

PV market share shifts dramatically in 2013

THE GLOBAL newly installed PV power capacity reached 36 GW in 2013, a 28% increase over 2012. Another dramatic change: Europe, the prevalent market in the PV sector in 2012, scaled back a bit as Asia assumed the leadership position in the PV sector with 19 GW of newly installed capacity.

The global PV picture in 2013 reflected a seismic shift in market share. Asia emerged holding a 53% stake of the total newly installed worldwide capacity in 2013, surpassing Europe (the market leader in 2012). Europe, now in second place with 11 GW, was followed by North America with 5.3 GW and Oceania — a region centered around the Pacific Ocean — with 0.8 GW. Europe in 2013 installed about 6 GW less than 2012, while North America installed roughly 2 GW more capacity. Oceania experienced a 0.2 GW drop in 2013.

Mitigating factors

The feed-in tariff reduction, regulatory changes or phasing out of national support in most countries had a considerable impact on the growth of PV industries and markets in 2013. Another driving factor was the imposition of customs duties and levies for different goods and products

in the PV value chain, depending on the country of origin of the respective products.

Geopolitical issues also played a role. For several European countries, especially Italy and Germany, diminished political support negatively impacted the PV market. Meanwhile, on other continents, the introduction of feed-in tariff, net-metering regulations or auction-based market introduction of PV all stimulated the fast growth of installed PV plants. Take China, for instance; the country introduced the feed-in tariff in 2011, and its PV plant capacity installed in 2013 subsequently increased by 183% compared to 2012.

Major markets

The major markets in Europe in 2013 were: Germany (3.3 GW); the UK (1.5 GW); Italy (1.4 GW); Romania (1.1 GW); and Greece (1.04 GW). Together these countries accounted

for 77% of the total newly installed European capacity.

Asia was led by China (11.3 GW), Japan (6.2 GW), and India (0.4 GW). Together, these countries represent 92% of newly total installed PV capacity in Asia.

In North America, the major market for solar is the United States (4.7 GW), which accounts for 92% of total new installed capacity.

In Oceania, the leading country was Australia with 0.7 GW installed.

Finally, in Africa the leading country was South Africa with 0.36 GW installed.

Market dynamics

Changes in the 2013 global solar market impacted the major industry players in various ways. In Germany, for example, there was a dramatic reduction of new PV installations. Industry observers attribute this to a change in the Feed-in-Tariff (FiT) mechanism where reductions of the rates are connected to the previously installed capacity in relation to a certain target capacity per of 2,500-3,500 MWp/annum. The end result was a 2.2% decrease of the FiT per month during the first quarter of 2013 and a 1.8% drop per month during second and third

Region	Cumulated installed capacity 2013		Installed capacity 2013		Estimated electricity generation 2013
	[GW]		[GW]		[TWh/y]
North American	13.8		5.3		23.4
South American	0.1		0.0		0.0
Europe	81.2		11.0		85.1
Asia	35.9		19.2		51.7
Oceania	3.2		0.8		6.7
Africa	0.4		0.1		0.0
World Total	134.7		36.3		167.4
Largest national market	Germany	35.6	China	11.3	

Table 4. Summary of the global PV power market 2013 [20] [21] [22].



Figure 5. Italy ranked third among Europe's biggest contributors to newly installed PV capacity in 2013. Shown is the PV Power Plant Portfolio in Sicily, Italy.

quarters. Throughout last quarter, the Feed-In-Tariff decreased 1.4 % per month. Accordingly, the plants connected within January 2013 up to 1 MWp received 0.14439 €/kWh; up to 10 MWp, 0.1178 €/kWh [23].

Likewise, the Italian market registered another strong reduction of installed PV plants capacity in 2013. This was mostly caused by the end of the last FiT, V Conto Energia. In June 2013, GSE officially announced the discontinuation of the incentive after its cap of 6,700 million euro was reached [24]. Currently the Italian Government does not offer subsidies on solar.

In France, approximately 40% of new installations in 2013 came from medium-sized projects between 36 kW and 100 kW. Plants of 250 kW or more made up almost a quarter of new installations. This country showed a slowdown in the fourth quarter of 2013, installing only 120 MW of new capacity [25]. All

in all, though, the solar market in France experienced a decrease of 50% compared to the previous year.

Not surprisingly, the UK market in 2013 grew 26.7% compared to 2012. The UK solar PV market has been moving towards this point, thanks to the Renewable Obligation Certificates, which is a parallel incentive scheme focused primarily on large-scale installations. In 2012/2013, the large-scale PV plants were eligible to receive two ROCs per MW. However, this was later reduced to 1.6 ROC per MW, due to cost adaption of PV plants [26].

