2.3 MW solar plant built by the German company IBC Solar in Sakura, north-west of Tokyo, Japan.

86 674 MWp

in the European Union at the end of 2014

PHOTOVOLTAIC BAROMETER

A study carried out by EurObserv'ER

EurObserv'ER

The global photovoltaic market continued to expand between 2013 and 2014, rising from 37.6 GW to almost 40 GW unlike the European Union market that plummeted further. The EurObserv'ER estimate of the European photovoltaic market is about 6.9 GWp in 2014, a 32.3 % drop on 2013, yet three years earlier, in 2011, it hovered around the 22 GWp mark.

91.3 TWh

Photovoltaic electricity generated in the EU in 2014

6 883.3 MWp

Photovoltaic capacity connected in the EU in 2014

PHOTOVOLTAIC BAROMETER – **EUROBSERV'ER** – APRIL 2015

Krinner's PV Plant in Gänsdorf, Germany, has a total capacity of 54.5 MW and covers an area the size of 270 football pitches.

The global photovoltaic market's robust health belies the European Union's market situation. While public policies continue to back solar power development in Asia, North America and the emerging markets (South Africa, South America, India, Turkey, etc.), the European market is beset by highly draconian national and European policies that hamper sector development. For the most part, these policies have been applied in the countries that have already invested heavily in their solar sectors (Germany, Italy, Greece, Belgium, etc.), while policies are more helpful in the UK and France, where the photovoltaic sector lags behind. However their efforts to pick up from where the former left off are too weak to revive the market that has been in free-fall since 2012.

At first sight this slump might appear to be incongruous, as the solar power market has never been so good. New European surveys such as those published at the end of 2014 by Ecofys ("Subsidies and Costs of EU Energy"), clearly demonstrate that back in 2012, the full (or LCOE) cost of producing electricity had already fallen below € 100/MWh in many European countries, and that it is now similar to the cost of nuclear and natural gas-sourced power. According to the Current and Future Costs of Photovoltaics study by the German think tank Agora Energiewende, published in February 2015, solar energy is on the verge of becoming the most competitive energy in many parts of the world. The study shows that from 2025 onwards, the cost of producing solar power will be € 0.04–0.06/kWh in Southern and Central Europe. By 2050, these costs may have fallen to € 0.02–0.04/kWh. It points out that these costs will also depend on the legal framework and financing terms, which could limit further reduction in the absence of political determination.

Nonetheless at world level, all the growth indicators are encouraging. In January 2015, the photovoltaic consultancy IHS published its market trend forecasts for the year 2015 citing about 30% new growth in global demand, which amounts to a market of about 57.3 GW. However its estimate for 2014, put at about 44.7 GW, is higher than either that of the EPIA (European Photovoltaic Industry Association) or that of the IEA PVPS (the International Energy Agency's photovoltaic programme), which we have used in this barometer. The difference stems from their assessment of the Chinese market, which is particularly hard to pin down.

The long-term growth forecasts are also very positive. In 2014, the International Energy Agency (IEA) again revised its growth forecasts for 2050 upwards. In its Technology Roadmap Solar Photovoltaic Energy publication, the IEA reckons that global photovoltaic capacity in a Hi-Ren scenario, may reach 4 600 GWp by 2050, which is enough to generate 6 300 TWh, or 16% of the world's electricity production. At the end of 2014, the global market's combined installed capacity should be about 180 GW and account for 1% of global electricity output. A new IHS report published in March, predicts that global installed capacity will stand at 498 GW by 2019, on the basis of a 75-GW annual global market.

THE 2014 GLOBAL MARKET… HAS 40 GW IN ITS SIGHTS

At the end of March the IEA PVPS released its first estimates of the global market, which it reckons should approach 40 GW (including 38.7 GW in countries that IEA PVPS members monitor directly), compared to installed capacity for 2013 put at 37.6 GW.

To no-one's surprise, Asia now dominates the global market, with roughly 60% of the volumes. China's market, whose installation data was revised downwards in 2013 (from 12.92 to 10.95 GW), stabilized in 2014 at around 10.6 GW **(tables 1 & 2)**, and is set to pick up sharply. In March 2015, the Chinese government announced a twelve-month target of 17.8 GW, with specific province installation quotas.

Japan's market also put on a strong spurt by installing about 10 GW in 2014 (9.7 GW according to the IEA PVPS) as against about 7 GW in 2013… almost matching its Chinese neighbour's progress for 2014. Solar power's progress in Japan is more of a forced march, as in July 2012 and in the aftermath of the Fukushima nuclear disaster; the government had to set up a particularly generous incentive system that pays for unused electricity output. In 2014, for instance, <10 KW systems were paid 37 yen per kWh (€ 0.29/kWh) over 10 years, for every unused kWh. The rate for >10 kW systems is 32 yen/kWh (€ 0.25/kWh) over 20 years. However the Japanese Feed-in Tariff is dropping sharply, for after the 10% reduction in 2013, and 11% reduction in 2014, the government announced a new 16% reduction, which will drive down the FiT to 27 yen/kWh in July 2015. The new FiT system has already prompted the Ministry of Economy, Trade and Industry (METI) to approve funding of 70 GW of photovoltaic projects in the space of two years… enough to supply 8% of the country's electricity requirements. However a number of analysts doubt that this capacity can be installed because of the dearth of available sites, and above all because of hostility from the country's electricity companies. The latter fear the consequences of this development on the price of electricity and the technical problems arising from connecting the PV capacity. They also argue for restarting the country's nuclear power stations. Five national operators have even announced that they intend to stop connecting new capacity. The government has taken these comments on board and plans to change the rules as of this year and allow the electricity utilities to cancel their purchasing engagements on projects that are not so sound.

