

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

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MAC Global Solar Energy Index (SUNIDX)



SOLAR INDEX PERFORMANCE

The MAC Solar Index, the tracking index for the Guggenheim Solar ETF (NYSE ARCA: TAN), posted a 1-1/3 year high in April but then fell sharply through late-September, showing some recovery in early October. The index is currently down -14.0% year-to-date. The MAC solar index in 2014 fell by -2% after soaring by +127% in 2013.

Solar stocks fell sharply in the May-September period due to (1) the sharp downward correction in the Chinese stock market, which caused some carry-over weakness in Chinese-headquartered solar stocks, (2) concern that slower economic growth in China may translate into reduced solar power growth in China, (3) the downward correction in the U.S. stock market which featured particular weakness in tech stocks and high-beta stocks, (4) continued weakness in crude oil prices, (5) a downward correction in the stock prices of solar yieldcos in order to produce more attractive dividend yields, and (6) continued solar trade disputes.

Solar stocks have seen a recovery rally so far in October on (1) ideas that the sector was severely undervalued at recent levels, (2) an upward rebound in SunEdison (SUNE), a solar bellwether, after the company announced cost-cutting, streamlined operations,

and more financial details about its margins and projects, and (3) the overall strength of the solar sector with strong revenue growth and improving margins.

Global solar demand continues to be very strong with both increasing unit sales and decreasing costs due to technology advances and economies of scale. Global solar installations in 2015 will grow by +36% y/y, the strongest growth rate in three years, according to GTM Research. At a country level, China this year should be able to easily hit its 2015 annual target of 17.8 GW, representing +37% y/y growth from 2014's install amount of 13.0 GW. U.S. solar in 2015 will grow by +29% y/y, according to GTM Research.

Meanwhile, the medium to long term outlook for solar remains very strong. Solar will boom over the next 25 years and will account for 35% (3.429 GW) of all electricity capacity additions through 2040, according to Bloomberg New Energy Finance's "[New Energy Outlook 2015](#)." Spending on new solar installs will be a massive \$3.7 trillion through 2040, according to the BNEF report. Moreover, BNEF says that all-in project costs for solar will plunge by another 48% by 2040 due to steep experience curves and improved financing.

Even after the October recovery, the solar sector remains undervalued compared with the broad market. The median trailing P/E of companies in the MAC Solar Index is currently 9.2, which is well below the P/E of 17.8 for the S&P 500 index. The median price-to-book ratio of 1.85 for the MAC Solar Index is well below the 2.72 ratio for the S&P 500. The median price-to-sales ratio of 1.12 for the MAC Solar Index is well below the 1.77 ratio for the S&P 500.

December's COP21 climate talks approach and more corporations commit to renewable energy

The Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21) meeting in Paris in early December is quickly approaching. There are hopes that the meeting will result in a new international climate change agreement aimed at capping global warming at a 2 degree (Celsius) increase from pre-industrial levels.

So far, 147 countries, accounting for 85% of world carbon emissions, have submitted pledges on reducing fossil-fuel emissions. However, even these pledges will probably not be enough to meet the 2-degree goal. The Climate Action Tracker group forecasts a 2.7 degree (Celsius) increase in global warming even if the pledges are met and Climate Interaction is forecasting a 3.5 degree (Celsius) increase.

As part of the COP21 agreement, the U.S. has pledged to reduce emissions by 26-28% by 2025 from 2005 levels, The European Union has pledged a 40% cut in greenhouse gases by 2030 from 1990. China has pledged to cut carbon emissions per unit of economic output by 60-65% by 2030 from 2005 and increase the share of energy from renewables and nuclear to 20% by 2030. India has set a goal of cutting carbon emissions per unit of economic output by 33-35% by 2030 from 2005 and to get 40% of its electricity capacity from non-fossil fuels by 2030. Russia has committed to a 25-30% reduction in greenhouse gas emissions by 2030 from 1990.

Ahead of the COP21 conference, the U.S. government is encouraging large U.S. corporations to demonstrate to world climate negotiators that there is broad-based business support in the U.S. for reducing carbon emissions and going off fossil fuels. As part of a White House initiative for sustainability investment announced in July, 13 major U.S. corporations including Apple, Berkshire Hathaway and Goldman Sachs, agreed to provide at least \$140 billion in new investment to reduce their carbon footprints.

