Global Market Outlook

For Solar Power / **2015 - 2019**

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SolarPower Europe, the new EPIA (European Photovoltaic Industry Association), is a member-led association representing organisations active along the whole value chain. Our aim is to shape the regulatory environment and enhance business opportunities for solar power in Europe.

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FOREWORD:
FROM THE PRESIDENT AND THE CEO

Dear Members,

Dear Friends of SolarPower Europe,

Welcome to the new edition of the Global Market Outlook, the first publication of the new era of the European Photovoltaic Industry Association (EPIA). As the European solar sector has matured into a leading player in the European electricity market, so to have we grown and evolved into a new organisation that reflects your needs – the needs of the European solar sector today.

SolarPower Europe will build on the tremendous achievements of the last 30 years of EPIA, and will continue to promote the interests of the solar sector in Europe and beyond. We will also continue to provide the high quality products that were associated with EPIA, such as the Global Market Outlook, while ensuring that they also evolve to represent the needs of the sector today. This year you will find more details on the issues impacting the numbers, than we previously reported.

The good news is in – solar power had another record year in 2014 with 40 GWs being connected worldwide. This beats the record of the previous year, when 37 GW were connected. The leading national markets were China with 10.6 GW, Japan with 9.7 GW and the USA with just over 6.5 GW. The total for Europe was 7 GW, with the UK leading the way – contributing 2.4 GW in 2014. The success of the UK, set to be the largest European market again in 2015, reinforces the evidence that solar power is a versatile and competitive energy source in any climate.

2014 also marks a tipping point in the make-up of our energy market. For the first time ever in Europe, renewables produced more power than nuclear. Solar power was a key in reaching this remarkable achievement. This demonstrates the fact that the power of solar is unstoppable, the developments in the sector that have supported solar to become a more predictable and cost competitive energy source in recent years underpin our growth.

The growing predictability of the energy that solar power can produce is also making it easier to build the right level of flexible support around our peak production times. All of you will be aware of the tremendous developments in storage and demand side management and the existing flexibility that can be provided by hydro and gas. The combination of these factors ensure that solar is ready for today and will be the pillar of a zero-carbon power future.

The future is set bright for solar power and SolarPower Europe – find out more about our predictions for the future and the evolution of our organisation inside!

Enjoy this publication, your feedback is welcome on any aspect of this report,

Best wishes

OLIVER SCHÄFER
PRESIDENT

JAMES WATSON
CHIEF EXECUTIVE OFFICER

SolarPower Europe

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The 540 GW mark at a global level could be reached in five years' time.

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EXECUTIVE SUMMARY

The global solar photovoltaic (PV) sector experienced a new year of growth in 2014 reaching a cumulative capacity of 178 GW, multiplying the installed capacity by a factor of 100 in only 14 years of development.

Thanks to the massive price declines achieved in recent years and continued in 2014, solar power is now broadly recognized as a cost-competitive, reliable and sustainable energy source. In fact, based on its technical characteristics, PV can and should be considered a low risk investment for the financial community today. Its market uptake is strongly dependent on a stable and forward-looking regulatory framework that allows for the realization of the full competitive potential of solar power.

Some of the main findings of our market analysis:

- At least 40 GW of PV systems were installed globally in 2014, up from 37 GW in 2013 setting a new record for the solar PV sector
- China, Japan and USA were the three top markets in 2014
- The 540 GW mark at a global level could be reached in five years' time
- 7 GW of PV capacity were connected to the grid in Europe in 2014, compared to 10.5 GW in 2013 and 17.7 GW in 2012
- For the first time, the United Kingdom lead the development of solar power in Europe with 2.4 GW, followed by Germany (1.9 GW) and France (927 MW)
- Solar PV is covering more than 7 % of the electricity demand in 3 countries in Europe: Italy, Germany and Greece
- Solar Power could grow in Europe by 80 % by 2019

The market growth experienced in 2013 and 2014 also improved the utilization rates of manufacturing capacities and generally lead to a continued recovery of the industry sector around the world.

This report presents figures for grid connected capacities which best describe the role of solar power in the energy system. While this approach leads to 40 GW added in 2014, analyses based on module shipments lead to higher numbers, around 44-46 GW. The difference between these two estimations is partially explained by installations that occurred at the end of the year and that were either not reported or not connected yet.

