

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), has rebounded somewhat since mid-February after the sharp sell-off seen in the first six weeks of 2016. The index is currently down -28% year-to-date. The MAC index in 2015 closed -15% lower after the -2% decline seen in 2014 and the +127% gain seen in 2013.

Solar stocks have recently seen weakness due to (1) the downward U.S. stock market correction seen in early 2016 and the general risk-off trading environment, (2) the U.S. Supreme Court's decision in February to stay the EPA's Clean Power Plan until challenges to the program can be heard in court, (3) concern that slower economic growth in China may translate into reduced solar power growth in China, (4) weakness in crude oil and natural gas prices that have had a negative effect on solar stocks as well the U.S. stock market in general, and (5) continued solar trade disputes.

Recent bullish factors for solar stocks include (1) the 5-year extension of the U.S. solar investment tax credit (ITC) approved by Congress in December, (2) the Paris COP21 global climate agreement in December, which established a long-term framework

for the world to reduce carbon emissions, and (3) a favorable extension of California's net metering program where nearly half of U.S. residential solar is installed.

Solar stocks are currently trading at bargain-basement prices compared with the broad market. The median trailing P/E of companies in the MAC Solar Index is currently 11.6, which is well below the P/E of 18.8 for the companies in the S&P 500 index. The median price-to-book ratio of 1.04 for the companies in the MAC Solar Index is well below the 2.81 ratio for the S&P 500. The median price-to-sales ratio of 0.96 for the MAC Solar Index is well below the 1.84 ratio for the S&P 500.

Despite the recent weakness in solar stock prices, the global solar industry itself continues to show strength. Global solar has grown at a very strong +25% compounded annual rate over the last five years. Meanwhile the long-term demand outlook for solar remains very strong since solar will account for 35% (3.439 GW) of all electricity capacity additions and a massive \$3.7 trillion of solar spending through 2040, according to Bloomberg New Energy Finance (BNEF). Moreover, BNEF expects all-in project costs for solar to plunge by another 48% by 2040, thus making solar one of the cheapest sources of electricity.

U.S. installed more solar than natural gas in 2015

The U.S. installed more new solar electricity generation capacity than natural gas capacity in 2015, meaning that solar flat out beat fossil fuels in 2015. Natural gas has an advantage over solar power as far as solar's intermittency, but solar wins on avoiding the environmental damage of natural gas and also having a known and fixed up-front cost as opposed to exposure to the volatility of natural gas prices down the road.

Specifically, solar installations in 2015 accounted for 29.4% of all new U.S. electricity generation capacity, edging out natural gas at 29.0%, according to SEIA/GTM Research's "U.S. Solar Market Insight report for 2015" ([link](#)). Wind actually beat both solar and natural gas with 39.0% of new generation. New nuclear and coal capacity was negligible. Solar and wind together accounted for more than two-thirds of new U.S. electricity generation capacity, together beating natural gas by a factor of 2-to-1.

U.S. solar growth is expected to soar by 120% in 2016

U.S. solar installs will see a banner year in 2016 with 120% growth to 16 GW, according to the SEIA/GTM report mentioned earlier. In 2015, U.S. solar installs grew by +15% to 7.3 GW from 6.3 GW in 2014, according to Bloomberg New Energy Finance. U.S. solar has grown by a compounded annual rate of +51% over the last five years.

U.S. solar growth will be temporarily boosted in 2016 by a large number of solar projects that were started early to beat what would have been the step-down of the investment tax credit (ITC) at the end of 2016, if Congress in late 2015 had not extended the ITC by another five years. GTM expects U.S. solar growth in 2017 to dip after the ITC-surge in 2016 but then resume strong growth again in 2018-19.

From a segment perspective, U.S. solar in 2015 received a big boost from +66% growth in residential PV to more than 2 GW, according to the SEIA/GTM report. Utility solar grew more slowly in 2015 by +6% to 4 GW but was still twice the size of residential solar installs. Utility solar will grow sharply in 2016 due to the huge 19.8 GW contracted project pipeline and will account for about three-quarters of U.S. solar installs in 2016, according to GTM. Non-residential solar (i.e., commercial and industrial) was little changed at 1.0 GW in 2015 but is expected to start growing again in 2016.