In addition, nine more major U.S. companies in September took the pledge to go 100% renewable as part of the RE100 Initiative (www.there100.org). There are now nearly 40 major global corporations that have committed to going 100% renewable including IKEA, Swiss Re, Goldman Sachs, Johnson & Johnson, Nestle, Nike, Phillips, Procter & Gamble, Salesforce, SAP, Starbucks, Steelcase, UBS, Unilever, Walmart, and others.

VP Biden highlights how “special interests” are standing in the way of solar

Vice President Joe Biden, speaking at the Solar Power International conference on Sep 17, said that more Americans need to “understand the possibilities of solar... just imagine what we can do. Folks, we are on the cusp for something huge here but a lot of folks don’t realize it.”

Mr. Biden lamented about how the U.S. has provided more than \$5 billion of annual tax credits for the oil industry for many years and yet there is difficulty in extending smaller alternative energy credits. Mr. Biden said, “Deep-pocketed special interests that have lobbied for fossil fuels for years are now saying ‘Let’s take away consumer choice. Let’s stifle the market. Isn’t it amazing?’” He added, “The Koch brothers—fine guys as I understand it—and groups like ALEC, have successfully argued for limits on the amount of net metered systems, like in Wisconsin. They are pushing back against change at every level, trying to alter how the market functions.”

Mr. Biden noted that solar has provided 40% of all new U.S. electricity generation capacity so far in 2015 and the solar industry now employs more people than Google, Apple, Twitter and Facebook combined. Mr. Biden noted that solar deployment in the U.S. has grown by 20-fold since the Obama administration took office in 2008. Mr. Biden also confirmed a White House announcement earlier in the day of another \$120 million in solar funding for making PV cheaper through advanced solar technology research.

Meanwhile, President Obama in August sounded similar themes when he spoke at a clean energy summit in Nevada. Mr. Obama said that there are “massive lobbying efforts backed by fossil fuel interests or conservative think tanks” that are opposing renewables and that are trying to protect an “outdated status quo.” He said that “pushing for new laws to roll back renewable energy standards or prevent new clean energy businesses from succeeding” was “not the American way.” But on a more optimistic note, Mr. Obama noted how some Tea Party groups are coming together with green and pro-solar groups to support solar so that consumers can exercise their freedom of choice to select “cleaner, cheaper, and more efficient energy.” Mr. Obama spoke shortly after the White House announced a \$1 billion increase in loan guarantees for renewable energy projects and a batch of other alternative energy support measures.

Pope Francis pleads for support in addressing climate change

Pope Francis on his visit to the U.S. in September raised public awareness of climate change issues and perhaps even modestly changed the terms of the climate change debate. The Pope said that citizens need to recognize that they have a responsibility to be stewards of the earth, saying “Humanity has the ability to work together in building our common home.” In remarks to Congress, the Pope called on the U.S. government to take “courageous actions” to address climate change and “avert the most serious effects of the environmental deterioration caused by human activity.”

“We’ve reached the limit of what’s possible with diesel and gasoline”

Elon Musk, CEO of Tesla (TSLA) and Chairman of Solar City (SCTY), recently said in response to a question about Dieselgate, “What the Volkswagen [scandal] is really showing is that we’ve reached the limit of what is possible with diesel and gasoline.” Mr. Musk said Volkswagen’s need to cheat on its emission testing shows that diesel cars simply cannot meet both government emissions tests and consumers’ performance standards. Mr. Musk said the scandal should lead automakers and consumers to the faster adoption of clean and high-performing electric vehicles. The Volkswagen scandal should make clear to consumers that there is no such thing as Volkswagen’s highly-touted claim of “clean diesel,” just as there is no such thing as “clean coal.”

California boosts renewable energy mandate to 50% with at least \$8 billion in solar sales potential

California's legislature and governor approved an increase in the state's Renewable Portfolio Standard (RPS) to require that at least 50% of California's utility electricity is produced by renewable sources by 2030, up from California's previous RPS of 33% by 2020. California's higher RPS means that there will be an extra \$8.6 billion of potential revenue for building new utility-scale solar projects, according to GTM Research. The California Solar Energy Industries Association estimates that the solar sales potential will be even higher at \$10 billion.