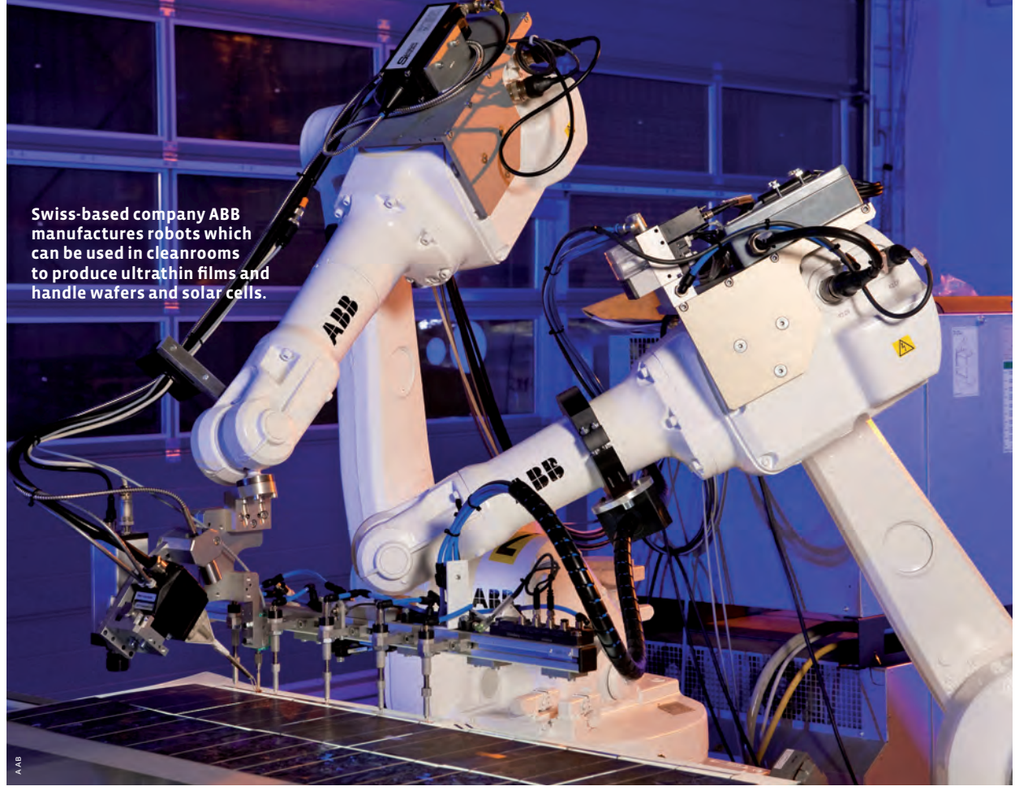
The US photovoltaic market took a 30% leap according to market figures published last March by SEAI (the American solar energy industries association) and GTM Research. They indicate that 6 201 MW of capacity was installed in 2014, up from 4 776 MW in 2013, taking installed PV capacity to date to 18.3 GW. Most of this growth was driven by the large ground-based solar park segment (i.e. 3.9 GW), projects led by the major energy players. In fact the residential segment (1.2 GW) eclipsed the commercial application segment (1 GW). The SEIA and GTM Research point out that in 2014, solar power accounted for 32% of newly-installed electricity-generating capacity in the United States, and for the second year running outstripped wind power (with a 23% share) and coal-fired electricity (no new capacity installed in 2014). However shale gas outperformed PV with a 42% share in 2014. GTM Research forecasts 31% growth in the 2015 solar market for the US, leading to an 8.1-GWp market. Turning to output, the EIA's (Energy Information Administration) federal statistics suggest that PV electricity output will almost double between 2013 and 2014, rising from 8.1 to 15.9 TWh. However, at less than 0.5% of American electricity production, it is still negligible (wind power has a 4.4% share). It should be borne in mind that the EIA underestimates output as its figures exclude power plants of less than one megawatt and thus roof-mounted systems are not factored in. Other markets, such as Australia and South Korea (both at 0.9 GW), have matured and are approaching one gigawatt of output… while even South Africa, whose market emergence is more recent, stands at 0.8 GW.

THE EUROPEAN MARKET SHRINKING LIKE A DEFLATED BALLOON

First available European Union market estimates give no cause for cheer. EurObserv'ER puts newly-installed capacity at about 6 883 MW, which is a 32.3% year-on-year drop **(table 3)** and takes its capacity to date to 86.7 GW **(table 4)**. In 2011, the European market established an installation record of almost 22 GW and has been in free-fall ever since. For the first time it has been overtaken by both the Chinese and Japanese markets, which has not occurred since 2002 (when Japan was the world's leading photovoltaic market). In 2015 also the United States should displace Europe in the market rankings.

This new European slowdown was expected by the PV experts and can be put down to a number of factors. The first is that many leading PV countries have opted to curb its development. Thus several markets that only recently crossed the one-gigawatt threshold, such as Italy and Greece, are losing speed if not ground to a halt. The governing politicians quote the main cause as being their determination to cap the increase in the price of electricity and make renewable energies easier to integrate into their electricity mix.

Another factor that is specific to the European energy market, also explains this slowdown. The recession that followed the 2008 financial crunch, has reduced European demand for electricity and created imbalance in that market. Eurostat claims that European Union (UE of 28) electricity output dropped from 3 387 TWh in 2008 to 3 261 TWh in 2013, which is a fall of 126 TWh in six years. At the same time, renewable electricity output (normalized for hydro- and wind power) increased by ↘



Swiss-based company ABB manufactures robots which can be used in cleanrooms to produce ultrathin films and handle wafers and solar cells.

A AB

573 to 823 TWh, i.e. by 250 TWh. PV electricity output increased fastest in the renewable total… more than tenfold from 7.4 TWh in 2008 to 80.9 TWh in 2013. According to EurObserv'ER, it rose to as much as 91.3 TWh in 2014, which is 12.9% more than in 2013 **(table 5)**. This push by renewable energies coupled with the drop in conventional electricity output poses major economic problems for energy operators, whose conventional production facilities' (fossil and nuclear) profitability has declined. These players are now putting extreme pressure on the decision makers to limit the increase in new renewable energy capacity growth, especially when sources are as decentralized as photovoltaic for self-consumption. Their view is that this development needs to be delayed so that they can maximize the write-off on their past investments and protect the current distribution system for as long as possible.

Self-consumption with no financial compensation such as toll access to the grid or connection tax to distribution networks also troubles these networks because their revenues for the electricity they distribute fund the maintenance of their infrastructures. Once again any major development of PV self-consumption is likely to increase the cost of distributing electricity from the network, thereby boosting the competitive advantage of self-consumed electricity.

This pressure is starting to pay off as more and more countries are taxing or considering taxing self-consumption. Several taxes have already been passed in Germany and Italy. In the Netherlands, a recent change to the electricity distribution cost rate structure will also act as a deterrent to self-consumption. While in the previous "net metering" system, the cost of access to the network depended on the quantity of network electricity used (the less consumers took from the network by self-consumption, the less they were taxed), the system has switched to lump-sum operation. Consumers pay the same amount to access the network regardless of how much electricity is self-consumed, and thus this makes consumption of their own electricity less advantageous.

The Spanish government has for the time being capitulated to public protest and given up signing the implementing decrees of a "punitive" tax of a toll on self-consumed solar power production. However this threat to introduce taxes, like a sword of Damocles, is in itself a curb to self-consumption. A potential investor, private individual or business owner, may have doubts that a system financed without taxes may very well be taxed later on, thereby undermining the expected savings. Without a clear policy on this market, self-consumption will be unable to become a major growth driver for the solar market.

Tabl. n° 1

*Top ten countries for total installed capacity end 2014 (in MWp)**

	Annual installed capacity	Cumulative capacity
Germany	1 899	38 301
China	10 560	28 199
Japan	9 700	23 300
Italy	385	18 450
United-States	6 201	18 280
Spain	21	4 787
France	975	5 600
United-Kingdom	2 448	5 230
Australia	910	4 136
Belgium	65	3 105

*Provisional figures. *Estimate.*
Source: EurObserv'ER 2015 for European Union figures, IEA PVPS 2015 for others.

NEWS FROM AROUND THE MAIN COUNTRIES

The UK, top European market in 2014

For the first time in its history the UK outstripped the rest of Europe for solar photovoltaic. The Department of Energy and Climate Change (DECC) released its network connection statistics at the end of February 2015 showing that 2 248 MW of capacity had been hooked up in 2014, taking photovoltaic capacity to 5 230 MW.

