

## SOLAR SECTOR UPDATE

The MAC Global Solar Energy Index (SUNIDX) is licensed as the tracking index for the Guggenheim Solar ETF\* (NYSE ARCA: TAN)

Note: Index performance does not reflect transaction costs, fees or expenses of TAN

For more information, visit: [www.GuggenheimInvestments.com/tan](http://www.GuggenheimInvestments.com/tan)\*

MAC Global Solar Energy Index (SUNIDX)



### SOLAR INDEX PERFORMANCE

The MAC Solar Index, the tracking index for the Guggenheim Solar ETF (NYSE ARCA: TAN), has rallied sharply by +32% so far this year, regaining strength after falling by -2% in 2014. The MAC solar index in 2013 soared by 127%.

Solar stocks surged during the first quarter of 2015 on bullish factors including (1) broadly positive Q4 earnings news across the solar sector and positive guidance for 2015, (2) announcements by more solar companies that plan to form yieldcos, (3) indications of strong world solar demand that has solar companies running at high utilization rates and planning more capacity, (4) news that China boosted its 2015 PV installation target by 19% to 17.8 GW from the preliminary figure of 15 GW, (5) the stabilization of crude oil prices and the broader realization that crude oil prices and solar stocks have little connection, and (6) heavy short-covering.

Negative factors for solar stocks included (1) continued solar trade disputes, (2) the need for solar profit margins to improve further, and (3) a shaky overall U.S. stock market picture due to high valuations and weaker earnings tied to the strong dollar.

The fundamentals of the solar industry remain favorable with

strong end-user demand, stable polysilicon and solar panel pricing (see charts on p. 3), right-sized industry capacity, and improving profitability among solar manufacturers.

### U.S. solar grew 30% in 2014 and more than 500 MW of residential solar was without state support

The U.S. installed 6.2 GW of solar PV in 2014, up 30% yr/yr, according to a report by GTM Research and SEIA ([link](#)). Notably, residential solar reached a record annual install level of 1.2 GW in 2014 and more than 500 MW of that was installed without any state-level support. That indicates how U.S. residential solar is spreading beyond states that provide strong solar support such as California due to falling solar costs. Solar accounted for 32% of new U.S. electricity generation capacity in 2014, coming in second behind natural gas but ahead of coal and wind. For 2015, GTM Research is forecasting a further 31% increase in solar installs to 8.1 GW.

Meanwhile, California became the first state to obtain more than 5% of its utility-scale electricity from solar. The total solar-generation figure is even higher after taking into account California's 2.3 GW of roof-top solar. California has aggressively promoted solar with its 33% renewable portfolio standard and other rebate incentives and net-metering policies to support smaller-scale solar.

### First Solar and SunPower surprise the markets with a joint yieldco

First Solar (FSLR) and SunPower (SPWR) surprised the markets in February by announcing a joint yieldco named "8point3 Energy Partners" for the number of minutes it takes for light to reach earth from the sun. The firms filed an IPO prospectus for the yieldco. The stock prices of both First Solar and SunPower rallied on the news. The two companies apparently went into a joint-venture yieldco in order to boost the number of the projects available for the yieldco and create some economies of scale.

In a yieldco model, a solar company spins off a self-contained development subsidiary that owns and operates large-scale solar farms under long-term power purchase agreements with investment-grade utilities or corporations. Yieldcos pay an attractive and predictable dividend flow to investors. The low-risk

yieldco typically has a low cost of capital to finance the project purchases. The yieldco model allows the parent company to free up its balance sheet to focus on manufacturing, services, installation, and project development, but the solar parent still receives long-term cash flow from those projects via its partial ownership of the publicly-traded yieldco.

The yieldco model has quickly proven itself in the solar energy industry. SunEdison in July 2014 launched its TerraForm Power (TERP) yieldco and has filed a prospectus for a second yieldco for overseas projects. Abengoa in June 2014 spun off its yieldco Abengoa Yield (ABY). Many of the other major solar companies have indicated an interest in spinning off their own yieldcos.