In 2013 Greece generated 1.04 GW in new capacity installed — an increase over 2012. Yet, the photovoltaic market in that country reflected an irregular installation trend. In the first quarter of 2013, 797 MW of new capacity were installed; 158 MW, 36 MW and 56 MW were added in the second, third and fourth quarters, respectively. This slowdown trend

was caused by the cut feed-in tariff of 2013. For solar parks installed after February 2013, the tariff for those smaller than 100 kW and larger than 100 kW will be 120 €/MWh and 95 €/MWh for the generated electricity. It also reflects the significant changes that happened in the economy as a whole as the tariffs were announced in August 2012 for these installations to be 225 €/MWh and 171.9 €/MWh. Thus, the new tariff announced corresponds to a 46.6% and 44.7% reduction [27].

Romania saw a tremendous increase compared to 2012 with 46 MW installed. The reasons for this incredible growth, industry watchers say, are the various incentives. The country released six green certificates per MWh, with each certificate open to be traded on a spot market from a minimum of 27 € to maximum of 55 € per MWh. Since the demand of these green certificates significantly exceeded expectations, a cut of green

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certificates from six to three per MWh for any projects connected after first January 2014 was announced in March 2013. Subsequently, impressive projects were connected before that date [28].

Emerging PV markets

Clearly China dominated the solar PV market in 2013 with 11.3 GW (of which 500 MW were contributed by off-grid systems). In fact, no country has ever added more than 8 GW of solar power in a single year prior to 2013. China's record outstripped even the most optimistic forecasts made 12 months ago. This massive growth was driven mostly by the generous feed-in tariff for both utility-scale as well as distributed generation installations (roof tops and residential installation). For large-scale plants based on the radiation level at the locations, the rate varies between 0.9 yuan (€ 0.102) and 1 yuan (€ 0.117) per kilowatt-hour (kWh) of energy generated.

For distributed projects the owners are entitled to receive between 0.62 yuan (€ 0.073) to 0.78 yuan (€ 0.0879) per kWh. Since this tariff was valid for all projects connected up to 1 of January 2014, this deadline created a similar rush at the end of the year previously observed in other markets such as Germany or Spain. The Chinese government is targeting 14 GW of additional PV capacity in 2014, but a large portion of this capacity (8 GW) is directed toward the distributed generation segment [29].

Elsewhere, in Asia, Japan ranked second — both in terms of newly installed capacity worldwide and in accumulated capacity in the Asian market in 2013. After the introduction of the aggressive FiT, the number of new PV plants installation grew at an impressive monthly rate.

Between April and November, Japan installed 4.585 GW — an astronomical 174% uptick compared to the 1.673 GW of capacity installed between July 2012 and the end of March 2013. Of these new installations 79% (or 3.632 GW) were utility and commercial installations; the remaining 21% (953 MW) were residential PV plants [30].

By April 2013, FiT rates for electricity generated by PV installations were lowered by 10%, thus PV systems below 10 kW are receiving ¥ 38/kWh (€ 0.274) over a period of 10 years and systems above 10 kW are receiving ¥ 37.8 (€ 0.273). This resulted in a growth to up to \$ 2 billion in new investments in the PV sector [31].

India also contributed to the PV growth in Asia in 2013, installing 1.1 GW of new PV capacity, confirming the same growth trend of 2012.

In the US, new capacity installed in 2013 exceeded the 29% growth rate of new capacity added in 2012 (3.36 GW). Except for the first quarter, during which 744 MW were installed, throughout the second and third quarters the installation rate was constant with an average of 950 MW installed per quarter. In the last quarter 2.108 GW of new capacity was installed, which is indicative of the typical year-end rush. Analysts expect 2014 will be another strong year for the US PV market, with installations likely to reach 6.6 GW. Mostly of this growth is projected to come from the residential segment, with the remainder generated by commercial and utility [32].

Farther afield, the South African market saw the installation of 75 MW of new PV plants capacity during the 2013 — a feat largely due to renewables IPP programme. The PV mass market for residential and medium

sized commercial applications has not officially started, but considering the country's huge solar radiation potential and constraints in the power system, massive growth of PV plants installations is expected in the coming years.

Looking beyond the core installation numbers, it appears that solar PV is starting to play a substantial role in electricity generation in some countries, particularly in Europe with its large installation basis. At the same time, lower prices and trade disputes have opened new markets from Africa and the Middle East to Asia and Latin America.

It is also noteworthy that in 2013 several new hybrid systems combining the photovoltaic plants and diesel back-up power in microgrids were installed. For instance, on Vava'u Island in the State of Tonga, a 500 kWp PV plant combined with the existing diesel power station was implemented in 2013. The project promises to reduce diesel consumption by up to 180,000 l per year and cover up to 13% of the island's energy demand [33].