DECC pointed out that 55% of the solar capacity deployed in the country at the end of 2014 was funded by the Feed-in Tariff system and that 36% had been funded by the Renewable Obligation (RO) system, i.e. 1 843 MW by the close of the year.

The Department also confirmed that the cut-off date for RO system would be brought forward by two years to 1 April 2015 – a decision considered prejudicial by the sector players because in contrast with the RO system, the Contracts for Difference (CfD) system only applies to >5 MW plants. The CfD system is being gradually rolled out and the first CfD allocation round was launched on 16 October 2014. The exercise price for photovoltaic was set at £ 120/MWh (€ 165/MWh) for tax years 2014/2015 and 2015/2016, and will decrease to £ 115/MWh in 2016/2017, then to £ 110/MWh in 2017/2018 and £ 100/MWh in 2018/2019.

For <5 MW plants, the Feed-in Tariff, applicable for 20 years, will continue remain in force. The system is somewhat intricate as it depends on both the plant's capacity (seven capacity segments for roof-mounted systems up to 250 kWp, another for >250-kWp plants), coupled with an additional level modulation. There are three levels – "higher", "middle" and "lower rate" – depending on building energy efficiency or whether the system is installed on a dwelling. The "higher rate" is set aside for buildings with a Level D or higher Energy Performance Certificate while the "lower rate" applies to buildings that do not make level D and >250-kW plants. A "middle rate", which is 10% lower than the higher rate, is especially dedicated to multi-occupancy dwellings. The degression is applied quarterly and depends on the previous quarter's installation level. The legislator has defined 5 "installation corridors" (low corridor, default corridor, High 1 corridor, High 2 corridor and High 3 corridor) that correspond to 5 different degression factors (0%, 3.5%, 7%, 14% and 28%), each one defined for three different capacity segments (<=10 kW, >10 kW <=50 kW and >50 kW). According to these rules the Feed-in Tariff applicable for the quarter from 1 April–30 June 2015 is 13.39 pence/kWh (about € 0.18) for <4-kWp plants installed on new buildings and goes down to 6.16 pence/kWh (about € 0.084/kWh) for plants installed on buildings with poor energy efficiency or capacity in excess of >250 kWp (more details on www.fitariffs.co.uk). The British government's aim is ambitious, as it hopes to quadruple the PV capacity installed at the end of 2014 with a target of 22 GW by 2020.

Tabl. n° 2

Top ten countries for installation during 2014 (in MWp)*

China	10 600
Japan	9 700
United-States	6 201
United-Kingdom	2 448
Germany	1 899
France	975
Australia	910
South Korea	909
South Africa	800
India	616

Provisional figures.
Estimate.* ***Source : EurObserv'ER 2015 for European Union figures, IEA PVPS 2015 for others.*

The German market dips below 2 GW

Germany no longer leads the European photovoltaic market. According to AGEE-Stat, the federal Ministry for Economic Affairs and Energy's working group on renewable statistics, the country installed 1 899 MWp in 2014 as opposed to 3 305 MW in 2013. The German market that enjoyed installation levels in excess of 7 GW in 2010 (7 318 MW), 2011 (7 485 MW) and 2012 (7 604 MW) has thus kept spiralling downwards as the outcome of its government's new policy, whose main aim is to keep a better grip on electricity price rises. This policy reduced the EEG surcharge Umlage that finances renewable energy development in Germany for the first time since the measure was introduced in 2000. The surcharge dropped to € 0.617/kWh in 2015 from € 0.624/kWh in 2014. Last year, a German household with annual consumption of 3 500 kWh would thus have paid a little less than 220 euros towards financing the expansion of its country's renewable electricity. In return, according to AGEE-Stat data, this financial effort has pushed up the renewable energy share of electricity demand from 6.2% in 2000 to 27.8% in 2014. Photovoltaic electricity output has risen from 60 GWh to 34 930 GWh over the same period and now accounts for 21.7% of Germany's renewable electricity output (estimated at 160.6 TWh).

The new EEG law, applicable since 1 August 2014, has introduced many changes to the German incentive system. Since then, only small installations with <=500 kW of installed capacity are still eligible for the guaranteed Feed-in Tariff system. From 1 January 2016, only <=100-kW installations will be eligible. FiT degression will be applied monthly and adjusted every three months in line with installation levels. When the installed capacity is in the target corridor set for

PHOTOVOLTAIC BAROMETER – **EUROBSERV'ER** – APRIL 2015

photovoltaic between 2 400 and 2 600 MW per annum, monthly degression will be 0.5%. If the installation pace exceeds that of the target, then degression may rise to between 1 and 2.8%. If on the other hand the target is missed, degression may vary by 0.25 to 0%. The Feed-in Tariff will only be raised, by 1.5%, if installed capacity falls 1 400 MW below target. Applied over the first three months of 2015, the monthly FiT degression rate was 0.25%, which indicates that first quarter results were below target. Thus on 1 March 2015, the FiT ranged from € 0.865/kWh for small ground-based plants (<=500 kW) to € 0.125/kWh for <10 kW roof-mounted systems.

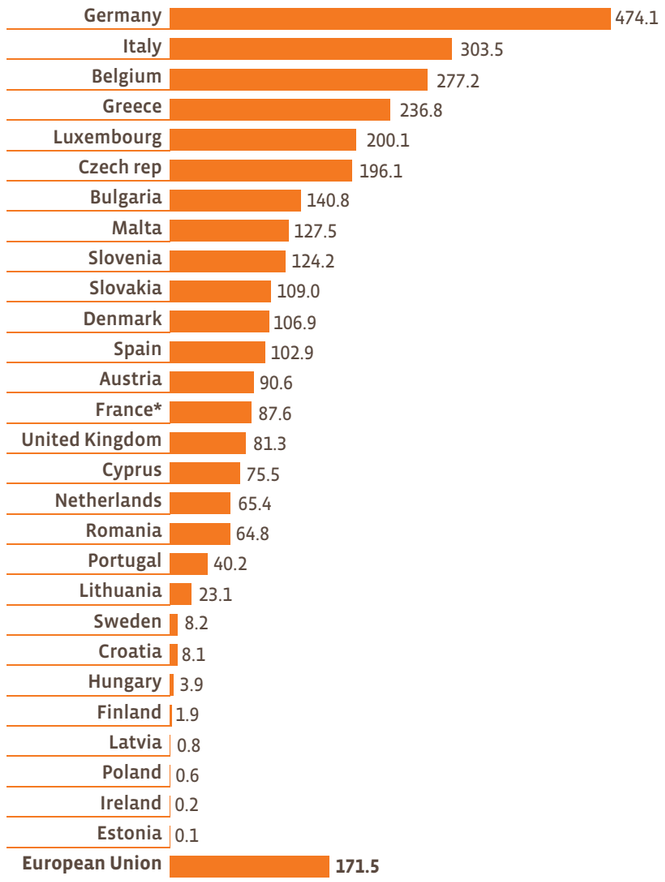
Furthermore, the direct sales system to the market plus market premium, which was optional until then (having started on 1 January 2012), became compulsory. In the direct sales system, a premium is added to the price of electricity on the EPEX Spot market to make up for the generator's "loss of earnings". The amount of the premium corresponds to the difference between the mean monthly market price for electricity and a reference Feed-in Tariff defined by the EEG law. The market premium also includes a management premium (set at € 0.04€/kWh for photovoltaic), by way of compensation for the risks and costs related to direct sales.