## Apple's \$848 million solar purchase is largest ever for U.S. corporation

Apple in early February announced a deal to purchase \$848 million worth of electricity from a First Solar solar plant in Monterey County, California on a 25-year power purchase agreement (PPA). Apple's purchase of 130 MW of electricity is enough to power its headquarter offices, its California retail stores, and one of its data centers. This is the largest solar power purchase yet by any U.S. corporation, other than utilities. Apple CEO Tim Cook said, "We're doing this because it's the right thing to do, but you may also be interested to know that it's good financially to do it. We expect to have a very significant savings because we have a fixed price for the renewable energy."

## Solar gains popularity among institutional investors

Google announced a \$300 million investment in a \$750 million SolarCity (SCTY) fund that will finance roof-top solar projects. Google expects to earn a return as high as 8% on its investment. SolarCity is currently the only sponsor for solar asset-backed securities (ABS) based on roof-top solar, but Moody's in January released a report saying that "Solar ABS" is emerging as a distinct asset class. Meanwhile, some institutional investors are investing in solar by owning the actual solar farms. For example, two Canadian pension funds, the Ontario Teachers' Pension Plan and the Public Sector Pension Investment Board, are teaming up with Santander in a joint venture to own \$2 billion worth of solar, wind and water infrastructure assets. The renewable infrastructure assets are attractive to institutional investors due to low risk, attractive long-term cash flows, and portfolio diversification.

## Solar homes fetch \$15,000 premium

U.S. homes outfitted with rooftop solar PV fetched an average premium of \$15,000 upon the home's resale, according to an in-depth study by the U.S. Department of Energy's Berkeley Lab in partnership with Sandia National Labs ([link](#)). The study bolstered the case for homeowners to install solar since the solar system boosts the value of their home as well as reduces their electricity costs and insulates them from rising utility electricity prices.

## Residential solar is going mass market

SolarCity (SCTY) in March announced a partnership deal with DirecTV that allows DirecTV service reps to sell SolarCity solar power systems. This gives SolarCity access to DirecTV's 37 million customers in the U.S. and Latin America. SolarCity already has sales partnership deals with Home Depot and Honda. The DirecTV deal is another example of how residential solar is going mass market.

## U.S. solar jobs grow at 20 times the national average and now outstrip coal industry

U.S. solar jobs in 2014 grew at nearly 20 times the national average rate and accounted for 1.3% of all new jobs in the U.S., according to the Solar Foundation's National Solar Jobs Census 2014 ([link](#)). U.S. solar jobs have grown by roughly 20% in each of the last two years and the forecast is for further 21% job growth in 2015. The solar sector now employs 173,807 workers, which is nearly double the 93,185 jobs in the coal mining industry and not far behind 215,700 jobs in the oil & gas extraction industry.

## Americans support solar more than any other energy source

Americans support solar development more than any other energy source, according to a Gallup poll released in March ([Gallup link](#)) ([SEIA article](#)). The poll found that 91% of Americans favor the same or more emphasis on solar, higher than 87% for natural gas, 84% for wind, 68% for oil, 63% for nuclear, and 55% for coal. The poll suggests strong grass-roots political support for solar among American voters even if some Congressional representatives aren't reflecting that grass-roots support.

## China raises its 2015 solar target to 17.8 GW to achieve world's largest installed solar base

China's energy regulator, the National Energy Administration, in mid-March raised its national 2015 solar installation target to 17.8 GW, which was 19% higher than its preliminary target of 15 GW announced in January. The announcement gave a boost to Chinese solar stocks in March. The 2015 target of 17.8 GW represents 27% growth from the 2014 target of 14 GW. If the target is reached, China by the end of 2014 will have about 45 GW of installed solar capacity, leapfrogging Germany as the world's largest installed-solar country. Germany had about 38 GW of solar capacity at the end of 2014.

