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Solar power in the US: Sunny today, cloudy tomorrow

Solar power in the US continues breaking records every year. In 2013, 4,751MW of photovoltaic power (PV) were installed, the highest yearly figure so far and up 41% over 2012. Another 410MW of Concentration Solar Power has being added, so the US ended the year with more than 13GW of total operating solar capacity, being within the top 5 countries in the world. The trend is expected to persist in 2014, when analysts predict around 6GW of new installation, growing in all segments, but most rapidly in the residential market, according to SEIA².

Despite the good results, very few in the sector would say that the US is a sweet spot for doing business in solar energy. The complexity of the electrical market, the great competition between players pushing prices lower and regulatory drawbacks make solar industry professionals' work very difficult. Additionally, putting the figures in perspective, solar power still represents less than 0.2% of the total electricity generation in the US³.

Complexity is due to, among other things, the fact that energy policy in the US is more a state responsibility than a federal one, except for some cross-border issues. This is the heritage of an uncoordinated and scattered development of the power utilities which were born at the beginning of the last century as small and local ventures. They grew at slow pace, becoming monopolies in the areas where they serve due to the nature of electrical distribution. To oversee this market power and avoid abuses as electricity was becoming more indispensable; local or state agencies began to regulate their activities, usually being called *Public Utility Commissions* (PUCs). So after a century of state regulations, mergers and acquisitions, deregulation attempts and some outrageous blackouts, the market in the US has be-

come a very heterogeneous and complex mix of models, with more than 3,200 utilities (public, private or even co-ops), three independent and asynchronous grids, 8 Independent System Operators and at least 52 legislation bodies to decide the future of the electrical markets.

Nevertheless, if there is something in this mess that they all agree on, it's to maintain reliability at the lowest prices. This is the pledge that solar, and the rest of the renewable technologies, must make every day. Solar technologies have been well-known for several decades, and they have already demonstrated their capacity of producing electricity from the sun in utility-scale grade, especially thermo solar power that used to be considered experimental. However, as much capacity is installed, utilities and regulators in some places, such as California or Hawaii, are becoming worried that the outdated grid cannot support it, especially for variable PV, whose ramps can be sharp and no efficient storage has been already developed.

Moreover, the cost of energy for solar power is still higher than conventional technologies in most cases, if this comparison can be ever done in a fair manner. Once reliability is assured, and it is nowadays, price is the next barrier for solar. The cost of electricity is the key variable for regulators to grant approval for a utility's project or raise tariffs for paying it back. The reason that makes PUCs allow more expensive technologies is because

they have a superior mandate from state governments to achieve a goal of renewable generation: the so-called *Renewable Portfolio Standards* (RPS). These objectives of renewable consumption are set only by some states (29 to be exact); for example, 8% in 2025 in New York, 33% in 2020 in California or 40% in 2030 in Hawaii. For achieving a more balanced mix, some states also imposed a *carve-out*, obligating solar power to be a particular percentage of the RPS.

However, it is the responsibility of the utility and the regulators (PUC) to achieve them in the most *cost-effective* way. So utilities, pushed or backed by PUCs, launch competitive *Request for Offers* (RFO) to buy renewable generation from developers (*Independent Power Producers*, IPPs) or, in few cases, to build their own plants. The deal is closed in the PPA (*Power Purchase Agreement*), where the price paid by the utility for renewable kilowatts-hour in the next 25 years is defined. These processes are tremendously competitive, especially in the solar sector, so big vertically integrated companies are usually the winners; since they can offer lower prices thanks to scale economies. For instance, FirstSolar, manufacturer and developer, is by far, the number one solar contractor in the country, with more than 1,500MW installed, five times more than the next competitor⁴.

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² Solar Energy Industries Association (SEIA): *Solar Market Insight Report 2013 Year in Review*

³ See www.eia.gov

⁴ See *Solar Power World: 2013 Top 250 Solar Contractors*



RPS are continuously in debate within the States and even the Houses. Raising them seems very unlikely in the short and medium terms, since unconventional fossil fuels coming from shale exploitation have flooded the markets with cheap natural gas, ready for electricity generation. Moreover, these are domestic and also cleaner than the conventional alternative, coal, so the former renewable supporters based on these arguments are now challenged.