By 1 January 2017 at the latest, the support level for renewable energies will be defined in a call for tenders. A pilot call for installed capacity of 150 MW for land-based plants was launched in March 2015 and finished in April 2015. 170 bids were submitted, thereby obviously clearly exceeding the planned 150 MW. The Federal Network Agency will now check for eligibility and announced the next round for tenders for 1 August 2015. For 2016 the calls will be reduced to 400 MW and further down to 300 MW in 2017[1].

Another specific feature of the market is that the vast majority of PV system producers with capacities of less than one megawatt self-consume part of their output. The cost of self-consumed electricity is much lower than the price of electricity purchased from the German grid. In 2013, according to data published by R2B energy consulting, the proportion of installations self-consuming part of their output was constantly on the rise. It has apparently reached almost 95% for <10-kW plants, 85% for 10–40-kW plants, 70% for 40 kW–1 MW plants, then the figure drops to 2% for >1-MW plants. The mean percentage of self-consumption per installation has been relatively stable since 2011. In 2013 it was about 27% for <40-kW installations, rising to 38% for 40-kW–1-MW plants and 20% for >1-MW plants.

Graph. n° 1

Photovoltaic capacity per inhabitant (Wp/inhab.) for each EU country in 2014



** French overseas department not included.* ***Source: EurObserv'ER 2015.***

French solar power output… 1.2% of national electricity production

If we take account of the indicator including the Feed-in Tariffs (not the indicator that includes grid connections) newly-installed capacity in mainland France (excluding overseas territories) should be at around 5 600 MW at the end of 2014 according to EurObserv'ER estimates compared to 4 625 MW in 2013, which is slightly less than one gigawatt of capacity altogether. This pick-up in growth follows 2012 and 2013, years in which less capacity was connected and resulted from implementation of the December 2010 moratorium. The 2014 installation level was lower than that of both 2011 and 2012 that recorded rises of 1 773 MW and 1 150 MW respectively.

In output terms, solar photovoltaic now accounts for 1.2% of French electricity production (0.9% in 2013), i.e. 5.5 TWh generated in 2014.

The main incentive mechanism for small installations in France is the Feed-in Tariff. It is indexed every quarter pegged to the volume of grid connection applications during the previous quarter. The tariff also depends on the photovoltaic panel's building integration level and installation capacity. Between 1 January and 31 March 2015, it was € 0.2655/kWh for installations rated at 0–9 kWp for fully-integrated panels. Simplified integration systems were paid € 0.1347/kWh, between 0 and 36 kWp, and € 0.1279/kWh for <100-kWp systems.

Above 100 kWp, the support mechanism is based on tenders as the Feed-in Tariff

Tabl. n° 3

Photovoltaic capacity installed and connected in European Union during the years 2013 and 2014 (in MWp)*

	2013			2014		
	On grid	Off grid	Total	On grid	Off grid	Total
United Kingdom	1 033.0	0.0	1 033.0	2 448.0	0.0	2 448.0
Germany	3 304.0	5.0	3 309.0	1 899.0	0.0	1 899.0
France	672.0	0.0	672.0	974.9	0.1	975.0
Italy	1 363.5	1.0	1 364.5	384.0	1.0	385.0
Netherlands	374.0	0.0	374.0	361.0	0.0	361.0
Romania	972.7	0.0	972.7	270.5	0.0	270.5
Austria	208.8	0.0	208.8	140.0	0.0	140.0
Portugal	57.0	0.5	57.5	115.0	1.2	116.2
Belgium	458.9	0.0	459.0	65.2	0.0	65.2
Sweden	18.0	1.1	19.1	35.1	1.1	36.2
Cyprus	17.5	0.1	17.6	29.7	0.2	30.0
Denmark	169.0	0.2	169.2	29.0	0.1	29.1
Malta	9.5	0.0	9.5	26.0	0.0	26.0
Spain	119.7	0.5	120.3	21.0	0.3	21.3
Poland	0.4	0.2	0.6	19.7	0.5	20.2
Greece	1 042.5	0.0	1 042.5	16.9	0.0	16.9
Luxembourg	21.0	0.0	21.0	15.0	0.0	15.0
Croatia	15.5	0.5	16.0	14.0	0.2	14.2
Slovenia	26.7	0.0	26.7	7.7	0.0	7.7
Hungary	22.5	0.1	22.6	3.2	0.1	3.3
Slovakia	45.0	0.0	45.0	2.0	0.0	2.0
Bulgaria	104.4	0.0	104.4	1.3	0.0	1.3
Ireland	0.0	0.1	0.1	0.0	0.0	0.1
Czech Republic	41.5	0.0	41.5	0.0	0.0	0.0
Estonia	0.0	0.0	0.0	0.0	0.0	0.0
Finland	0.0	1.0	1.0	0.0	0.0	0.0
Latvia	0.0	0.0	0.0	0.0	0.0	0.0
Lithuania	61.9	0.0	61.9	0.0	0.0	0.0
European Union	10 159.1	10.3	10 169.5	6 878.4	4.9	6 883.3

Estimate. **Overseas department not included for France.* ***Source: EurObserv'ER 2015.*

1) Amendment Roman: Source. www.bundesnetzagentur.de/DE/Sachgebiete/ElektrizitaetundGas/Unternehmen_Institutionen/ErneuerbareEnergien/PV-Freiflaechenanlagen/PV-Freiflaechenanlagen_node.html

PHOTOVOLTAIC BAROMETER – **EUROBSERV'ER** – APRIL 2015

is too low (€ 0.0662/kWh). The support mechanism for PV installations on very large roofs >250 kWp (more than 2 500 m² of panels) and ground-based plants is based on ordinary tenders involving a standard specification, drawn up with sector players that impose more stringent environmental and industrial requirements. The third and most recent tender of this type to be launched in November 2014 covered the installation of 400 MW (150 MW building-mounted installations, 200 MW for ground-installed plants and 50 MW for car park shelters). The closing date for bids is 1 June 2015. For installations in capacities ranging from 100–250 kWp, the tendering procedure is simplified, to guarantee project bearers are given a faster response, and prevent any speculation in the segment in question. A third tender of this type was launched in March 2015 covering 120 MW of capacity distributed over three consecutive bidding periods for a capacity of 40 MW each and lasting 4 months. The closing date for bids for the first period is 21 September 2015.
These tenders are important for the sector players, but not enough to give the sector sustainable development momentum. Arnaud Mine, CEO of SER-Soler (the solar branch of the renewable energies Syndicate) remains very critical about how tender procedures are currently used. Interviewed by the magazine Plein Soleil last February, he expressed himself on the subject: "These tenders are effectively a moratorium by another name. The tenders for large capacities pop up haphazardly without programming or medium-term vision, for inadequate volumes and incur many delays".