## China's "Under the Dome" film goes viral and increases pressure on Chinese government to address pollution

The online documentary film "Under the Dome," made by well-known China Central Television newscaster Chai Jing, was seen online by more than 150 million people in just its first days, which certainly qualifies as "going viral" ([link](#)). The impact of the film

in China has been likened to America's "Inconvenient Truth" film and the 1962 book on pesticides named "Silent Spring" by Rachel Carson that led to the ban on DDT and was instrumental in the creation of the U.S. Environmental Protection Agency.

The film highlights Chai Jing's investigation into China's major pollution problems as a means of understanding the risks from pollution to her young child, whom had a benign tumor at birth and whom she had to keep inside "like a prisoner" on extremely bad air days that amounted to nearly half of the days in 2014.

"Under the Dome" provided some support for Chinese solar stocks in March with the theme that China's horrendous air pollution means the Chinese government has no choice but to reduce the country's dependence on coal and increase its reliance on clean sources of electricity such as solar. Some Wall Street analysts went so far as to say that the film represents a watershed moment for China's environmental policy and the awakening of the Chinese public to the need for solutions to China's pollution problems.

## Middle East is shocked at solar potential after 5.85 cent/kWh Dubai project

The Middle East was shocked to learn that the Dubai Electricity & Water Authority in Nov 2014 accepted a bid for a 200 MW solar power plant with a price of 5.85 U.S. cents/kWh (without subsidies) under a 25-year power purchase agreement. Various Middle East countries are in the midst of a big push to install solar to meet the strong growth in electricity demand. Middle East and North African countries will announce \$2.7 billion worth of solar projects this year, according to the Middle East Solar Industry Association. Saudi Arabia has pushed back its solar plans due to reduced government revenue after the plunge in oil prices, but Saudi Arabia still plans to install 41 GW of solar capacity by 2040.

Middle East countries can now install large-scale solar power for the equivalent of only \$25-30 per barrel of oil in a new oil-burning electricity plant, according to a report for the National Bank of Abu Dhabi written by the University of Cambridge and PwC ([link](#)). That means that it makes much more economic sense for oil producers to install solar and then sell their oil on the world markets at current prices near \$56/bbl, or retain oil reserves in the ground for future sale, rather than burn that oil to generate electricity. Saudi Arabia currently obtains about 65% of its electricity from burning oil.

## U.S.-Chinese solar duties are finalized while EU enforces previous trade agreement

The U.S. International Trade Commission (ITC) on Jan 21 finalized the duties levied by the U.S. Commerce Commission against Chinese solar companies that evaded the previous ruling by sourcing solar cells from Taiwanese suppliers. The ITC ruling finalized the latest round of the long-running U.S.-Chinese solar trade spat. Meanwhile, the EU announced that it planned to apply tariffs to three Chinese PV firms (Canadian Solar, ReneSolar, and

ET Solar) that the EU says violated the 2013 EU-China trade agreement. ReneSolar responded by saying it will withdraw from the agreement while Canadian Solar and ET Solar pleaded innocent and said they plan to fight the proposed order. Canadian Solar said it does not see the EU order having a "significant impact" in its 2015 guidance.

## SolarCity sues Arizona utility that is trying to slow solar by imposing surcharges

Many utilities have grown comfortable with their monopoly power and co-opted regulatory commissions. However, utilities are now becoming very concerned about the inroads that solar is making into their customer base and reducing demand for their product.

One utility in Arizona, Salt River Project (SRP), thinks it found a solution for battling solar by imposing surcharges on customers who install solar, thus replacing their lost revenue and making solar less economically attractive. The regulatory commission in SRP's service area approved the utility's surcharge plan despite the fact that about 500 solar users showed up at a commission hearing to protest the plan. However, SolarCity then sued the utility, charging that the surcharges are discriminatory and anti-competitive.

This is only the beginning of what will be a long war as the utility industry tries to fend off the disruptive technology offered by solar. As seen with other disruptive technologies, legacy companies can sometimes use their money and political clout to slow the new technology, but better customer solutions nearly always win in the end.