Two maps for the global and European level form the centerpiece of this report. A number of easy-to-grasp indexes highlight the PV market development across the world and in Europe.

The report and all figures can be downloaded on
www.solarpowereurope.org

178 GW of Solar Power are now installed in the world.

1

SOLAR POWER:

TECHNOLOGY AND INDUSTRY TRENDS

© Photo courtesy of First Solar

The success story of massive cost reductions in the solar power sector was continued in 2014, both for decentralised and utility scale installations. PV system price declines of around 75% in less than 10 years have brought solar power close to cost competitiveness in several countries and market segments.

In parallel with this development, the annual PV market volume has multiplied by 40 times in less than a decade, and the global value of the PV sector will probably reach the landmark of 100 billion EUR in 2015. Despite the low risk of financing inherent to the technology, access to capital is a major challenge for a continuously growing sector.

The industry has continued to recover after the significant pressure of overcapacities in 2012 and 2013. Last year, many manufacturers of solar components have been able to significantly improve their business results.

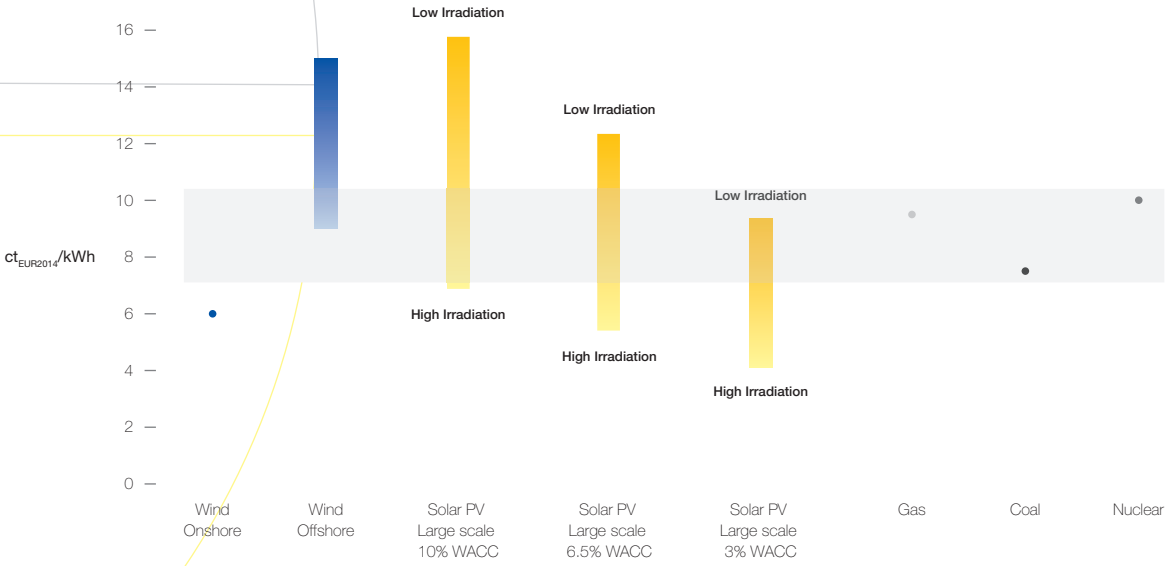
Solar PV appears as a cost-competitive, reliable and sustainable electricity source in a growing number of countries

The cost of PV systems continued to decline in 2014. System prices below 1 EUR/Wp (for utility scale PV above 1 MW) are now common in several European countries, while prices around 1 USD/Wp have been reported in the most competitive tenders. This has been achieved thanks to the declining prices of modules – except in Europe where the minimum import price on modules from China has maintained prices at a higher than market level - and inverters, combined with economies of scale that brought installation costs down much faster than many expected.

This resulted in highly competitive levelised costs of electricity (LCOE) for PV generation as shown in Figure 1. This figure features the generation cost for large scale solar installations under three different levels of cost of capital, respectively 3%, 6.5% and 10%. In order to highlight the range of the generation cost in Europe, Cyprus and the United Kingdom have been considered as extreme cases of irradiation.