North Carolina becomes the fourth state to reach the 1 GW solar mark

North Carolina as of September had 1.04 GW of installed solar capacity, according to the NC Sustainable Energy Association (NCSEA) ([link](#)). North Carolina became the fourth state to reach that mark behind California, Arizona and New Jersey. The solar industry in North Carolina accounts for \$1.8 billion in revenue and over 4,000 full-time equivalent jobs, according to the NCSEA's 2014 Clean Energy Industry Census.

Solar ITC extension has a chance of becoming part of grand energy bargain

Congressional committees have so far failed to approve an extension of the solar Investment tax credit (ITC). The solar ITC under current law will drop to 10% from 30% for commercial projects installed after Jan 1, 2017, and the ITC will be eliminated

for residential solar on that same date. Based on the Congressional track record, Congress is not likely to even consider a solar ITC extension until late 2016, just before the ITC step-down is set to occur. However, there is some hope for an earlier consideration of the solar ITC extension since some Democrats are talking about a grand energy bargain involving dropping the U.S. crude oil export ban in return for an extension of alternative energy support measures such as the solar ITC extension.

There is no doubt that solar growth in the U.S. will see a sharp drop in 2017 if the 30% ITC isn't extended. Solar developers are racing to get solar projects installed before the Jan 1, 2017 ITC step-down, which means there is sure to be a hang-over in 2017 after the 2015-16 front-loading. However, that would only be a bump in the road for the global solar industry since the U.S. accounted for only 14% of world solar installs in 2014. Even if the U.S. solar industry temporarily stumbles in 2017-18, the rest of the world will still be going full speed ahead with solar and U.S. solar will then recover at a slower non-ITC growth rate.

In addition, even if there is a 2017 ITC step-down, U.S. solar will still have significant government support from various state support measures such as state tax credits, net metering, and Renewal Portfolio Standards (RPS). Solar will still see continued support at the federal level from (1) the Property Assessed Clean Energy (PACE) financing program, (2) the Department of Energy's SunShot initiative along with technical and policy support from national laboratories, and (3) the EPA's Clean Power Plan (CPP), which involves a 32% reduction in national greenhouse gas emissions from 2005 through 2030 and a goal for the U.S. to get 28% of its power from renewable energy sources by 2030, more than double last year's 13% level.

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 30 cents per watt in May, increasing slightly to 32 cents by October, according to Bloomberg New Energy Finance. Solar cell prices in the past four years have plunged by a total of -61% from the 81-cent level seen in mid-2011.

