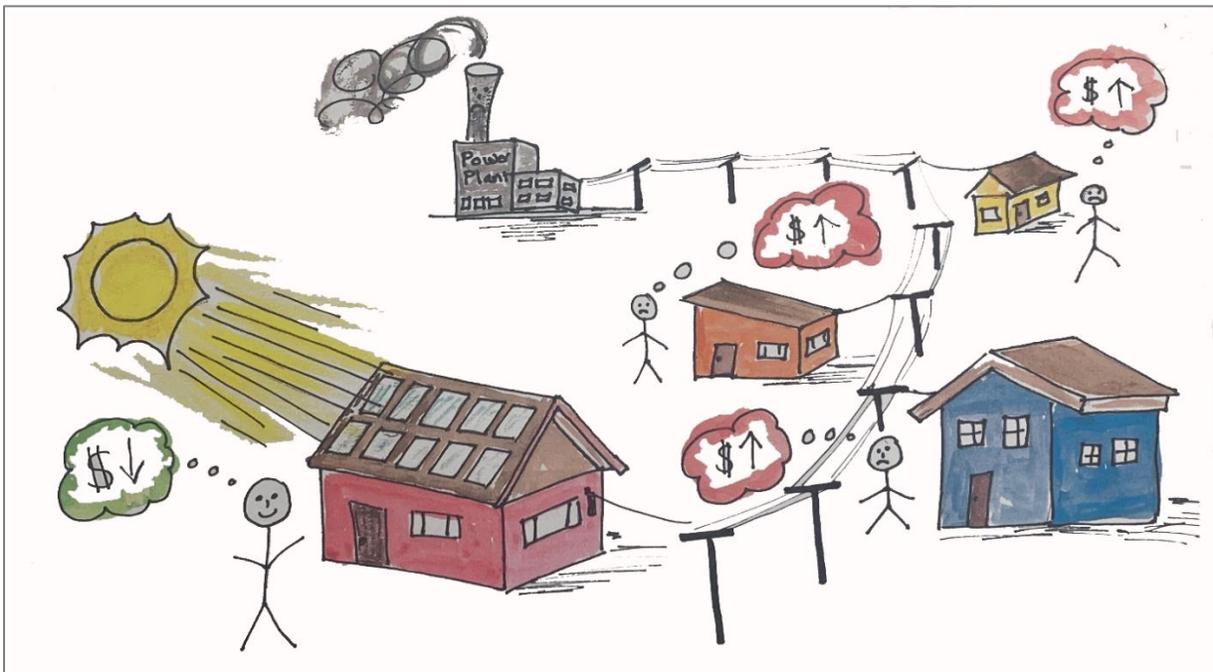


WHY SOLAR PV ISN'T ALWAYS THE SIMPLE SOLUTION

By Gwen Holdmann, director, Alaska Center for Energy and Power

If you can afford it, why wouldn't you install solar power on your rooftop? Globally, there has been a proliferation of solar photovoltaic (PV) technology installed by customers to offset their own home electric power consumption. This market has been driven by dramatic cost reduction in the cost of solar panels, the near universal accessibility of the resource and the relative ease of installation. For those who are able to generate enough power to offset most or all of their home's power needs, receiving a low bill or even a credit from their utility company is a great feeling. But the whole story is often a little more complicated.

Solar installations generally use a power inverter that conditions their output and connects them to the home's electrical system, which is connected to the utility grid. Because solar production doesn't usually meet home power demand perfectly at all times, many customers end up feeding power to the grid during the day, when they generate a surplus, and drawing power from the grid at night or on rainy days, when their domestic loads exceed the amount they are producing from their solar panels. By banking extra power in this way, the homeowner is essentially using the grid as a free virtual battery. That service is great for the homeowner, but, if too many people are doing this at once, it can be a real challenge for the utility to manage for three big reasons — technical, safety and financial issues.



Solar energy is an exciting option for many residents. It is important to work closely with your local electric utility if you are considering adding solar to your home. This will avoid any issues that could lead to power disruptions, safety issues or higher costs for other members of the community. Illustration by Gwen Holdmann.

Technical issues — Residential solar PV can cause serious issues related to power quality and grid stability in some markets where adoption rates are high. One example is in Hawaii, where distributed solar PV installations generate a significant portion of energy during daylight hours. On Oahu, over 12% of electric utility customers have rooftop solar systems, and the utility has struggled to accommodate this influx while maintaining reliable power to all its customers. In rural Alaska, these issues can be

magnified significantly because electric grids are very small in comparison to most markets. With smaller grids, there is less capacity to absorb energy from significant, but intermittent and unpredictable, sources of energy without disruption to the overall power supply. For example, solar PV output can ramp up and down very quickly based on the immediate availability of energy from the sun, which can drop off substantially every time a cloud passes overhead. This means that, in order for utility on a small grid to maintain power availability, it needs to have back-up generation online, called a spinning reserve, ready to go instantaneously to make up for rapid fluctuations in solar output.

Other unintended consequences can also occur on small grids if solar PV projects are not planned properly. For example, most utilities produce what is called three-phase power, where AC power is carried on an A, B and C phase. Since most homes and businesses require only 120-volt electricity, each building is only on one phase. The utility attempts to balance the amount of power drawn on each phase to prevent outages and other issues. If the phases become out of balance because a few houses on one phase produce solar power and significantly reduce their need for the utility, the resulting phase imbalance could cause outages for the whole grid.

HAVE YOU READ YOUR METER LATELY?

Power fed back onto the grid can also be read by some electric meters as power consumed. There are cases where residents installed solar without coordinating with their utility and were surprised when their electric bills nearly doubled. Their electric meters were not designed to read reverse power flow and counted solar production as billable power! So the moral of the story is, for safety reasons and to ensure proper accounting, ALWAYS work with your utility when planning a solar installation.

Safety issues — Solar PV production in Alaska is at its highest during the spring and summer months, which is also the time of year when communities typically experience lower demand from the grid (the exception to this can be when there are significant summer commercial activities, such as fish processing or tourism). And even if a customer has every intention of using all solar-produced power onsite and is not planning to export power to the utilities' grid, there will almost certainly be times when the sun is producing more power can be used by the residence at that instant. If connected to the grid, the extra power produced is sometimes pushed back onto the grid. This can be very dangerous or even deadly, especially if utility workers are doing repairs on what they assume is a de-energized grid. It could also impact the system protections (line fuses are an example) in the utility grid and pose physical danger to consumers when faults arise.

Financial issues — Widespread consumer-owned generation challenges the traditional electric utility business model. That model has historically been designed around centralized generation, with utilities sending power one direction to passive consumers on the other end of the line. An enormous investment in infrastructure has been made by utilities to provide reliable power to their customers, with costs being recovered over decades. In Hawaii, some of these solar homes have zero electric bills, which is causing problems for the electric utility company that must provide power to the other residents and maintain the power lines that the solar power uses without charge.

The bottom line is that, while solar energy can be a viable resource in Alaska, it does not come without challenges. It is important to understand not only the benefits to the individual resident or facility, but also how it can impact other residents and a utility's ability to keep costs contained. There are ways to mitigate these issues, such as using onsite storage (like batteries) that can benefit the homeowner or individual consumer in case of an outage, but these solutions come with higher upfront costs. Another approach can be to work as a community to build a larger scale solar PV project in consultation with the local utility that can help with sizing, optimal location and controlled operation. Often, these community

solar projects benefit from better economies of scale, access to the most optimal local resources, and improvement in the energy security and resilience of the community as a whole — rather than just one or two residents or buildings that can afford it.

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