Tabl. n° 4

Connected and cumulated photovoltaic capacity in the European Union countries at the end of 2013 and 2014 (in MWp)

	2013			2014		
	On-grid	Off-grid	Total	On-grid	Off-grid	Total
Germany	36 337.0	65.0	36 402.0	38 236.0	65.0	38 301.0
Italy	18 053.0	12.0	18 065.0	18 437.0	13.0	18 450.0
France*	4 614.3	10.7	4 625.0	5 589.2	10.8	5 600.0
United Kingdom	2 780.0	2.3	2 782.3	5 228.0	2.3	5 230.3
Spain	4 740.8	25.2	4 766.0	4 761.8	25.5	4 787.3
Belgium	3 039.9	0.1	3 040.0	3 105.2	0.1	3 105.3
Greece	2 578.8	7.0	2 585.8	2 595.8	7.0	2 602.8
Czech rep	2 063.5	0.4	2 063.9	2 060.6	0.4	2 061.0
Romania	1 022.0	0.0	1 022.0	1 292.6	0.0	1 292.6
Netherlands	734.0	5.0	739.0	1 095.0	5.0	1 100.0
Bulgaria	1 018.5	0.7	1 019.2	1 019.7	0.7	1 020.4
Austria	626.0	4.5	630.5	766.0	4.5	770.5
Denmark	571.0	1.4	572.4	600.0	1.5	601.5
Slovakia	588.0	0.1	588.1	590.0	0.1	590.1
Portugal	299.0	3.8	302.8	414.0	5.0	419.0
Slovenia	248.1	0.1	248.2	255.9	0.1	256.0
Luxembourg	95.0	0.0	95.0	110.0	0.0	110.0
Sweden	34.8	8.4	43.2	69.9	9.5	79.4
Lithuania	68.0	0.1	68.1	68.0	0.1	68.1
Cyprus	33.9	0.9	34.8	63.6	1.1	64.8
Malta	28.2	0.0	28.2	54.2	0.0	54.2
Hungary	34.3	0.6	34.9	37.5	0.7	38.2
Croatia	19.5	0.5	20.0	33.5	0.7	34.2
Poland	1.8	2.4	4.2	21.5	2.9	24.4
Finland	0.2	10.0	10.2	0.2	10.0	10.2
Latvia	1.5	0.0	1.5	1.5	0.0	1.5
Ireland	0,2	0,9	1,0	0,2	0,9	1,1
Estonia	0,0	0,1	0,2	0,0	0,1	0,2
European Union	79 631.3	162.2	79 793.5	86 506.8	167.1	86 673.9

Overseas department not included for France.* ***Source: EurObserv'ER 2015.*
Note: according to the Czech Ministry of Industry and Trade, Czech Republic decommissioned 2.9 MWp of solar capacity during 2014.

Feed-in Tariffs retroactively lowered in Italy

According to preliminary data from the Italian public energy manager GSE, 385 MW of capacity was installed in Italy in 2014, taking PV capacity to date to 18 450 MW. The market peaked in 2011 with 9 303 MW installed over 12 months and has slipped ever since. It reached 3 017 MW in 2012, and 1 365 MW in 2013. The dramatic fall can be put down to the fact that the last Conto Energia programme fund has been totally allocated and that since there are no incentives for investors to produce. In 2005 when the programme was rolled out, a limit of 6.7 billion euro was set as the maximum annual allocation of the 5th Conto Energia. The final GSE scoreboard (Contatore Fotovoltaico) indicates that at the end of the day 531 542 installations for a combined capacity of 18 216.6 MW were financed over the five consecutive programmes. Success may not be the best epithet to use to describe the Italian scheme as the country paid a high price to develop its sector. If we compare annual electricity output in 2014 (23.3 TWh according to Terna's provisional data) with the programme's annual cost, each additional kWh of solar power was financed to the level of € 0.288. This figure is on the high side compared to the cost of producing a kilowatt-hour in a ground-based plant in Southern Italy that is now less than € 0.10/kWh and bearing in mind that high-capacity plants were the main beneficiaries of the programme.
The Italian government decided last summer to reduce the programme's cost by slashing Feed-in Tariffs from 1 January 2015 and applying the cuts to existing contracts. The new law offers owners of >200-kW systems with a FiT guaranteed over 20 years through the Conto Energia mechanism three options. The first is immediate rate reduction by 5–9% (the bigger the system, the bigger the reduction). The second is to prolong the FiT guarantee period to 24 years, in exchange for a 17–25% rate reduction. The third offers a recalibrated rate with an initial reduced rate period followed by a second increased rate. The government claims that this retroactive rate reduction will only affect 6% of PV plant owners, who receive almost 60% of the production subsidies all told. It reckons that the law will save Italian electricity consumers about 1.5 billion euros in 2015. At the same time, the law introduced a 5% tax on self-consumed electricity production. Italy is the country that

Tabl. n° 5

Electricity production from Solar photovoltaic power in European Union in 2013 and 2014 (in GWh)*

	2013	2014
Germany	31 010.0	34 930.0
Italy	21 588.6	23 299.0
Spain	8 297.0	8 211.0
France	4 660.6	5 500.0
United Kingdom	2 035.6	3 931.0
Greece	3 648.0	3 856.0
Belgium	2 640.0	2 768.0
Czech Republic	2 032.6	2 121.7
Romania	420.0	1 355.2
Bulgaria	1 361.0	1 244.5
Netherlands	516.0	800.0
Austria	582.2	766.0
Portugal	479.0	631.0
Slovakia	588.0	590.0
Denmark	517.5	557.0
Slovenia	219.5	244.6
Luxembourg	74.0	120.0
Cyprus	56.0	104.0
Lithuania	45.0	73.0
Sweden	35.0	71.5
Malta	31.0	57.8
Croatia	11.3	35.3
Hungary	25.0	26.8
Poland	4.0	19.2
Finland	5.9	5.9
Ireland	0.7	0.7
Estonia	0.6	0.6
Latvia	0.0	0.0
European Union	80 884.0	91 319.7

Estimate.* ***Overseas department not included for France.* ***Source: EurObserv'ER 2015.*

PHOTOVOLTAIC BAROMETER – **EUROBSERV'ER** – APRIL 2015

has offered solar power the greatest place in its electricity mix, put at 7.5% in 2014.