In addition to RPS, tax credits given by the federal and states governments act as catalysts in the definition of the PPA price, balancing renewable capacity installation in the short run. The reduced tax amount is translated into lower offers in the PPA price, so they are actually a subsidy to utility and consumers, who buy cheaper renewable electricity. The most important tax credit for solar power is the ITC (*Investment Tax Credit*), which is available for projects that will be online by 2016, giving 30% of investment costs back as an incentive. Due to the economic downturn and the difficulty of monetizing this credit, for projects that went online between 2009 and 2011, there was the option of receiving the incentive as an upfront grant, under the 1603 program, known as *Cash Grant*. This option was fantastic for solar projects, since developers did not need tax equity investors and they could reduce their financial needs. It is estimated that over 45,000 individual projects were supported by this program. However, the dream has

turned into a nightmare for developers as the *Sequestration* is reducing the amount of cash grant received, challenging the legal certainty of a country that is supposed to be the hero of capitalism and have a responsible government, with a measure that is close to retroactivity. Since there has not been an agreement in Congress about raising the debt ceiling, the Budget Control Act of 2011 fired the automatic spending cuts in the Federal Budget, causing a reduction of 8.7% in 2013 and a 7.2% in 2014 of the Cash Grant, which will continue over the next years. That has squeezed the small margin of developers, compromising financial viability of projects that are already online, which included the grant in their project financing⁵. It is especially dramatic for the handful of thermo solar projects, due to the size and the huge amount of investment. Many foreign companies are affected, especially the Spanish ones. The situation is chipping away at the country's credibility.

Nevertheless, despite these difficulties, the solar market continues growing, as mentioned before, driven by cost reductions, financial innovations and improved investor confidence in this long-term venture.

Solar PV in depth

As mentioned, 2013 was the record year on capacity additions, with 4,751MW of

⁵ SEIA: Letter to OMB and Treasury on 1603 Sequestration Cuts

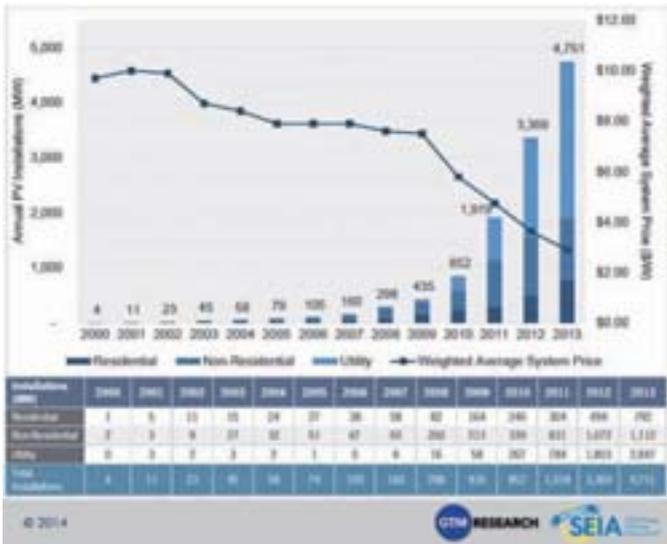
Solar PV installed. Annual weighted average PV system prices continued to descend in 2013, reaching a historic low of \$2.89/W.

More than a half of this new capacity (2,621MW) was installed in California, which continues being the champion in solar power in the US, followed by Arizona (421MW), North Carolina (335MW), Massachusetts (237MW) and New Jersey (236MW). In cumulative capacity, California is also the leader with more than 5GW running, followed by Arizona (circa 1.5GW) and New Jersey (over 1GW).

By segment, the utility scale broke records too with 2,847MW installed. However, the project pipeline (PPA-signed) in this segment fell from 12.6 GW to 11.7 GW, of which 3.3 GW is currently in construction with expected completion in the next two to three years. This is the first symptom that RPS-demand is starting to wane and the effect of tax credit cuts, since ITC is only available for less than three years (to 2016), for projects that usually need more than two years of development.