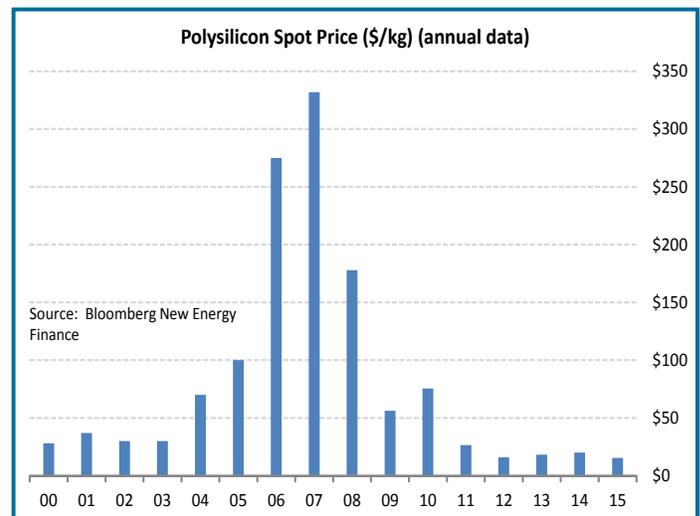
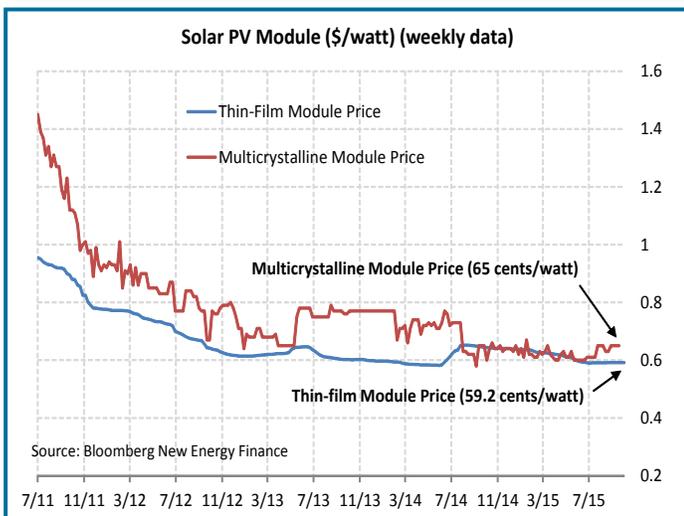
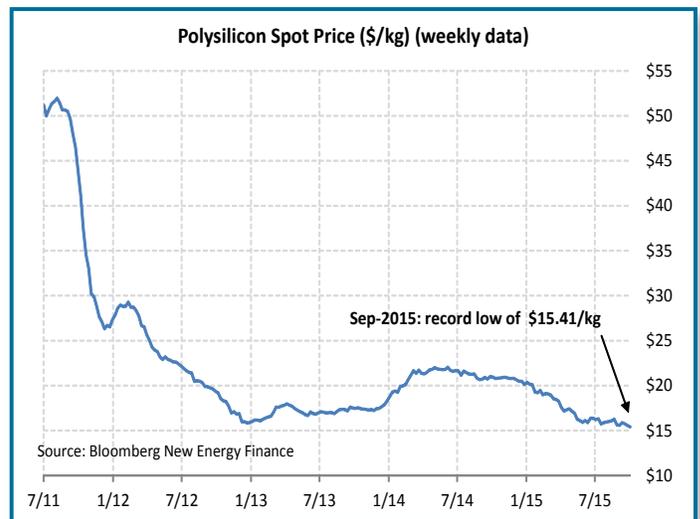
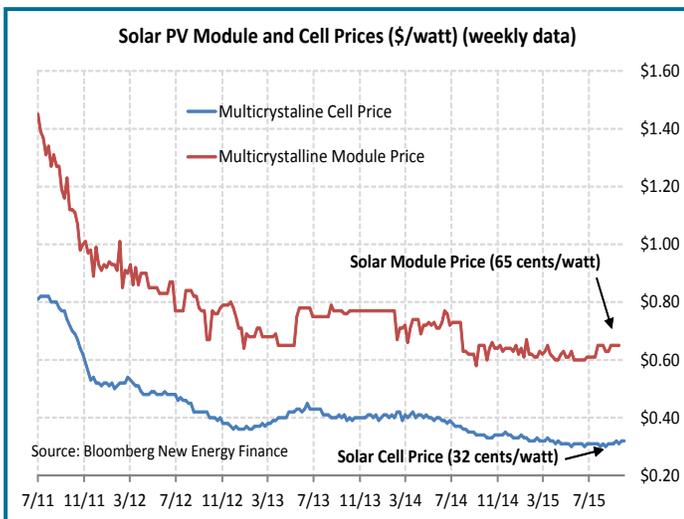
Meanwhile, the price of multicrystalline solar modules posted a new record low of 58 cents per watt in September 2014 but then increased a bit and were at 65 cents per watt in July 2015, according to data from Bloomberg New Energy Finance. Solar module prices in the past four years have plunged by a total of -55% 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 fell to a record low of \$15.41 per kg in October, according to data from

Bloomberg New Energy Finance. Polysilicon prices in the past four years have plunged by a total of -70% from the \$51.37 level seen in mid-2011. The decline in polysilicon prices is a key factor in allowing solar cell and solar panel prices to decline.

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 increased modestly by +2% to the current level of 59.2 cents per watt.

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.