Meanwhile, the residential solar industry had a big win in red-state Georgia where the Georgia Senate passed a bill allowing third-party solar leasing for homes and businesses. Georgia's governor is expected to sign the legislation. House Bill 57, "Solar Power Free-Market Financing Act of 2015," allows third-party lessors to sell electricity to homeowners and businesses which was previously the privilege of only monopoly electric utilities. Florida is one of the few other states that does not allow third-party leasing, which is a key reason why Florida has been a laggard in installing solar.

## Solar plane is nearly half-way through its around-the-world flight

Solar Impulse 2 has successfully completed 5 of the 12 legs on its around-the-world trip (see [www.solarimpulse.com](http://www.solarimpulse.com)). The plane is flying solely on power generated by solar panels on its wings and fuselage. The plane is not using any fuel or emitting any pollution. The founders of the project do not expect commercial airliners to convert to solar panels, but they are seeking to "demonstrate that the actual alternative energy sources and new technologies can achieve what some consider impossible." The project illustrates how solar power can be suitable for even a mission-critical operation such as plane flight.

## SOLAR PRICING

Prices for solar cells and modules since mid-2014 have been moving sideways to mildly lower. Specifically, the price of multicrystalline solar cells fell from 37 cents per watt in mid-2014 to a new record low of 33 cents per watt in early 2015, according to data from Bloomberg New Energy Finance. Solar cell prices in the past 3-3/4 years have plunged by a net -61% from the 81-cent level seen in mid-2011.