Geographically, solar installs were more broadly spread across the U.S. in 2015 with 13 states installing more than 100 MW of solar, up from 9 states in 2014, according to the SEIA/GTM report. There are now six states that have surpassed 1 GW in installed solar capacity, including California, North Carolina, Nevada, Arizona, New York, and New Jersey.

California installed the most solar in 2015 at 3.266 GW, accounting for 45% of all U.S. solar installs, according to the SEIA/GTM report. North Carolina installed the second most solar in 2015 at 1.134 GW (+186% yr/yr), accounting for 16% of all U.S. solar installs. The next largest amounts of solar installs in 2015 were Nevada (-12% yr/yr to 307 MW), Massachusetts (-10% to 286 MW), New York (+64% to 241 GW), and Arizona (-5% to 234 MW).

The SEIA/GTM report found that the average price of a solar system in the U.S. fell by -17% in 2015. The largest price declines were seen in the utility-scale solar. A steady decline in solar pricing is being caused by reduced hardware costs, installation costs, and financing costs.

World solar growth in 2016 is expected to slow somewhat from 2015's strong +24% pace

Solar PV installs across the world in 2015 grew by +24% to 56 GW from 45 GW in 2014, according to Bloomberg New Energy Finance. World solar has now shown a compounded annual growth rate of +25% over the last five years and has risen by

three-fold from 18.2 GW in 2010.

As for 2016, GTM Research is forecasting solar growth of +8.5% to 64 GW from GTM's estimate of 59 GW of 2015 solar. However, IHS is forecasting much higher 2016 growth of +17% to 69 GW from IHS's 2015 install figure of 59 GW. IHS expects 2016 growth to mainly come from the U.S., China, and India. The overall world solar growth rate in 2016 is expected to be somewhat slower than 2015 due to reduced subsidy support in Europe and Japan.

China was the top country for world solar installs in 2015 at 16.0 GW, up +23% from 2014. Japan was in second place with 11.6 GW of installs (+13% yr/yr), the U.S. was third with 7.3 GW of installs (+15% yr/yr), and the UK was fourth with 3.7 GW of installs (+69% yr/yr). Solar in India holds great promise but has a long way to go with only 2.1 GW of installs in 2015 (+158% yr/yr). Due to reduced subsidy support, Germany solar installs fell by a double-digit rate for the third straight year to 1.0 GW, down from the peak of 7.6 GW in 2012. Further information on 2015 solar installs is available on pages 5-6 of this report.

U.S. utility scale solar is seeing strength outside mandated growth

The fact that solar is coming of age can be seen in a new report by GTM Research forecasting that more than half of U.S. utility-scale solar growth in 2016 will be outside state-mandated renewable portfolio standards (RPS) (see "[The Next Wave of U.S. Utility Solar: Procurement beyond the RPS](#)"). State RPS regulations require utilities to obtain a certain minimum proportion of their electricity from renewable sources. GTM reports that through 2015, RPS requirements in 36 states and Washington DC accounted for 61% of utility-scale solar installs. However, GTM now predicts that a majority of utility solar (52%) will be outside RPS requirements in 2016 with more than 6 GW of non-RPS utility solar. The report says that the two main drivers of utility solar are falling costs and the fact that utilities can lock in stable electricity generation prices on a multi-year basis as opposed to having exposure to the volatile costs of natural gas.

Clean Power Plan is stayed by Supreme Court while litigation on the merits progresses

The U.S. Supreme Court on February 9 surprised many observers by granting a stay for the states on complying with the EPA's Clean Power Plan (CPP) until the merits of the plan are litigated in court. The Supreme Court's stay means that states, if they wish, can stop the planning process on how they will comply with the CPP, which in any case does not require plans to be submitted until 2018 and does not come into full effect until 2022.