THE PHOTOVOLTAIC INDUSTRY ON THE UP AND UP

The upswing in global photovoltaic capacity in 2014 has naturally stimulated significant increase in PV cell and module output by the world's leading manufacturers. EurObserv'ER holds that the Chinese players have held their grasp on the world rankings monopolizing the top six ranks **(table 6)**. The top ten module manufacturers include one player from Japan (Sharp Corporation), one from Taiwan (Motech) and two US players (First Solar and SunPower).
The main manufacturers' fortunes improved in 2014, as a consequence of high demand from global market expansion and slower-paced module price falls. Some manufacturers have become more profitable as module production cost reduction has outstripped the drop in the market price of modules.
Another trend that is becoming more marked is that increasing numbers of manufacturers no longer rely solely on supplying modules but are branching out into project development, which may be for third parties via EPC (engineering, procurement and construction) contracts or for their own projects. Lastly, a number of key players are getting involved in financial engineering innovations, primarily by creating financial vehicles of the "Yieldco" type as a new growth vector for their businesses and also to monetize their assets. A Yieldco is a publicly traded company, whose shares are exchanged on the markets. The dividends are raised from the revenue generated by the asset portfolio that comprises operating PV plants. This type of investment is attractive in that it removes the inherent risk of PV plant project developments. SunPower subscribed to another financial innovation, leasing, in 2014 by creating a $ 250-million investment fund. The principle involved is that of leasing a photovoltaic facility to individual homeowners for a lower price than their conventional electricity bill. Private individuals can then profit immediately from solar energy without having to bear the cost of the initial investment. Leasing, along with other third-party financing mechanisms is now the main vehicle for photovoltaic development in the United States' residential sector.

TRINA SOLAR, NEW WORLD NO. 1

In 2014, Chinese manufacturer Trina Solar laid claim to the world module manufacturing leadership. In its 2014 financial report it claimed to have shipped approximately 3.66 GW of modules (3.34 GW sold on the market and 324 MW for its own internal projects). Accordingly, it increased its shipments in 2014 by 41.9%, over the 2.58 GW delivered in 2013. Net sales thus increased by 28.8% year-on-year to $ 2.29 billion. It claims that this strong increase should be attributed to the high demand in the Chinese, Japanese and US markets, where it is particularly well positioned.
Furthermore these results pushed Trina Solar back into profitability. Its financial report for 2014 records a net profit of $ 61.3 million, compared to a net loss of $ 72.2 million in 2013. The company remains highly optimistic about the future and reckons that its gains will increase quarter after quarter. It explains that the reason for its return to profitability is its ability to face off the trend to lower mean module sales prices without compromising on manufacturing quality. It also plans to develop its

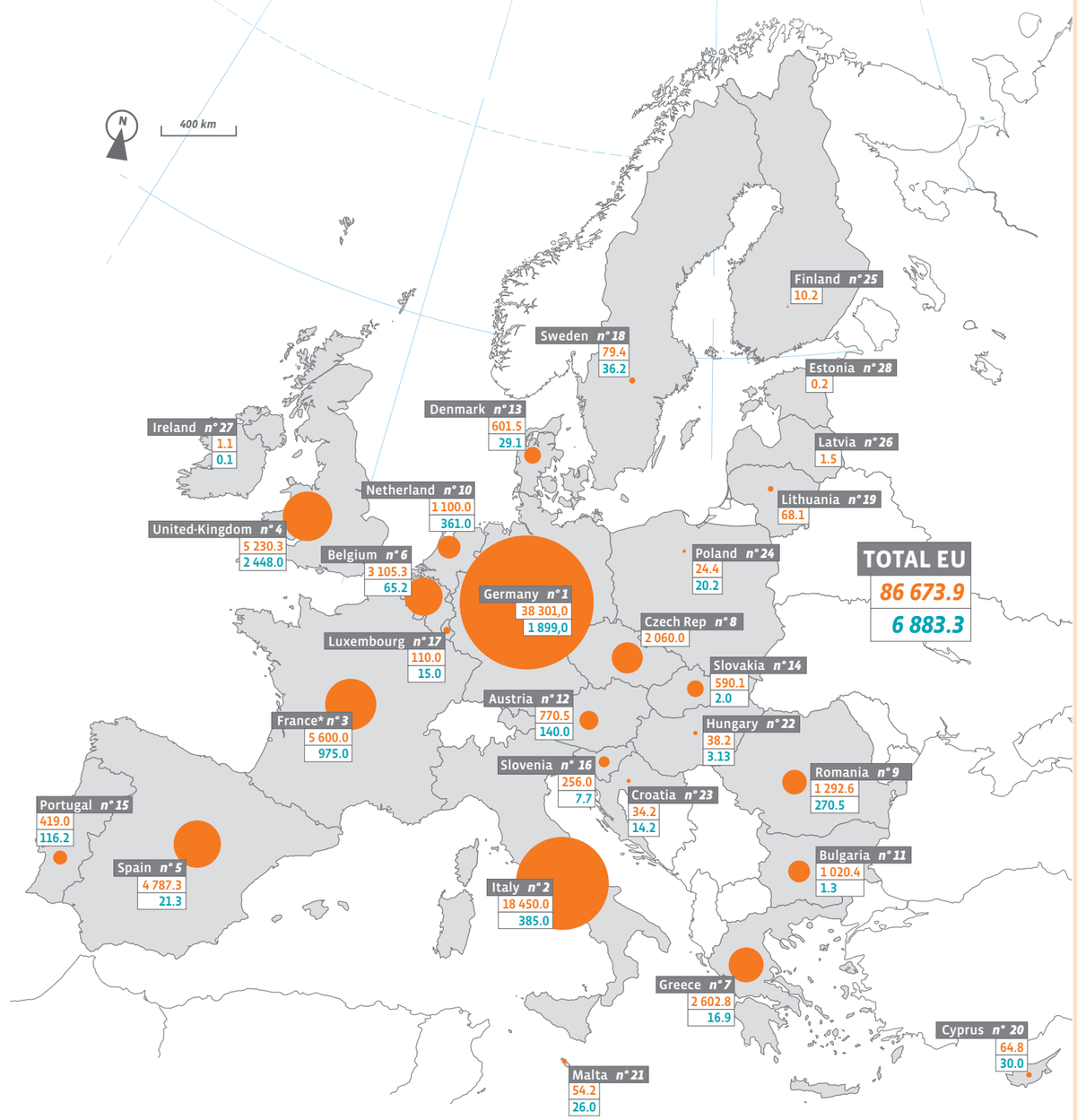
Tabl. n° 6

Main photovoltaic modules ***manufacturers in 2014***

Company	Technologies	Country	Locations of the production lines	Modules delivered in 2014 (in MWp)
Trina Solar	Wafers, Crystalline (mono) cells, modules	China	China	**3 660**
Yingli Green Energy	Wafers, mono and multi crystalline cells, modules	China	China	**3 361**
Canadian Solar	Lingots, wafer, cells, modules, PV systems	Canada, China	Canada, China	**3 105**
Jinko Solar	Crystalline ingots, wafers, cells, and mono- and multi-crystalline PV	Chine	China	**2 944**
JA Solar	Mono-Crystalline, Silicon Module, Poly-Crystalline, Silicon Module	China	China	**2 407**
Renesola	Poly silicon wafers and modules, micro inverters	China	Poland, South Africa, Inde, Malaysia, South Korea, Turkey, Japan	**1 970**
Sharp Corporation	Crystalline (mono, multi)/Thin Film (a-Si, mc-Si)	Japan	Japan, USA	**1 900**
Motech	Crystalline (mono, multi) cells, modules and inverters	Taiwan	Taiwan, China, Japan, USA	**1 632**
First Solar	Thin film modules (CdTe)	USA	Malaysia, USA	**1 500**
Sun Power	Crystalline (mono, multi)cells, modules	USA	USA, Philippines	**1 254**

Source: EurObserv'ER 2015 (according to financial reports).

