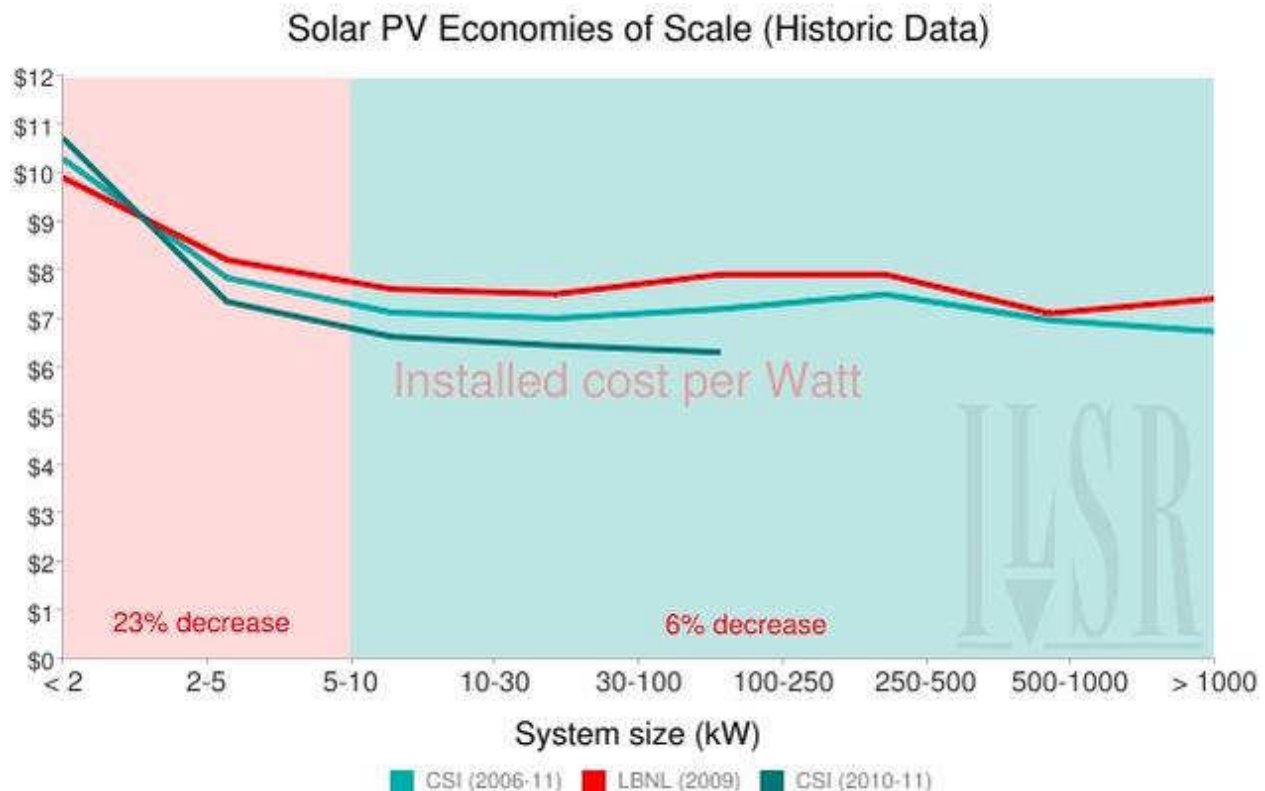


Solar PV makes most sense at modest size

by John Farrell 19 August 2011

<http://www.grist.org/solar-power/2011-08-19-solar-pv-makes-most-sense-at-modest-size>

Is bigger better when building solar PV power plants? When looking at historic data in the U.S., no. But when considering other sources, perhaps. Ultimately, "community scale" solar is likely to provide the best combination of affordability, speed, and opportunity for local economic benefit. There are two good sources of solar installed cost in the U.S. market -- the California Solar Initiative (CSI) dataset [PDF], which spans from 2006 to 2011, and the Lawrence Berkeley Labs' 2010 report, "Tracking the Sun III." The following chart illustrates the cost per watt to install solar PV projects, based on a range of system sizes:



The historic data confirms earlier analysis by the Institute for Local Self-Reliance that most solar PV economies of scale are achieved at small size. In the full CSI database, there's a 23 percent decrease in per-watt cost when increasing project size from under two kilowatts (kW) to five to 10 kW, but only a further 6 percent decrease in sizing up to over 1,000 kW. The other two curves (representing recent CSI data and the "Tracking the Sun" data) are quite similar.