The goal of EPA's CPP is to reduce national greenhouse gas emissions by -32% from 2005 through 2030 and for the U.S. to get 28% of its power from renewable energy sources by 2030, more than double the 2014 level of 13%. The CPP is the centerpiece of the Obama administration's plan on how to comply with the Paris COP21 global climate agreement. The CPP encourages states to

get more of their electricity from clean energy sources. If the CPP ultimately survives its legal challenges, it will provide a big boost for solar and wind power.

Attention on the CPP now shifts to the CPP court case on the merits that is currently being heard in the federal D.C. Circuit Court. Oral arguments on the case could be heard as early as June. Once the case is decided either way, it will undoubtedly be appealed all the way up to the Supreme Court.

The recent death of Supreme Court Justice Antonin Scalia potentially complicates the CPP situation. The Supreme Court issued the stay for the CPP when Mr. Scalia was still alive and the decision was 5-4 in favor of the stay. The fact that the Supreme Court granted the stay was a hint that the Court might be inclined to strike down the CPP altogether if the Court had been ruling on the merits of the CPP. However, conservatives have currently lost their 5-4 advantage on the court and much now depends on how a new Supreme Court justice would rule on the case, whenever a new justice might be approved by the Senate. In any case, it will likely be at least 2017 or 2018 before the legal status of the CPP receives a final determination in the Supreme Court if the CPP is not killed earlier in the event that a Republican president is elected in November.

Solar industry gets a final win on net metering in California

The U.S. solar industry received a big win when the California Public Utilities Commission on Jan 28 formally approved its earlier proposal for a "net metering 2.0 program" to take effect when the current program expires in 2017. The decision preserves net metering payments made to solar households at retail rates, rather than at a lower rate such as a wholesale rate. However, there were some negatives in the decision such as an initial interconnection fee of \$75-100 for new solar customers, a 2-3 cent per kWh fee on net metering customers that is paid by other utility customers, and a move to make net metering tariff payments in the future tied to the variable "time-of-use" cost of electricity at various times during the day. On the whole, the solar industry was pleased with the proposal since the California PUC preserved net metering at retail rates. The industry hopes that the California proposal will provide a regulatory model for other states.

Oregon phases out coal and adopts a 50% renewable energy target by 2040

Oregon's governor on March 11 signed into law a measure that requires the state's utilities to stop purchasing coal power by 2035. Oregon thereby became the first state to begin to phase out coal power by legislative action. The bill also requires Oregon's utilities to get at least 50% of their electricity generation from clean sources by 2040. Other states with aggressive renewable energy targets include a 50% target by 2030 for California and New York, a 75% target by 2032 for Vermont, and a 100% target by 2045 for Hawaii.

Exxon gets hits by both climate change resolution and Rockefeller Foundation divestment

The SEC in March ruled that Exxon Mobil Corp (XOM) will have to include a climate change resolution in its annual shareholder proxy ballot. The proposal was submitted by New York state's comptroller. If approved by shareholders, the climate change resolution would require Exxon to detail the impact that climate change, or legislation on climate change, could have on the company's profitability. Exxon shareholders typically have not approved climate change resolutions, but the resolution nevertheless spotlights the profitability risks for fossil fuel companies from climate change and the shift to a lower carbon future. Chevron (CVS) was also required to put a climate change resolution on its annual proxy ballot.

Meanwhile, the Rockefeller Family Fund said in March that it will divest from fossil fuels. The Rockefeller Fund also said that it will eliminate its holdings of Exxon Mobil because it believes the company has misled the public about climate change risks. The fact that the Rockefeller Family Fund is divesting from Exxon Mobil is particularly notable since Exxon Mobil is the descendent of Standard Oil, the company that made John D. Rockefeller the richest man in the world at the time. It is a sign of the times when some hundred years later, Mr. Rockefeller's descendants have rejected their fossil fuel heritage due to the deleterious impact of fossil fuels on the environment.