Photovoltaic capacity connected ***in the European Union in 2014* (MWp)***



Key

86 673.9 Cumulated photovoltaic capacity in the European Union countries in 2014* (MWp).

6 883.3 Photovoltaic capacity connected in the European Union countries during the year 2014* (MWp).

Estimate. **Overseas departments included for France.* ***Source: EurObserv'ER 2015.*

Organic solar cells treatment at the Interuniversity Micro Electronics Center (IMEC) in Leuven, Belgium.

IMEC

project portfolio outside China, primarily in the UK and Japan.

YINGLY ON THE PATH OF RECOVERY

Yingly Solar, the 2012 and 2013 world leader, is in a little less fortunate situation. The Chinese company, which saw its top slot plucked from it, nonetheless reckons that it has consolidated its business volume. In its 2014 financial report, the manufacturer announced that it had shipped 3 361.3 MW in 2014 (including 260.3 MW in own projects), which is a slight improvement on 2013 (3 234.3 MW). Net sales dipped to 12 927.4 million yuan ($ 2 083.5 million), from 13 418.1 million yuan in 2013 ($ 2 162 million). It attributes this lower figure to the drop in module sales price, but in contrast with Trina Solar, Yingly was unable to return to profitability in 2014. The manufacturer announced a net loss of 1 299.8 million yuan in 2014 ($ 209.5 million) compared to a net loss of 1 944.4 million yuan ($ 313.4 million) in 2013. Its Chinese CEO is confident about the global market's growth prospects in 2015, especially after the March 2015 announcement by Beijing that it had set its annual installation target at 17.8 GW. The manufacturer expects to increase deliveries this year with a volume ranging from 3.6 to 3.9 GW (including 400–600 MW for its own projects).

CANADIAN SOLAR'S PROFITABILITY HIGHER

According to our ranking, Sino-Canadian firm Canadian Solar should remain in third position. The manufacturer announced shipment of 3 105 MW last year, but points out that only 2 813 MW were included in its 2014 sales (compared to 1.9 GW of its 2013 income). The company's net sales rose sharply from $ 1.65 to 2.95 billion, hand-in-hand with profitability which rose from $ 31.7 to 239.5 million in 2014. For the full year 2015, the company expects total module shipments to be in the range of approximately 4.0 GW to 4.3 GW, including 3 300 MW to 3 500 MW of third-party module sales, 235 MW to 275 MW of project and EPC sales, and 460 MW to 490 MW of shipments to projects which will be held on the balance sheet pending the launch of a YieldCo vehicle

In February 2015, Canadian Solar announced that it had entered a final agreement with Sharp Corporation to acquire Recurrent Energy, a North American solar project developer for $ 265 million. Once completed, this acquisition will enable the manufacturer to increase its investment project reserve by about 4 GW, giving potential sales worth roughly $ 3.2 billion that will be added to the 4.5 GW of investment projects that it already holds.

FIRST SOLAR AND SUNPOWER LAUNCH A YIELDCO TOGETHER

First Solar is the first American manufacturer of this category to ship about 1.5 GW in 2014 (its estimated production for the year is 1 846 MW). Its 2014 financial report indicates that the company's annual sales volume was a little higher (2.5%) than in 2013, giving a net turnover of $ 3 392 million, compared to $ 3 309 million. Net profit improved, rising from $ 353 million in 2013 to $ 396 million in 2014. However the 2014 sales volume was below target, as the manufacturer had forecast sales of $ 3.6–3.9 billion. First Solar claims it registered new orders for 2.5 GW in 2014, which takes its project backlog to date to 13.5 GW. This world specialist in cadmium telluride announced at the start of the year that TetraSun, its new crystalline silicon cells and modules production plant, had started manufacturing. The plant, whose production capacity is 100 MW, is already turning out modules with cell efficiency of 20.5%.

SunPower, the second largest American module manufacturer (60%-owned by the French Total Group), specializing in top-of-the-range modules, announced it had shipped 1 254 MW officially recorded in its sales figures, which rose to more than $ 3 billion in 2014 ($ 3 027 million) from $ 2.5 billion ($ 2 507 million) in 2013. The company's net profit soared from $ 95.6 million in 2013 to $ 245.8 million in 2014.

Although these two American manufacturers compete on the global market, on 10 March 2014 they announced that they had taken legal steps to create a joint (50:50) Yieldco type financial corporation. The two manufacturers will pool assets chosen from their respective solar plant portfolios into this company called 8point3 Energy Partners, which will allow them to raise funds for developing new projects. The number of shares and initial price offering of the company (still subject to authorization), which will be listed on NASDAQ have not yet been fixed. The setting up of a Yieldco comprising solar assets of this type is not new to the United States, for in July 2014, the American developer Sun Edison succeeded in raising $ 600 million of funds, and NextEra $ 450 million in June 2014 in the same way.

EN R WEST – DR SOLAR

Tabl. n° 7

Major European utility-scale project developers in 2014

Company	Country	Installed PV capacity by 2014 (in MW)	Employees 2014*
Juwi AG /MVV Energie AG	Germany	2 500	1 540
Belectric	Germany	1 500	1 600
Abengoa *	Spain	1 223	24 750*
Enerparc	Germany	1 200	n.a.
Saferay	Germany	747	n.a.
EDF énergies nouvelles	France	705	3 050
Martifer	Portugal	560	3 000
Activ Solar	Austria	524	n.a.
GP Joule	Germany	434	n.a.
Elecnor / Enerfin	Spain	250	13 000*

*Large energy companies and major manufacturers (such as First Solar, Yingli,...) because of their size and ability to raise capital may also plan, construct, own or operate substantial renewable energy portfolios. The table is no ranking but displays a representative view on specialized European PV project developers (EPC). * All employees of the company. These may include other renewable technologies such as wind or CSP or other business segments.* ***Source: EurObserv'ER 2015 (based on WIKI-Solar project developer data base and updated company information).***

PHOTOVOLTAIC BAROMETER – **EUROBSERV'ER** – APRIL 2015

A MORE STABLE MARKET THROUGH TO 2020

For the last three years the European Union photovoltaic has been struggling, bridled by public policies bent on regaining control of the sector and healing the "financial" wounds arising from the runaway market boom at the start of the decade. The question we need to answer is exactly how long the national political decision makers will take before they are ready to re-launch their sectors on sounded bases, against the backdrop of a real vision of the future of national and European energy systems.

This vision, is what the European Commission is trying to roll out through its major project that was unveiled on 25 February 2015 – the European Energy Union. This "Energy Union" is reminiscent of the ECSC (European Coal and Steel Community) in 1951, at a time when Europe was built on the common management of coal. This new EU project intends to be more sustainable and in phase with the EU's current geopolitical reality. In the first place it aims to reduce the 28 States' energy dependency primarily on Russian gas because geopolitical tensions between Europe and Russia are clearly threatening part of our energy supplies. It also aims to introduce real energy transition to a low-carbon, climate-friendly European economy, by offering the most affordable and competitive energy.