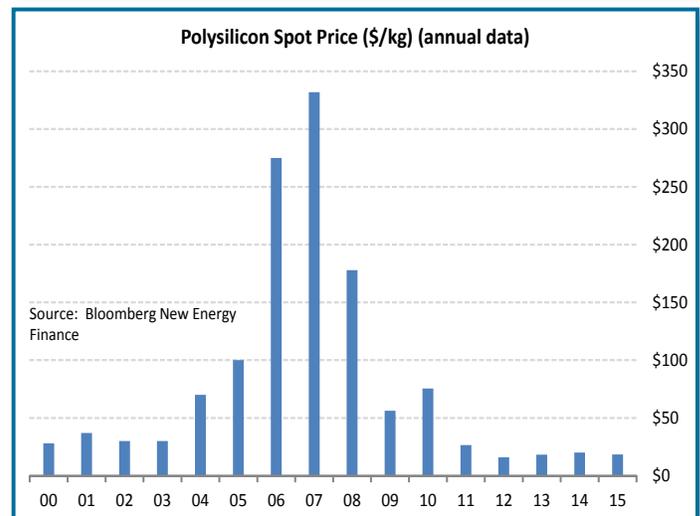
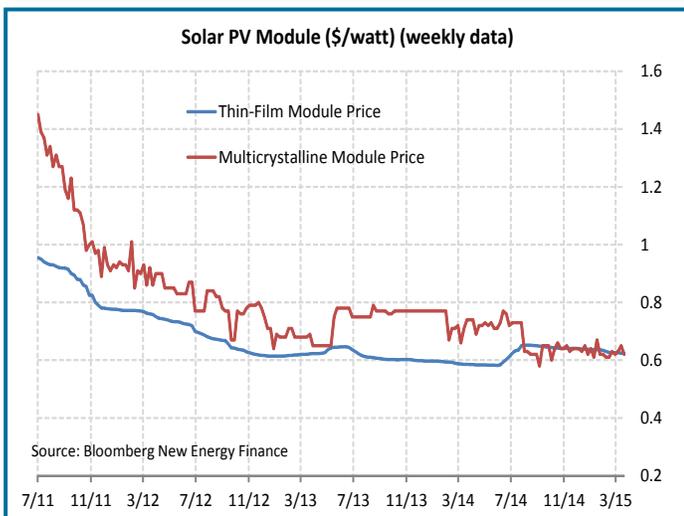
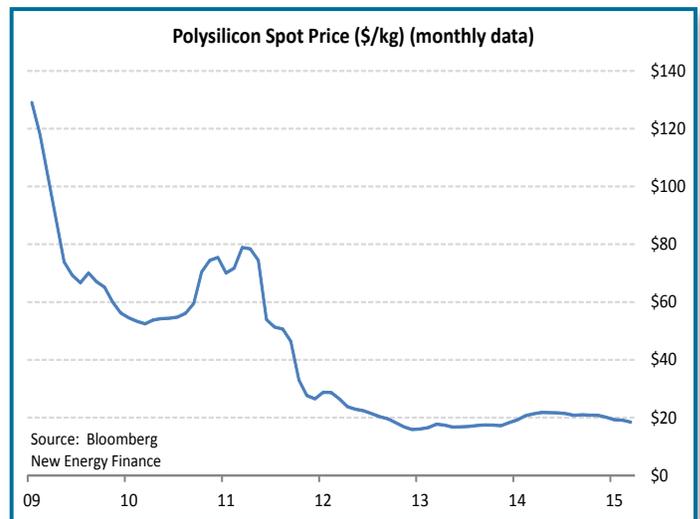
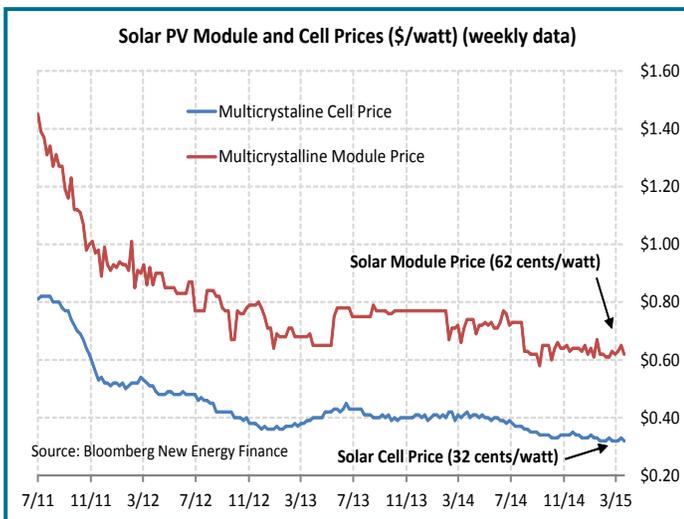
Meanwhile, multicrystalline solar module prices posted a new record low of 58 cents per watt in September 2014 but then recovered a bit and were at 62 cents per watt by late-March 2015, according to data from Bloomberg New Energy Finance. Solar module prices in the past 3-3/4 years have plunged by a net -57% from the \$1.45 level seen in mid-2011.

Spot polysilicon prices traded slightly above \$20 per kilogram during most of 2014 but then eased in early 2015 and were at \$18.46 in late March, according to data from Bloomberg New

Energy Finance. Polysilicon prices posted a record low of \$15.83 per kilogram in Dec 2012 but are currently 17% above that record low. Polysilicon prices in the past 3-3/4 years have plunged by a net -64% from the \$51.37 level seen in mid-2011.

Solar pricing in 2013-14 stabilized mainly because of stronger demand and reduced production capacity after the 2011-12 shakeout forced smaller and higher-cost producers out of the market. In addition, the large players are now calibrating their production more closely to demand. Various trade spats have also provided some support for solar module prices.

The price of thin-film modules made by First Solar and others posted a new record low of 58.2 cents in early June 2014, according to Bloomberg New Energy Finance. Thin-film module prices have since recovered modestly by +7% to the current level of 62.2 cents per watt.