Commercial and residential segments, represented 1,112MW and 792MW respectively. The first one grows at a small rate, but the residential is distinguished by its remarkably consistent incremental growth. New financing options (lease, loan and PPAs) are more widely available for homeowners as well as new distribution channels closer to retail markets as partnerships with home improvement stores, electricity suppliers or other home service suppliers such as cable television. SolarCity, the company founded by the cousins of Elon Musk (Tesla), stands out as the leader of the contractor segment, ranking second, after FirstSolar.

Net metering is the battlefield here. Since it is a direct threat to the utility business model, as they are paid by kWh served to customers, a strong debate is taking place in many states about how to manage it. It is not a simple question; as long as homeowners continue to need the grid as a backup and for balancing generation and consumption, while efficient and economic storage is developed. Utilities are lobbying the PUCs for charging high fees to customers arguing that *distributed generation* (DG) solar users take far more from the grid than they give. Solar supporters



Solana-Abengoa

alleged that DG can actually be beneficial, since it is closer to consumption and it will avoid new transmission and distribution infrastructure to cope with demand increments. A strong battle will come in the following years.

CSP, stop and hope

Concentrated Solar Power is at the end of a cycle in the US. Between the end of 2013 and the first half of 2014, the largest capacity addition in the history of the country is going online. However, no new commercial project has started construction in the last two years, and the few that are in advanced grade of development, are trapped in permitting or financing phases. Now the *Sequestration* is adding a new hurdle in the road, as commented.

Around 1,300MW of CSP will be online soon, thanks to the key role of Spanish companies, which have been developers, engineers, contractors or suppliers. These projects are the result of extensive development during the last five years, and they are scattered throughout the southwest of the country⁶: Abengoa, with Solana, already successfully operating for the last six months, and Mojave, in commissioning (280MW each, parabolic trough), BrightSource, with Ivanpah in operation (392MW, tower), Solar Reserve – Cobra, with Crescent Dunes (110MW, tower) and Nextera - Sener, with Genesis (250MW, parabolic trough).

Two challenging moments for solar power are ahead: first in 2016 when the ITC will end and second, in 2020 when RPS compliance dates arrive, especially in California, the first market for solar power by far

Projects in development are Rice (Solar Reserve – Cobra, 150MW, tower) with all permits and PPA but without financing, and Palen (BrightSource – Abengoa, 500MW, tower), that does not have all California Energy Commission permits yet. Both projects are currently on stand-by.

All these new online projects were possible somehow thanks to the Federal 1705 *Loan Guarantee* program, where the government securitized up to 80% of the investment, making financing possible at a reasonable price. This program ended in 2011, but now there is a glimmer of hope for new projects, as Ernest Moniz, Secretary of Energy, announced last February during Ivanpah opening. The previous 1703 loan guarantee program is about to open for new applications, allocating up

to 4 billion dollars only for renewable energy where CSP funding could perfectly be granted.

Conclusions

Solar PV, especially distributed generation paired with smart grid, has the capability of altering the traditional power industry model that is more than one century old. Technology is becoming so reliable and inexpensive that it is beginning to cause concern among utilities regarding losing their core business: producing, transporting and distributing electricity to customers. The silent revolution has already started and it is more a matter of time when having solar panels on roofs will be as American as apple pie.

In the short or medium term, the market will depend on the cost of solar energy (which is expected to slightly increase as global excess capacity is removed²), availability of government incentives (*Sequestration* will force developers to revise some PPA prices), and new state and local policies support; with the cheap natural gas looming as an strong alternative for solving the energy puzzle, but with solar net metering being a very reasonable option.

Two challenging moments for solar power are ahead: first in 2016 when the ITC will end and second, in 2020 when RPS compliance dates arrive, especially in California, the first market for solar power by far. Political decisions made for later dates are crucial for the future of solar energy in the next decade ◀◀

⁶ See www.nrel.gov/csp/solarpaces/