The European Commission's press release states that the Energy Union would be based on the following principles. It involves a solidarity clause, by reducing dependency on a single national supplier, especially in the event of any cut-off of energy supply and free circulation of energy. For the electricity market this implies setting up a more interconnected market that is more open to renewable energies. The notion of free circulation primarily aims to overhaul State subsidy policies on their internal market and curtail subsidies to environmentally-harmful energies (primarily fossil energy subsidies). The Energy Union also gives priority to energy efficiency and transition to a sustainable low-carbon society. This last point calls for the electricity grid to be able to absorb locally-produced energy easily and efficiently, particularly from renewable energy sources.

While this is a Europe-wide issue, it is indeterminate, for some governments consider energy to be too strategic and are not ready to entrust its management to the Community executive. Governments are also subject to lobbying from their national players (and more often than not they hold shares in them), in defence of their own economic interests.

Another avenue that could be taken in this Energy Union would be better distribution of national investments across Europe to optimize the electricity mix directly at European Union level. In the case of solar photovoltaic that implies promoting development in the countries of Southern Europe, where solar power is cheapest. This possibility of Member State cooperation already exists in the framework of the current renewable energy directive (article 9), but is so far used sparingly.

Over and above the declarations of good intentions of a number of major countries, the renewable energy market will only pick up if the current system is overhauled, and legal and statutory frameworks are implemented to ease renewable energies' integration into the electricity mix. This integration must occur both at local level (local production and self-consumption) by setting up smart grids, and at European level by installing infrastructures that would enable green electricity exchanges between neighbours. Action or inaction in these areas will be the real litmus test of energy transition.

It has to be admitted that in 2015, the see-saw effect is still on the side of advocates for slowing down the progress of renewable energies. In the case of solar photovoltaic, the main legislative aim of a number of Member States is to implement retroactive measures in their production support system to reduce the price of their electricity bill. Examples of this are Spain, Italy and some Central European countries such as the Czech Republic, or alternatively solar taxes on self-consumed electricity. The generalization and trivialization of these measures could create a long-term obstacle to the re-launch of the European solar market. Setting a pre-set defined legal framework indispensable to the development of self-consumption and grid installation is surprisingly taking much longer.

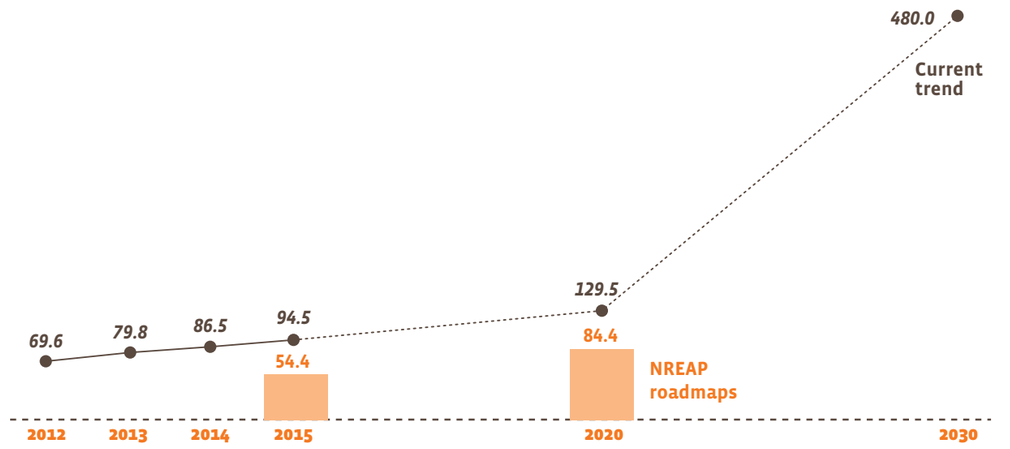
Consequently, EurObserv'ER has yet again reduced its combined photovoltaic capacity forecasts for the 2020 timeline. The fact that the European Union exceeded the combined NREAP targets in 2014, six years early, is neither here nor there **(graph 2)**, given the extent to which countries had underestimated the potential of solar power when they drew up the action plans in 2009 and 2010.

Nonetheless, in line with the growth forecasts of the main European Union markets, 2015 should mark the end of the European Union market's sapping decline. According to EurObserv'ER, growth should even be positive and reach about 8 GW, and then settle into a relatively stable annual installation volume. This growth driver is as yet fragile. It is largely based on the impetus of the UK market, slight upturn of the German market relating to its targets, the French market remaining at 1 GW, and modest recovery in the Italian market (also around the one-gigawatt mark), carried by the implementation of the new legislation governing self-consumption and the establishment of electricity storage systems in the market. Soon another growth vector could ease the European market recovery. It entails setting up new financing models[1] for consumers, such as those carried out by third parties (leasing system)... currently the main vector behind solar power's development in the United States. These models could be partly carried by the electricity companies, provided that they turn over a new leaf and opt for going with the development of this energy transition. □

(1) "PV Financing" is a European project that has just started and is set to produce new business photovoltaic models to help the sector to continue to develop outside of the FiT system. For more details see www.pv-financing.eu

Graph. n° 2

Comparison of the current trend of photovoltaic capacity installed against the NREAP (National Renewable Energy Action Plans) roadmap (in GWp)



Source : EurObserv'ER 2015.

Source tables 3 and 4: Photovoltaic Austria, Apere (Belgium), APEE Bulgaria, University of Zagreb, Croatian Energy Market Operator –HROTE (Croatia), Cyprus Institute of Energy, Ministry of Industry and Trade (Czech Republic), PA Energy Ltd and ENS (Denmark), Agee-Stat (Germany), Helapco (Greece), University of Miskolc (Hungary), GSE (Italy), NSO (Malta), Zonnestroomnl.nl, IEO (Poland), DGGE and EDP (Portugal), AHK Rumaenien, ECB (Slovakia), JSI (Slovenia), REE (Spain), Uppsala University (Sweden), United Kingdom (DECC).

The next barometer will cover concentrated solar power and solar thermal sector.

Download

EurObserv'ER is posting an interactive database of the barometer indicators on the www.energies-renouvelables.org (French-language) and www.eurobserv-er.org (English-language) sites. Click the "Interactive EurObserv'ER Database" banner to download the barometer data in Excel format.

Co-funded by the Intelligent Energy Europe Programme of the European Union

This barometer was prepared by Observ'ER in the scope of the "EurObserv'ER" Project which groups together Observ'ER (FR), ECN (NL), Institute for Renewable Energy (EC BREC I.E.O, PL), Jozef Stefan Institute (SL), Renac (DE) and Frankfurt School of Finance & Management (DE). Sole responsibility for the publication's content lies with its authors. It does not represent the opinion of the European Communities nor that of Ademe or Caisse des dépôts. The European Commission, Ademe and Caisse des dépôts may not be held responsible for any use that may be made of the information published. This action benefits from the financial support of Ademe, the Intelligent Energy – Europe programme and Caisse des dépôts.

PHOTOVOLTAIC BAROMETER – **EUROBSERV'ER** – APRIL 2015