## SOLAR PV ANNUAL NEW INSTALLATIONS

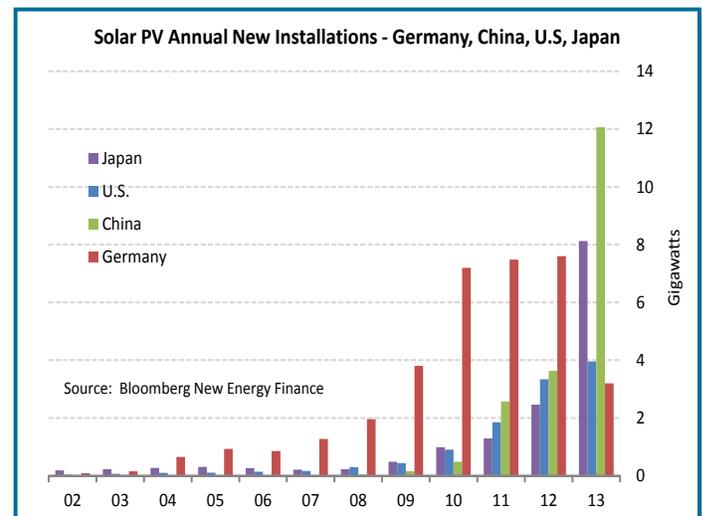
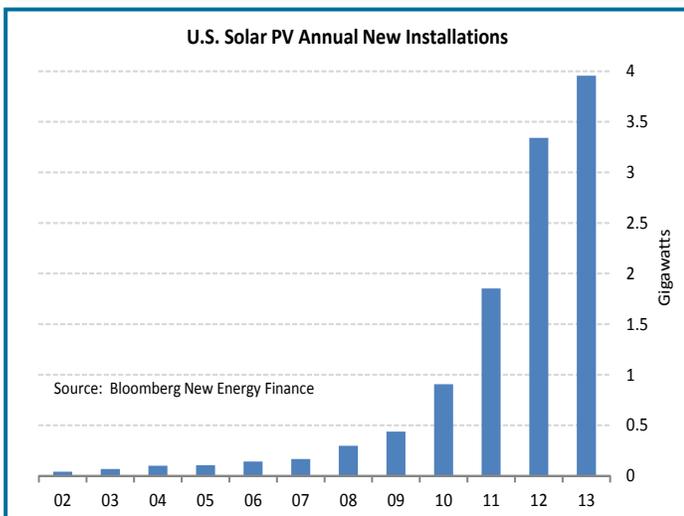
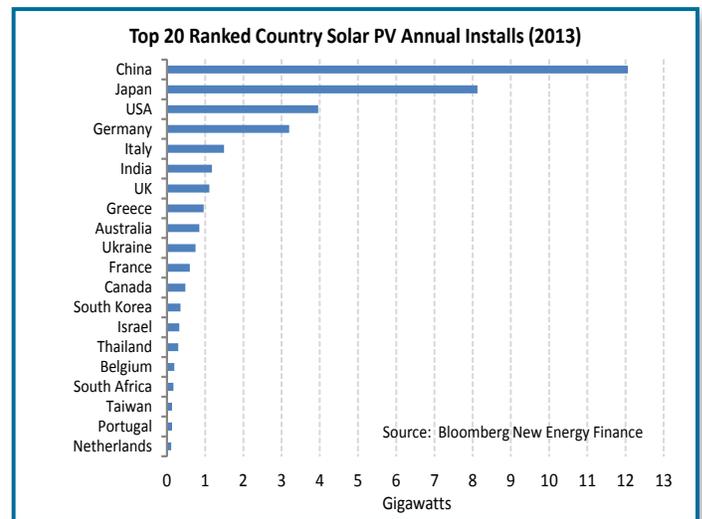
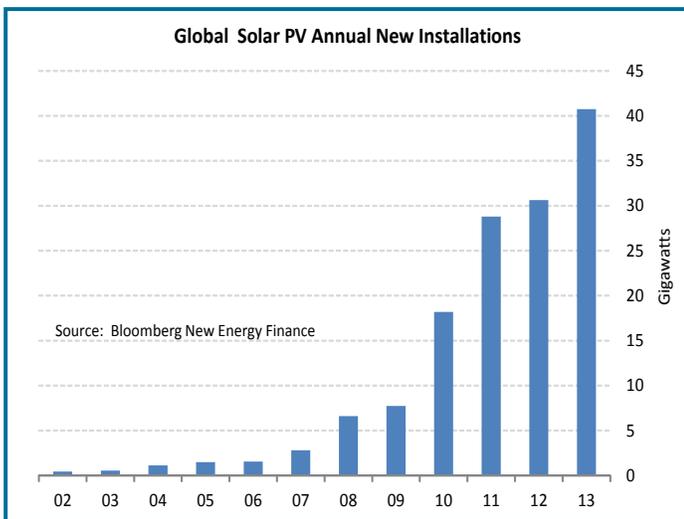
Global new solar PV installations in 2013 grew by +33% y/y to a record 40.7 gigawatts (GW), according to Bloomberg New Energy Finance. That was up from 30.6 GW in 2012 and a sharp improvement from the poor +6% y/y growth rate seen in 2012. Global solar PV installations have grown by a compounded annual rate of +44% over the last 5 years and have risen six-fold from 2008.