SunEdison may be close to bankruptcy filing due to liquidity crunch

SunEdison (SUNE) is reportedly planning a bankruptcy filing according to reports by Debtwire and the Wall Street Journal. SunEdison was dropped from the MAC Solar Index on March 22 due to the bankruptcy planning reports.

If SunEdison does in fact file a bankruptcy petition, it will not be because of conditions in the solar industry but rather because the company got caught in a liquidity crunch after trying to grow too fast and taking on too much debt with a highly complex financing structure. The company also ran into internal financial control problems that resulted in a delay in filing its annual report, which resulted in a breach of some loan covenants.

SOLAR PRICING

Prices for solar cells and modules since mid-2014 have been moving sideways to lower. Specifically, the price of multicrystalline solar cells fell to a new record low of 30 cents per watt in May 2014 but was mildly above that level at 32 cents by March 2016, according to Bloomberg New Energy Finance. Solar cell prices in the past 4-3/4 years have plunged by a total of -60% from the 81-cent level seen in mid-2011.

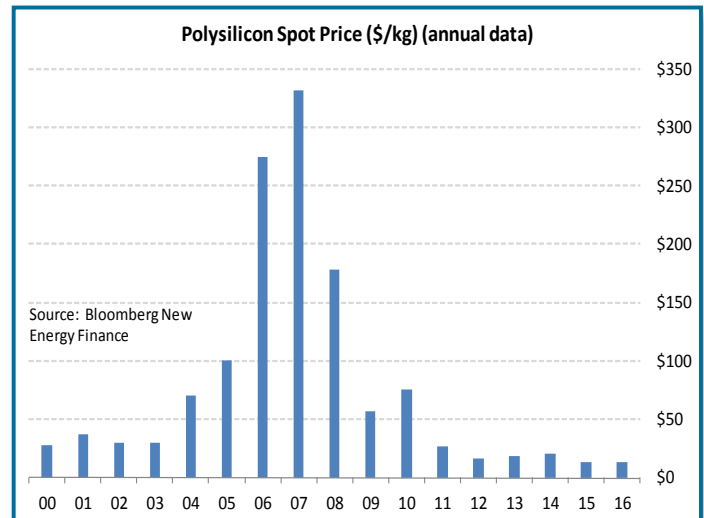
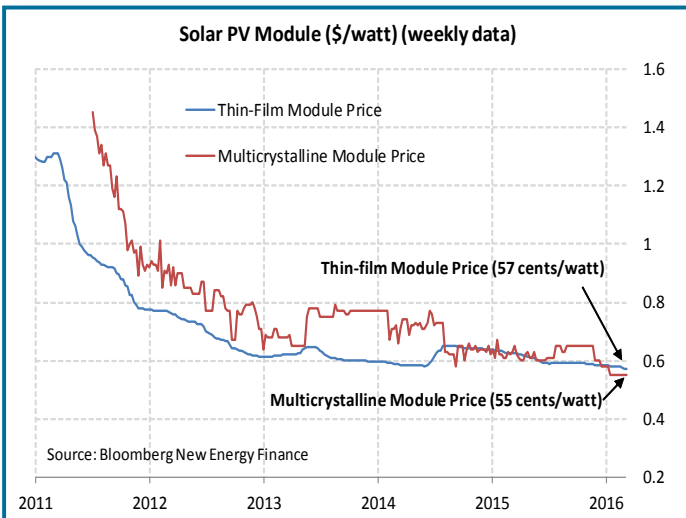
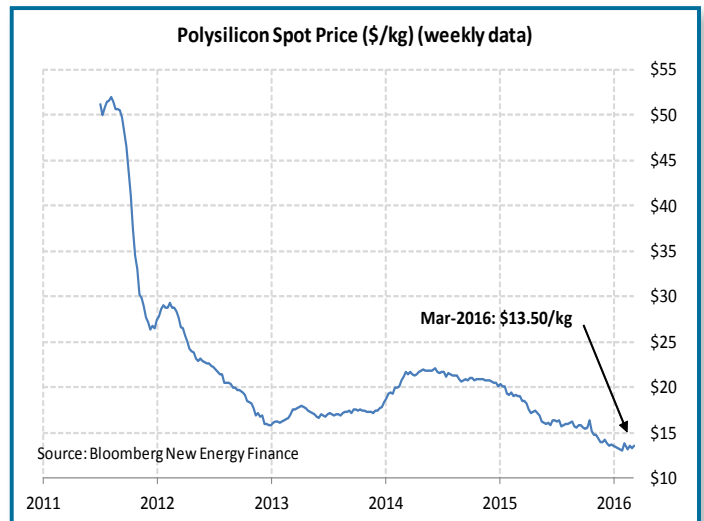
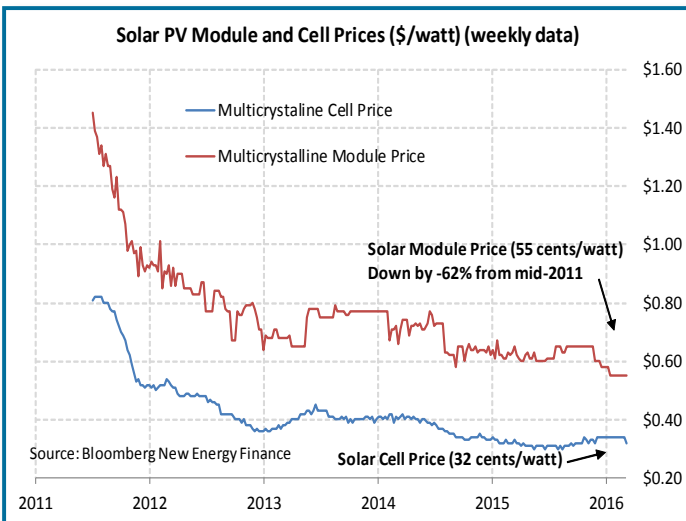
The price of multicrystalline solar modules has moved lower since late 2015 and fell to a new record low of 55 cents per watt in early 2016, according to data from Bloomberg New Energy Finance. Solar module prices in the past 4-3/4 years have plunged by a total of -62% from the \$1.45 level seen in mid-2011.

