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How Big is Utility-Scale Solar?

9 September 2013

By [Patrick Donnelly-Shores](#)

The phrase “utility-scale solar” is heard so frequently in discussions about renewable energy that it comes as a bit of a shock when one realizes that there is no commonly accepted definition as to what size comprises “utility-scale”. If you don’t believe it, a quick google reveals a staggeringly wide range of definitions, from greater than 25 kW to greater than 50 MW, a difference of several orders of magnitude.

If it’s difficult to agree on the size of a utility-scale solar facility, perhaps it’s easier to agree on the shape. A utility-scale solar facility is one which generates solar power and feeds it into the grid, supplying a utility with energy. Virtually every utility-scale solar facility has a Power Purchasing Agreement (PPA) with a utility, guaranteeing a market for their energy for a fixed term of time (check out GreenTech Media’s great article, [“Anatomy of a Utility-Scale PPA”](#)).



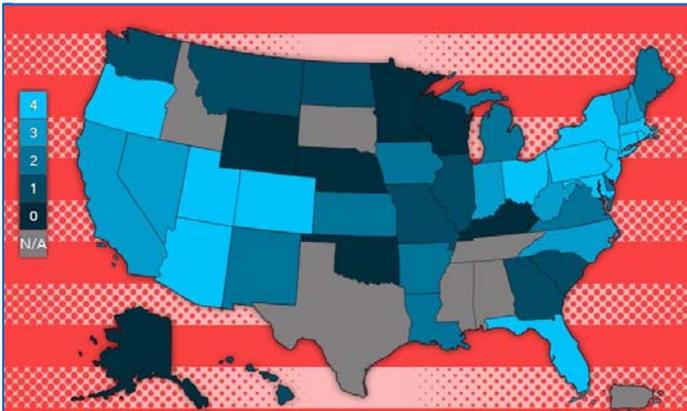
Recurrent Energy’s Sunset Reservoir solar array in San Francisco (photo courtesy Recurrent Energy)

That is where the similarities end. There was a time when the dominant paradigm in America was to build solar facilities on previously unused desert lands. While this is still occurring, more and more facilities are being built on abandoned agricultural lands, like [in the solar boom town of Gila Bend, Arizona](#). A few years ago, one might have said that they tend to be in remote locations, but that's also simply no longer true. Recurrent Energy's innovative [Sunset Reservoir project](#) in San Francisco is a 5 MW solar facility built on top of an enclosed reservoir in the heart of one of America's biggest cities.

Which brings us to the issue of size. When utility-scale solar burst onto the scene in the middle part of the last decade, people would have scoffed at the idea of a 5 MW project like Recurrent's qualifying as "utility-scale." Many definitions put forth at that time, such in the definitive piece of academic research into the late '00s solar boom in California, the University of Michigan's [Renewable Energy in the California Desert report](#), used 50 MW as a threshold. That number largely based on the rush of applications at that time to develop truly huge facilities, like the famous (can we begin calling it infamous yet?) 377 MW [Ivanpah SEGS](#) near the California/Nevada border. Given the tremendous permitting difficulties experienced by facilities like Ivanpah, some [pundits have foretold](#) the coming end of utility-scale solar at such sizes.

More recent definitions are of a much more modest size. The Solar Energy Industries Association, the leading trade group for solar developers, [defines utility-scale solar](#) [PDF] as greater than 1 MW. Project developer [Borrego Solar](#) agrees, while developer SunPower sells [solar modules at a minimum size](#) of 1.5 MW. Not everyone goes so low: in a [recent report](#) [PDF], the National Renewable Energy Laboratory rather arbitrarily chose a 5 MW threshold; while the booster-ish website [Wiki-Solar](#) chose a 10 MW threshold.

So we've determined that different entities claim different minimum size thresholds for utility-scale solar projects. But perhaps it's equally instructive to attempt to define what a utility-scale project is **not**. Any solar project needs to sell its power to remain afloat. And we said a utility-scale project, by definition, has a PPA. The only other way to sell solar power to a utility is through [net-metering](#), where generated power is used on-site (typically from the rooftop of a house or business), and excess power is fed into the grid, purchased by the utility from the producer on a per-kWh basis. Net-metering is enacted by state legislation, and each state has its own regulations as to the maximum size of a solar facility that is eligible for net-metering. This may be our most promising avenue of inquiry yet, because any facility that is over the maximum size for net-metering must have a PPA.



"Grades" given to states for net-metering facility size caps. Light blue states (like Oregon) have a cap of 2MW; sky blue (like California) of 1MW; steel blue (like Kansas) of 500 kW; navy blue (like Washington) of 100 kW; and darkest blue (like Wyoming) of 50 kW or less. Grey states are stuck in the stone age, and do not allow net-metering.

However, as with our previous attempts at arriving at a number, we are confounded by variation. Forty-four U.S. states have net metering laws, and the maximum size varies tremendously, from as little as 25 kW in Wyoming and Nebraska, the size of a large rooftop system, to the rather ludicrous 80 MW cap in New Mexico, which is absurd, as anyone who is going to invest the money in an 80 MW system would not do so without the assurances of a PPA in place. That said, a plurality of states have caps in the 1 MW – 2 MW range. See the accompanying map, courtesy of the great policy guide [Freeing The Grid](#).

Now we seem to be on to something. Both industry and state legislatures seem to have agreed that utility-scale solar facilities must have a minimum size of between 1 – 2 MW. And yet, something about that doesn't seem quite right. A now-slightly-out-of-date rule of thumb is that it takes an acre to produce a MW with photovoltaic cells (today, it's more like 1.5 MW/ac, at least according to the aforementioned SunPower). In terms of on-the-ground presence, the difference between a one acre solar facility, and a 4,000 acre behemoth like Ivanpah, is like the difference between Goldman Sachs (total assets: \$938b) and the Bank of Idaho (now serving Idaho Falls AND Pocatello, total assets: \$239m): they're not even really the same category of entity.

But it would be foolish to arbitrarily decree that 50 MW is the minimum size, particularly with the proliferation of projects like the 21 MW [Blythe Solar Generating Facility](#), in the desert west of Blythe, CA, a project that is decidedly utility-scale.* The aforementioned Recurrent Energy [coined the term "distributed-scale"](#) for its projects 5 MW – 20 MW (including the Sunset/San Francisco project). And perhaps this might make the most sense: projects of that size typically will be closer to population centers, as it wouldn't be economically viable to build small projects in the middle of the desert.

No matter how you package them, solar facilities of greater than 1 MW are an indelible, and direly needed, part of humanity's energy future. The level of funding and attention they receive, however, is at least partially tied to how we regard them- as a utility-scale facility, capable of generating bulk energy for the masses, or as a distributed facility, intended to serve to local energy system. Words do matter.

[Update: WikiSolar is conducting a [public consultation](#) to gather input on a working definition of utility-scale. Head on over and offer your input.]

**Note: this is different from the [founding Blythe Solar Power Project](#).*

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