affordable housing provider in Colorado found that solar+storage would save their facility approximately \$2,500 per hour in avoided downtime costs during a power

outage. A survey of community health centers in Florida found that power outages cost each health center an average of \$41,000 per day in lost revenue.

- **IMPROVED PUBLIC HEALTH OUTCOMES.** Solar+storage can provide reliable backup power to critical community facilities and medical institutions during power outages, allowing service providers to remain open and operational. Solar+storage can also support heating and cooling systems, a critical service for medically vulnerable residents when temperatures are dangerously high or low. Solar+storage can also provide backup power to support electricity-dependent medical equipment, like oxygen concentrators and mobility devices.
- **ENVIRONMENTAL BENEFITS.** Replacing a diesel generator with solar+storage reduces toxic emissions that contribute to poor air quality and climate change. Solar+storage also offsets the amount of energy required from the grid, which is likely to be at least partially generated by fossil fuels. One affordable housing provider estimated that their solar+storage system offset 40,000 pounds of carbon dioxide that would have otherwise been emitted as a product of grid-supplied electricity.

This text was adapted from chapter 3 of Clean Energy Group's July 2024 publication, *Understanding Solar+Storage: Answers to Commonly Asked Questions About Solar PV and Battery Storage*. Read the full guide at www.cleanegroup.org/publication/understanding-solar-storage.

How to Value Solar+Storage Benefits

CASE STUDY: Boulder Housing Partners

LOCATION: Boulder, Colorado

SUMMARY: In addition to being a leading affordable housing developer and the housing authority for the City of Boulder, Boulder Housing Partners (BHP) also provides command-post services to over 3,000 low-income residents during emergencies. BHP explored solar+storage as an option for their North Boulder headquarters. Their primary goal was to remain open and operational through a power outage.

The total cost of the solar+storage installation was \$143,476. After factoring in various value streams, the estimated payback was approximately 19 years.

The items listed below highlight the value streams that BHP considered when evaluating the benefits that solar+storage could add to their headquarter offices. Some benefits had a monetizable value, while others did not.

More information and resources related to the BHP solar+storage project are contained in an extensive case study, found at <https://www.cleangroup.org/ceg-projects/resilient-power-project/featured-installations/boulder-housing-partners>.

Monetizable Benefits



Utility bill savings from solar

\$1,145 in electric bill savings annually



Utility bill savings from battery storage and smart control system

Demand charge electric utility savings of \$456 for a single month



Avoided cost of outages

Estimated \$6,295 saved each year by maintaining services, rather than having to cease operations, during an outage.

Nonmonetizable Benefits



Emissions reduction

Solar+storage offset 40,000 pounds of CO₂ emissions over the life of the system



Resilience

Reliable and automatic backup power in the event of an outage



Avoided emissions

BHP was able to install a smaller gas generator that runs less often by prioritizing solar+storage