Spot polysilicon prices have been falling since mid-2014 and posted a new record low of \$13.08 per kg in early-February 2016, rebounding slightly higher to the latest reading of \$13.50 in early March 2016, according to data from Bloomberg New Energy Finance. Polysilicon prices in the past 4-3/4 years have plunged

by a total of -74% 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 since polysilicon is the key raw material for most solar cells.

The price of thin-film modules made by First Solar and others fell to a record low of 57.0 cents in March 2016, according to Bloomberg New Energy Finance. Thin-film module prices have fallen by a total of -40% from the mid-2011 level of 95.5 cents.

Solar prices fell sharply in 2011-12 as new Chinese solar firms flooded the market. However, solar prices then stabilized in 2013-14 due to strong demand and tighter supplies after the 2011-12 shakeout forced the smaller and higher-cost producers out of the market. The large players are now calibrating their production more closely to demand. Various trade spats have provided some support for solar module prices due to solar tariffs and minimum pricing schemes. Solar prices in general should slowly decline over time due to improved technology and lower production costs.



SOLAR PV ANNUAL NEW INSTALLATIONS

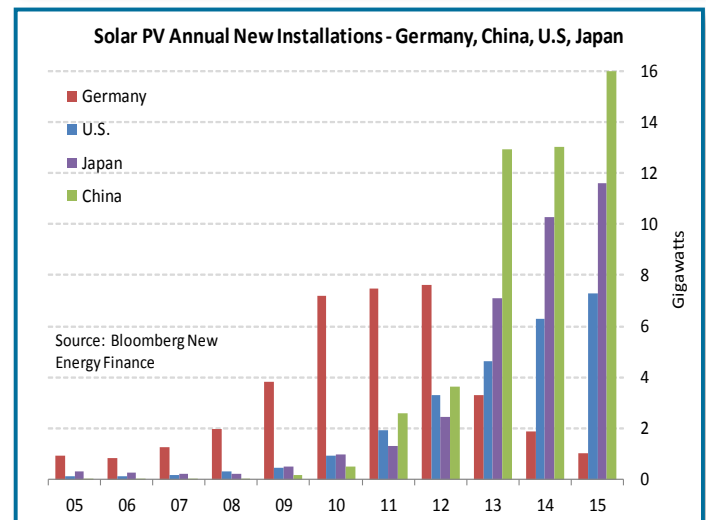
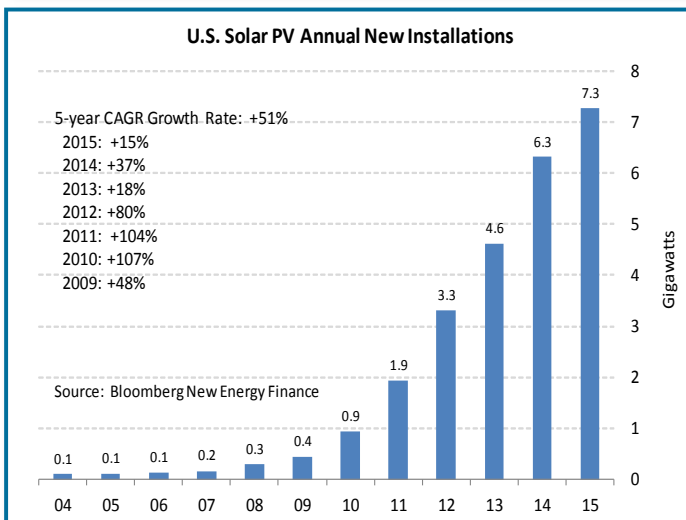
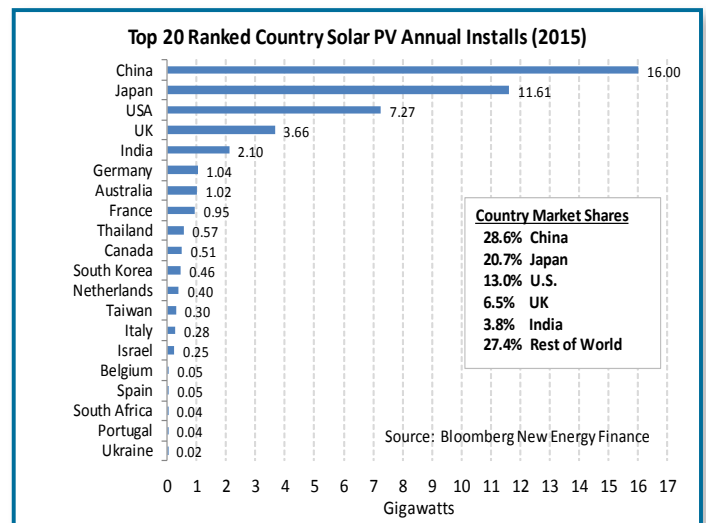
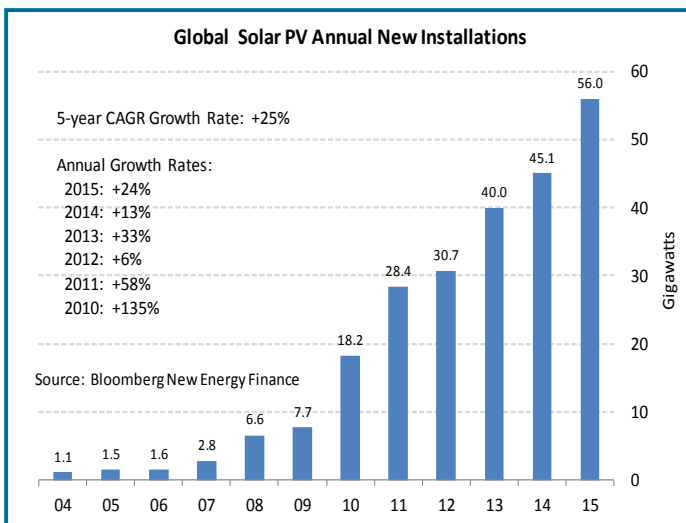
Global new solar PV installations in 2015 grew by +24% y/y to a record 56.0 gigawatts (GW), according to Bloomberg New Energy Finance. The 2015 growth rate of +24% followed growth rates of +13% in 2014 and +30% in 2013. Global solar PV installations have grown at a compounded annual rate of +25% over the last 5 years and have risen by eight-fold from 2008.