SOLAR PV ANNUAL NEW INSTALLATIONS

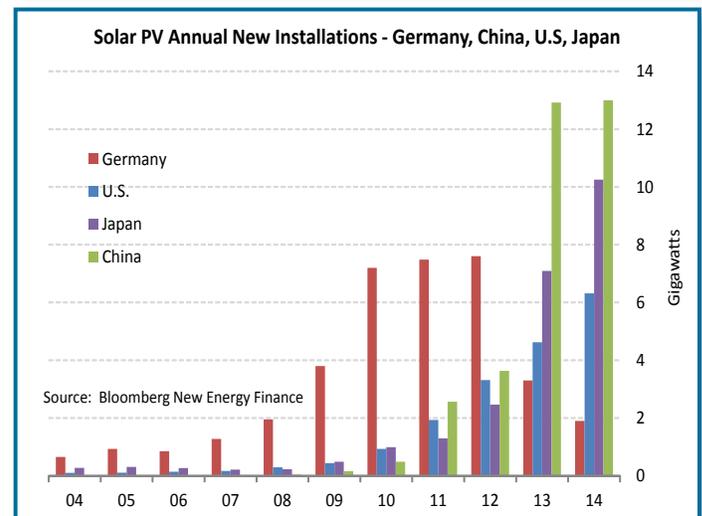
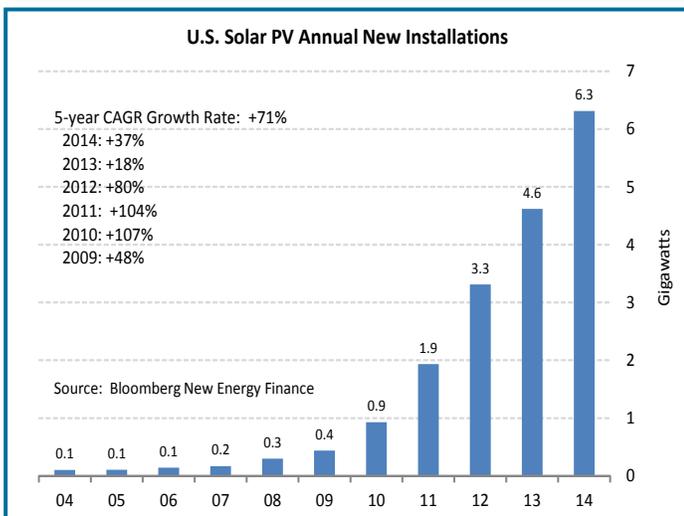
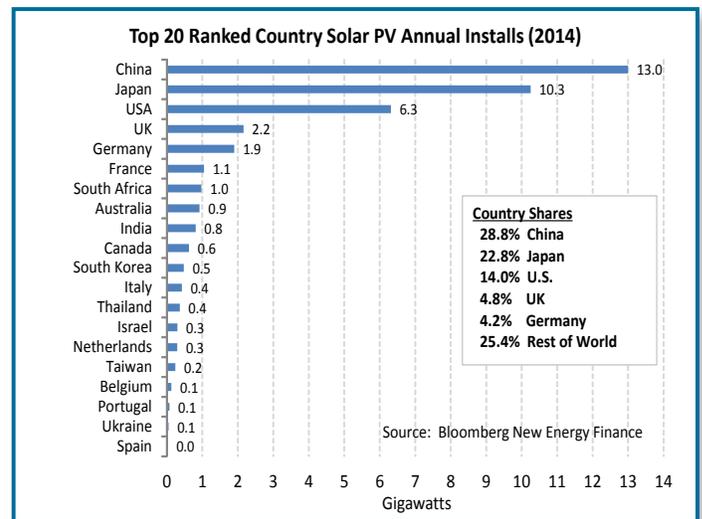
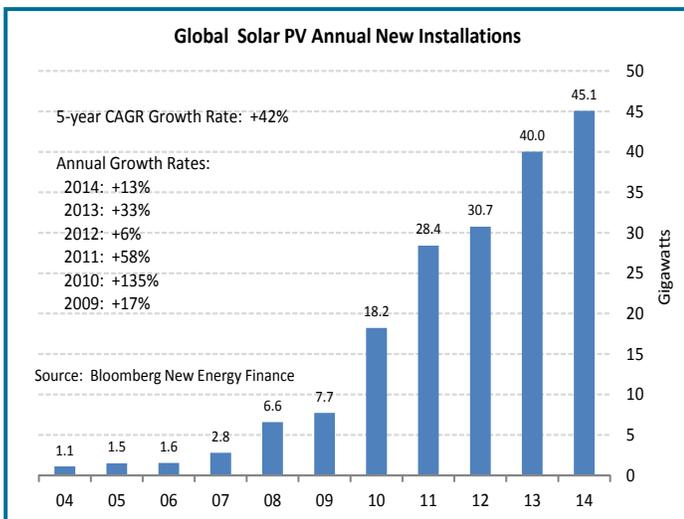
Global new solar PV installations in 2014 grew by +13% y/y to a record 45.1 gigawatts (GW), according to Bloomberg New Energy Finance. The 2014 growth rate of +13% followed growth rates of +30% in 2013 and +8% in 2012. Global solar PV installations have grown at a compounded annual rate of +42% over the last 5 years and have risen by six-fold from 2008.