By using this emerging hybrid technology, fuel price increases will likely be reduced, contributing to the development and improvement of the quality of life, especially for all remote communities which currently still rely on fossil fuel-based gensets. Furthermore, large-scale hybrid systems can be also adopted for big cities currently powered by diesel generators.

Large projects

Two of the world's biggest projects were completed in 2013 (see Table 5). The first one, Longyangxia Hydro-solar PV Station, was entirely designed and built by POWERCHINA. The construction began in March 2013, and grid connection and

Project Name: Longyangxia Hydro-solar PV Station	Project Name: California Valley Solar Ranch
Project: 320 MWp Location: Qinghai Province, China Technology: Crystalline PV panels Land Area: 9.4 km ² , Completion Date: 4 th December 2013	Project: 250 MWp Location: Carrizo plain, northeast of California Valley Technology: High efficiency crystalline Land Area: 17.66 km ² , Completion Date: October 2013
Project Name: Gonghe Industrial Park phase I	Project Name: Catelina Solar Project
Capacity: 200 MWp Location: Qinghai Province, China Technology: Crystalline PV panels Completion Date: 12 December 2013	Capacity: 143.2 MWp Location: Bakersfield, Kern County, California Technology: Thin-Film panels, CIGS and CdTe type Completion Date: August 2013
Project Name: Campo Verde Solar	Project Name: Arlington Valley Solar Energy II
Capacity: 139 MWp Location: Imperial County, California Technology: Thin-Film panels, CdTe First solar Completion Date: September 2013	Capacity: 125 MWp Location: Maricopa Country, Arizona Technology: Crystalline Completion Date: May 2013

Table 5. Major projects that achieved commissioning in 2013 [34].

commissioning started at the beginning of December 2013. During its 25-year expected lifetime, the project is expected to feed 498,000 MWh of electricity per year into the grid. A separate project, a 200 MWp installation, was also commissioned.

The second large-scale project, California Valley Solar Ranch (CVSR) with a capacity of 250 MWp, was implemented with a single-axis tracking system and is located in Carrizo plain, northeast of California Valley. The project, which was completed in 2013, is owned by **NRG Energy; Sun-power** is the contractor. The project is expected to feed 550,000 MWh per year into the grid.

Also in 2013, three PV plants with a peak power between 125 MWp and 143 MWp were commissioned.

In 2013 several factors combined to create a favourable environment for innovation among PV producers: module prices stabilised, production costs continued to decrease and solar cell efficiency slightly improved. All this enabled the manufacturers to expand their production capacity and prepare for further growth in demand.

The Top 10 PV module suppliers alone delivered in 2013 40% of the newly installed capacity in 2013. Nine of the Top 10 companies are based in China or Japan, with the exception of one in Canada (Canadian Solar).

The massive growth of Japanese PV installations also drove the expansion of PV Japanese module manufacturers; in 2013 **Sharp Solar** and **Kyocera** ranked third and fifth, respectively [36].

PV market sectors

The concentrated photovoltaic (CPV) side of the market has seen considerably increasing numbers due to the higher efficiency levels in locations with high direct normal irradiation and low moisture. However, it still remains small compared to the conventional PV market. In 2013 several concentrated PV plants were completed in Australia, Italy and United States, with small pilot plants currently under way in Chile, Namibia, Portugal, Saudi Arabia and South Africa, as well as other locations. By the end of the year, over 165 MW of total capacity was operating in more than 20 countries.

According to market research from IHS, CPV installations are forecast to total 1.362 GW by 2020, with 160 MW expected to be installed this year [37].

Cost reductions

The global PV panel industry saw prices fall dramatically between 2009 and 2012, mainly due to: (i) competition, (ii) economies of scale and (iii) technological and manufacturing

advances. During the year 2012, the module prices saw only one direction (downward), while in 2013 they remained quite stable over 2013. For instance, in January 2013 the average price for crystalline PV modules made in China was 0.50 €/Wp; by comparison, it was 0.80 €/Wp for the module-type produced in Germany. In December 2013 the crystalline modules made in China maintained the same price, while the ones made in Germany featured a reduction of 0.10 €/Wp [38].

The PV inverter market saw the same trend as the module market dating back to 2009, when Asian manufacturers gained successively higher market shares. Four companies from China and Japan made the Top 10 PV inverter supplier list of 2013 [39]. China and Japan represented 35% of global PV inverter revenue in 2013 (it was just 12% in 2011). The global leader is again **SMA**, followed by **ABB**, which includes **Power One**. Many industry experts surmise that the decline of the PV market in Europe and the shift of focus for cost saving gains away from modules to the rest of the BoS directly impacted European inverter suppliers. In the last two years, their revenue has been halved, and many of leading names from the last five years are no longer ranked among the Top 10.