China was the top country in the world for new annual PV installs for the third straight year with 16.0 GW of installs in 2015, up 23% from the 13 GW of installs seen in 2013 and 2014. Japan remained in second place for the third straight year with 11.6 GW of new installs in 2015, up by +13% from 10.2 GW in 2014. The U.S. stood third in new installs in 2015 for the third straight year at 7.3 GW, up by +15% y/y. The UK was in fourth place for the second straight year with 3.7 GW of new installs in 2015, up +69% from 2.2 GW in 2014.

The sharp increase in installs in China, Japan and the U.S. more

than offset the declines in continental Europe, which continued to be undercut by reduced subsidy support. German solar installs in 2015 fell by -46% to 1.0 GW and were far below the 2013 peak of 7.6 GW. Italian installs in 2015 fell by -34% to 280 MW, sharply below the 2011 peak of 7.9 GW. French installs in 2015 fell by -10% to 950 MW, about half of the 2011 peak of 1.8 GW.

U.S. solar PV installations in 2015 grew by +15% to a record high of 7.3 GW from 6.3 GW in 2014, according to Bloomberg New Energy Finance. U.S. PV installations over the last 5 years have grown by a compounded annual growth rate of +51%. U.S. PV installations in 2016 will more than double to 16 GW, according to GTM Research, with about three-quarters of those new installs coming from utility-scale projects. The states with the largest amount of new PV solar installations in 2015 were California (-8% yr/yr to 3.3 GW), North Carolina (+186% to 1.1 GW), Nevada (-12% to 307 MW), Massachusetts (-10% to 286 MW), and New York (+64% to 241 MW), according to the GTM Research.



SOLAR PV CUMULATIVE INSTALLATIONS

The amount of cumulative PV electricity generation capacity across the world grew sharply by +30% y/y to 248 gigawatts (GW) in 2015, according to Bloomberg New Energy Finance. In just five years, global cumulative solar PV electricity generation capacity has increased by nearly six-fold from 44 GW in 2010 to 248 GW in 2015, representing a compounded annual growth rate of +42%.

China leapt ahead of Germany in 2015 to take the top spot in the world for cumulative solar capacity at 49 GW, according to Bloomberg New Energy Finance. China at the end of 2015 accounted for 20.0% of world solar PV capacity. In the past five years, China's cumulative solar capacity has soared by 62-fold from only 789 MW in 2010 to the 2015 level of 49 GW, representing a 5-year compounded annual growth rate of 129%.

Germany fell into second place with 38 GW of cumulative solar PV capacity, but that was up by only +2.8% from 2014. Germany's

cumulative solar electricity capacity in the past 5 years has doubled from 17.1 GW in 2010 to 38.4 GW in 2015. Germany at the end of 2015 accounted for 15.5% of the world's total solar PV capacity.

Japan remained in third place for the third straight year. Japan's cumulative solar capacity in 2015 rose by +48% to 37 GW, representing 14.9% of world capacity. Japan's cumulative solar capacity in the past 5 years has risen by nine-fold to 37.0 GW from only 3.9 GW in 2010, representing a 5-year compounded annual growth rate of 57%.

The U.S. remained in fourth place for the third straight year. U.S. solar capacity in 2015 rose by +38% to 27.8 GW, representing 11.2% of world capacity. U.S. cumulative solar electricity capacity over the past five years rose by ten-fold to 27.8 GW from 2.6 GW in 2010 and showed a compounded annual growth rate of +61%.