China in 2014 remained in the number one world spot for annual PV installs for the second straight year with 13.0 GW of installs in 2014, up by +1% from its 2013 level of 12.9 GW. Japan remained in second place for the second straight year with 10.5 GW of new installs in 2014, up by +45% from 7.1 GW in 2013. The U.S. stood third in new installs for the second straight year at 6.3 GW, up by +37% y/y. The UK moved into fourth place for new installs in 2014.

The sharp increase in installs in China, Japan and the U.S. more than offset the declines in Europe, which were caused by reduced subsidy support. German installs in 2014 fell by -43% to 1.9 GW,

adding to the -57% decline seen in 2013 from the peak of 7.6 GW seen in 2012. Italian installs in 2014 fell by -69% to 424 MW, adding to the overall plunge of -95% seen in 2012-13 from the peak of 7.9 GW posted in 2011. French installs in 2014 rose by +62% to 1.0 GW, but that was still below the peak of 1.8 GW posted in 2011. UK installs in 2014 rose by +99% to a record 2.2 GW, adding to the +37% growth rate seen in 2013.

U.S. solar PV installations in 2014 grew by +37% to a record high of 6.3 GW from 4.6 GW in 2013, according to Bloomberg New Energy Finance. U.S. PV installations over the last 5 years have grown by a compounded annual growth rate of +71%. GTM Research is forecasting that U.S. PV installs will grow by +29% in 2015 to 8.1 GW. The states with the largest amount of new PV solar installations in 2014 were California (+35% to 3,549 GW), North Carolina (+19% to 397 MW), Nevada (+621% to 339 MW), Massachusetts (+28% to 308 MW), Arizona (-41% to 247 MW), New Jersey (+2% to 240 MW), according to the GTM Research.



SOLAR PV CUMULATIVE INSTALLATIONS

In 2014, the amount of cumulative PV electricity generation capacity across the world grew sharply by +32% y/y to 191.2 gigawatts (GW), according to Bloomberg New Energy Finance. In just five years, global cumulative solar PV electricity generation capacity has increased by nearly eight-fold from 24.8 GW in 2009 to 191.2 GW in 2014, representing a compounded annual growth rate of +34%.

Despite the sharp drop in new installs in the past two years, Germany at the end of 2014 still had the world's largest amount of cumulative installed solar electricity generation capacity at 37.4 GW, according to Bloomberg New Energy Finance. Germany's cumulative solar electricity capacity in the past 5 years has risen by four-fold from 9.9 GW in 2009 to 37.4 GW in 2014.

China remained in second place in 2014 with 32.9 GW of installed PV, representing 17.2% of installed global PV capacity. China's

cumulative solar electricity capacity in the past 5 years has risen by 110-fold from 300 MW in 2009 to 32.9 GW in 2014. China in 2015 will easily move ahead of Germany into first place for cumulative solar PV capacity.

Japan moved into third place in 2014 from fourth place in 2013. Japan's cumulative solar capacity in 2014 rose by +69% to 25.0 GW, representing 13.1% of world capacity. Italy fell to fifth place in 2014 from third place in 2013 with cumulative capacity in 2014 of 18.3 GW, representing 9.6% of world capacity.

The U.S. moved up to fourth place in 2014 in world PV cumulative capacity from fifth place in 2013. U.S. solar capacity in 2014 rose by 57% to 20.2 GW, representing 10.6% of world capacity. U.S. cumulative solar electricity capacity over the past five years rose by 12-fold from 1.7 GW in 2009 to 20.2 GW in 2014 and showed an annual compounded growth rate of +51%.