But the historic U.S. data is not the only story.

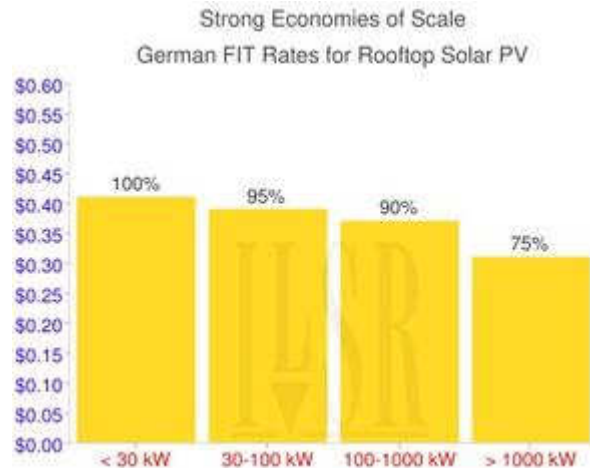
The Clean Coalition -- a distributed generation advocacy organization -- has different numbers on installed cost from their network of installer partners. These figures, data on very recent or proposed installations, tell a different tale, illustrated below in green (on the same chart as the historic data):

Solar PV Economies of Scale (historic plus present)



In the historic data of installed costs, almost all the economies of scale for solar are captured at a project size of 10 kW. But in the Clean Coalition data, the savings from building bigger continue strongly through the 100 kW size range.

Their data is not alone. In the German feed-in tariff, solar PV producers are paid a fixed price per kWh generated, with prices set according to the location of the solar PV plant (roof/ground) and by size (small, medium, large, etc). Overall, Germany has cheaper solar, with average installed costs for under-100 kW rooftop PV installations of just \$3.40 per watt (20 percent less than comparable U.S. projects). Their economies of scale are also strong, with the cost of solar falling most rapidly for projects over 1000 kW in size.



The data don't provide conclusive evidence. Historic installed cost data in the U.S. suggests most economies of scale are captured at a very modest size, but recent U.S. data on pending projects and from the German solar market -- the most mature in the world -- suggests there are scale savings even for projects that are 1-megawatt and larger.

There are limits to the scale advantages, however. In their 2010 Utility Solar Rankings [PDF], the Solar Electric Power Association noted that projects over 50 megawatts (MW) in size have financing and transmission complications that outweigh their scale economies.

PV projects, which ranged in size from 1-kilowatt residential installations to 48-megawatt power plants, have much shorter planning horizons and project completion times, along with lesser siting, permitting, financing and transmission requirements at these small- and medium-sized scales. However, larger PV and CSP projects (those greater than 50 MW) require overcoming financing, siting/permitting, and transmission barriers that might emerge at these larger sizes

Additionally, CEO of Standard Solar, Tony Clifford, and other distributed generation developers have noted that 20-MW and smaller projects are more effective because larger projects must "mess with the Federal Energy Regulatory Commission (FERC)," a prospect with a chilling effect on any entrepreneur.

In the end, it may be that solar economies of scale are very similar to those for wind power, where projects of 5 to 20 MWs are the most cost effective. This scale of distributed renewable energy generation can deploy quickly, as SEPA notes, at low cost, and without requiring significant expansion to the high-voltage (and slow built) transmission system. The Germans, who installed a world-leading 10 gigawatts of solar over the past two years, put a majority of it on rooftops in sizes of 10 to 100 kilowatts.

Moreover, distributed solar is amenable to local ownership and its attendant economic and political benefits because the project budget and size is manageable at the local level. The evidence suggests that solar power shows economies of scale at a relatively small size, and the benefits of developing solar at that scale far outweigh any potential savings from building bigger.

John Farrell specializes in energy policy developments that best expand the benefits of local ownership and dispersed generation of renewable energy. He works at the Institute for Local Self-Reliance (ILSR) and his Grist material flows from his ongoing and expanding distributed generation website: <http://energyselfreliantstates.org>.