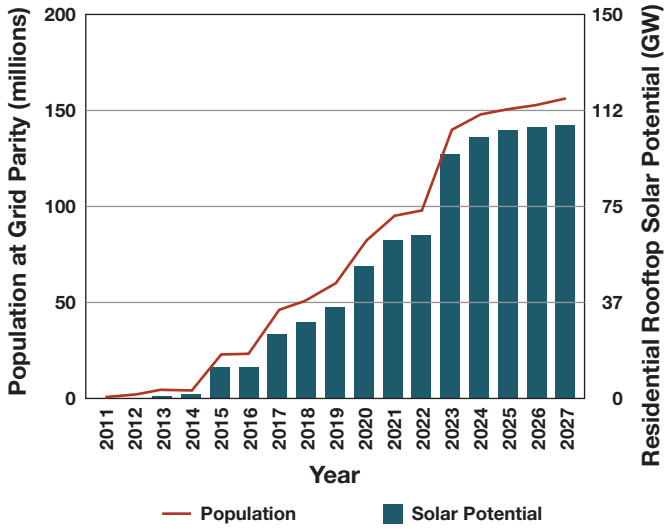
PV & Grid Capacity

In California, Hawaii, New Jersey, and other states, commercial and roof photovoltaic (PV) systems are starting to overload the system—not the grid itself, but the system of companies and regulators that control and manage the electric grid.

As distributed generation (DG) began to take hold in 2011 in California and Hawaii, utilities claimed to be worried that too much DG would compromise the grid's safety and reliability. An extremely crude rule is that the base load (the minimum amount of electricity ever required) is approximately one-third of the peak load (the maximum amount of electricity required). As a safety margin, utilities round down to 30% and then divide by two to determine the maximum amount of distributed generation allowable on any portion of the grid. In the absence of better information and more experience, this rationale, in the name of safety and reliability, was embedded into policies of the Federal Energy Regulatory Commission (FERC).

In Hawaii, the state with the highest electric rates (most of its electricity comes from burning imported oil), PV has boomed to the point that it's coming up against the 15% rule for many main distribution circuits. Most electric bills list a per-kWh fee for generation, transmission, and/or distribution. Generation is the energy itself. Transmission occurs via the huge power lines between central generating stations and major substations. Distribution is in the smaller lines going from the major substations, often through more substations, to customers.

Residential Rooftop Solar Potential & Population at Grid Parity



In February 2012, the Solar Energy Industries Association (SEIA) petitioned FERC to grant a PV-only exception to the 15% rule to allow as much PV-generated electricity on a distribution circuit to match the minimum peak demand between 10 a.m. and 2 p.m. In July, FERC held a day-long technical conference on the proposal. The National Renewable Energy Laboratory also has made recommendations to modify the 15% rule by using screening criteria specific to solar electricity. Rather than using the absolute minimum load for a circuit (usually at night) or a percentage of the peak load (which usually occurs in the daytime during the summer), a more useful metric is a percentage of the minimum daytime load. If the capacity of solar-generated electricity on a distribution circuit is lower than the lowest amount of demand, then the PV-generated electricity does not have the potential to overwhelm the circuit.

In California, a longstanding policy was to limit net-metered PV system connections to 5% of "aggregated customer peak demand"—the combined peak momentary demand for all customers. With the current rate of PV being installed, the state's largest utility, Pacific Gas and Electric (PG&E), was expected to reach this limit in 2013. The California Public Utilities Commission (CPUC) has now redefined that 5% to be the sum of the non-coincident peak demands of all utility customers. The practical effect is that the PV system capacity cap on a circuit is now more than twice what it was.

The CPUC is conducting a study, due by 2015, to consider the costs and benefits of increased PV penetration on the grid. SEIA's western states director, Sara Birmingham, says the CPUC ordered the study because of widespread disagreement on the issue of cost-shifting between solar-generating and nonsolar-generating customers. She believes the study will find any costs as minimal.

Just how much PV power can a grid utilize? In Germany, during a particular sunny Friday, nearly one-third of the nation's electricity came from PV systems. Twenty-four hours later, PV supply approached 50% of the total usage—it was still particularly sunny and demand was lower because of the weekend. While these are just peak events, it shows that the limits are more bureaucratic and political than technical and economic.

—Andy Kerr