

Power Electronics Smooth Solar Transition

New devices address instability caused by high penetration of distributed solar.

- By [Martin LaMonica](#) on January 21, 2014

Why It Matters

The growing popularity of solar panels is increasing the stress on power grids. The debate over who pays for upgrades is likely to keep heating up.

As rooftop solar panels become increasingly popular, utilities are growing concerned that they will put pressure on local grids, destabilizing power service and requiring costly equipment upgrades.

The rapid adoption of solar photovoltaics has already prompted changes in Germany and parts of Hawaii, California, and New Jersey. Because nearly 10 percent of Hawaiian Electric's customers have rooftop solar, the utility now requires solar contractors and customers on the island of Oahu to get approval before installing a PV system. It's also developing a model for sharing the cost of studying what upgrades may be required to add another rooftop solar system, says a spokesperson for the local utility.

To address the instability caused by distributed solar, startup Gridco Systems is introducing a product that uses power electronics to smooth out spikes in voltage caused by solar generators. The company thinks its ground- or pole-mounted devices will create a distributed control infrastructure to monitor and manage the flow of power for a number of uses, including solar integration.

Today's electromechanical systems, such as capacitor banks or voltage regulators at substations, can take minutes to adjust voltage and are far removed from the solar installations where the problems occur. Meanwhile, prices have come down for power electronics, devices that can change the properties of electricity and precisely control the amount of power going to various applications. That means the technology is more economical for use in the power grid, says Naimish Patel, the CEO of Gridco Systems, which has raised \$30 million from venture capitalists.

If voltage on a circuit goes too high, it can endanger utility crews and cause damage to both utility and customer equipment. Distributed solar can also cause reliability problems if there's a fault on the grid. Power plants can ride through disturbances, but solar PV generators are designed to shut down immediately, which can cause a spike in demand for power.

As a general rule, when solar power represents more than 15 percent of the peak-time load, utilities will want to analyze the potential impact. Given the fast adoption of solar, utility executives say that some sort of planning for equipment upgrades is required. A group of 16 western utilities called the Western Electric Industry Leaders wrote a [letter](#) last year to policy makers calling for rules that require the installation of so-called smart inverters. These devices can convert solar panels' direct current to household alternating current, and they can also address problems with power quality.

The U.S. can avoid what happened in Germany, where utilities and the solar industry spent hundreds of millions of dollars on equipment upgrades, the utility executives wrote: "These new smart inverters will only cost about \$150 more than current inverters, approximately one percent of the overall cost (of a solar installation). This is a bargain price given the expensive retrofit process in Germany."

Devices based on power electronics, like Gridco's, are more expensive than smart inverters but offer more features, analysts say. Gridco's product, for instance, can be used to regulate voltage in solar-heavy circuits and to support voltage for better efficiency as well. Because they can connect to utilities' communications networks, utilities can also directly control them, something that is hard to do with inverters on customer premises.

Gridco says its power regulators cost between \$5,000 and \$8,000. One device could regulate a single cluster of homes with rooftop PV, but managing voltage fluctuations in a utility-scale installation could require multiple devices.

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