China leapfrogged Germany into the number one world spot for annual PV installs with 12.0 GW of installs in 2013, up by +232% from its 2012 level of 3.6 GW. Japan took second with 8.1 GW of new installs in 2013, up by +230% from 2.5 GW in 2012. The U.S. stood third in new installs at 4.0 GW, up by +18% y/y.

The sharp increase in installs in China, Japan and the U.S. more than offset the declines in Europe caused by reduced subsidy support. German installs in 2013 fell by -58% to 3.2 GW from 7.6

GW in 2012, although that was still large enough to put Germany in fourth place for world installs. Italian installs fell by -58% to 1.5 GW from 3.6 GW in 2012. French installs fell by -44% to 600 MW from 1.1 GW in 2012. The diversification of solar PV installs beyond Europe was a very healthy development for the solar industry.

U.S. solar PV installations in 2013 grew by +18% to a record high of 4.0 GW from 3.3 GW in 2012, according to data from Bloomberg New Energy Finance. U.S. PV installations over the last 5 years have grown by a compounded annual growth rate of +68%. SEIA is forecasting that U.S. PV installs will grow by an annual compounded growth rate of about +30% over the next three years to 9.2 GW by 2016. The states with the largest new PV solar installations in 2013 were California (2,621 MW), Arizona (421 MW), North Carolina (335 MW), Massachusetts (237 MW), and New Jersey (236 MW), according to the SEIA.



## SOLAR PV CUMULATIVE INSTALLATIONS

The amount of cumulative PV electricity generation capacity across the world grew sharply by +40% y/y to 146 gigawatts (GW) by the end of 2013, according to data from Bloomberg New Energy Finance. In just five years, global cumulative solar PV electricity generation capacity has increased by nine-fold from 16.8 GW in 2008 to 146.0 GW in 2013, representing a compounded annual growth rate of +43%.

Germany at the end of 2013 had the world's largest amount of cumulative installed solar electricity generation capacity by far at 35.4 GW, according to Bloomberg New Energy Finance. Germany's cumulative solar electricity capacity in the past 5 years has risen by more than five-fold from 6.1 GW in 2008 to 35.4 GW in 2013.

China moved into second place in 2013 with 19.1 GW of installed PV, representing 13.1% of installed global PV capacity. China's

cumulative solar electricity capacity in the past 5 years has risen by 136-fold from 140 megawatts in 2008 to 19.07 GW in 2013.

Italy was in third place in 2013 with 18.0 GW of installed PV, representing 12.3% of world capacity. Japan was in fourth place in 2013 with 15.6 GW of installed PV, representing 10.7% of installed global PV capacity.

The U.S. was in fifth place in world PV cumulative capacity in 2013 at 12.5 GW representing 8.6% of world capacity. U.S. cumulative solar electricity capacity over the past five years rose by more than nine-fold from 1.37 GW in 2008 to 12.5 GW in 2013 and showed an annual compounded growth rate of +47%.