PV system price declines of around in less than 10 years. **75%**

FIGURE 1 SOLAR ELECTRICITY GENERATION COST IN EUROPE IN COMPARISON TO OTHER SOURCES



Sources:
Solar Photovoltaic Large Scale: Agora Energiewende - LCOE Model. Wind: IRENA. Gas, Coal, Nuclear: Ecofys.

In 2014, super-competitive calls for tenders in emerging countries, in the US and even in Europe, demonstrated how cheap solar electricity has become in just a few years. PV power prices below 60 USD/MWh have been granted in one project in Dubai, which remains to be proven to be profitable. Other calls revealed prices between 67 and 80 USD/MWh. These should be considered as best in class examples for the solar generation cost within a favourable context.

These examples show how the cost-competitiveness of solar electricity progresses quickly and how PV is producing at similar price ranges as new conventional generation plants.

While large-scale PV generation costs already compare with conventional electricity production today, at the distributed level solar power production is now competitive with retail prices in many countries. Whether these factors are sufficient to guarantee the flourishing of PV in the market, however, depends on the regulatory context and power system design.

The achievement of grid parity (or socket parity), has started to drive developments in the prosumer-market and thus applies mainly to the distributed solar segment. The competitiveness in this sector depends heavily on how retail electricity tariffs are defined and how charges and taxes are applied to prosumers.

For utility scale PV the main reference point is the wholesale power market prices. In liberalised power systems, the marginal power prices achieved in the power exchanges are currently not high enough to cover the cost of new generators, including solar power. Approaches like power purchase agreements, tenders and premiums are driving the market forward. Competitiveness on the wholesale market generally depends on an inclusive and forward-looking market design, as well as a flexible power mix that leads to sustainable wholesale price formations.

Cost of capital is one of the main barriers to the decrease of solar electricity cost

Based on its predictable output and its technical reliability, solar PV can and should be considered a low risk investment for the financial community. However, the perceived risk associated with solar PV is influenced by several external factors that increase the cost of capital for solar PV in all market segments.

- **The regulatory risk, especially the possibility of retroactive measures:** This risk is by nature unpredictable, since it is linked to political decisions and cannot easily be hedged with existing financial products. It therefore drives the cost of capital higher.
- **The operational risk:** This can be reduced with the right combination of components certification and quality installation processes. Meanwhile, the current track record of solar PV installations has not yet convinced the financial community of the stability of solar PV revenues.

Bankability has become a central concept in PV risk management but it cannot replace the use of adequate standardisation and certification processes to guarantee both components and installation quality in the long term.

An industry on the edge of a new cycle of investment:

After the rapid price decline and the industry consolidation, 2014 saw several actors returning to profit, in a growing market. From a technology point of view, crystalline silicon-based PV continued to dominate the market, while the share of thin film remained stable, thanks to Cadmium Telluride (CdTe) and the boom of the Japanese market for Copper Indium Gallium Selenide (CI(G)S).

The market growth experienced in 2013 and 2014 brought the utilisation rates of manufacturing capacities for solar components to more reasonable levels and reduced the pressure on prices. In Europe, the price undertaking for PV modules maintained the prices of some Chinese producers at higher than market levels, while other Asian manufacturers continued to offer cheaper prices.

After years of dramatic cost reduction, innovation seems to play a central role again. Several manufacturers have announced orders for innovative equipment to upgrade their current production lines or to put new ones in place. In parallel, new module factories are opening within, or close to, emerging markets while some continued to close in Europe.

The market growth has brought production capacities closer to a sustainable utilisation rate and therefore, with profitable companies, a new cycle of investment can start in the PV sector. This is strengthen by the expected market growth in several regions.

A new cycle of investment can start in the PV sector.

2

GLOBAL SOLAR MARKET:
UPDATE AND PROSPECTS

2014 saw the confirmation of a trend which has started in 2013: the formerly European centric solar power market became truly global. The development in Asia and America has demonstrated that solar PV is not a simple European whim. Significant levels of installations were connected in Africa and Latin America as well, demonstrating the potential of solar PV to drive economic growth. Despite the market growth around the world, Europe remains the leader in terms of cumulative installed capacity.

40 GW has been installed globally in 2014, setting a new record for the solar PV sector

After having reached close to 37 GW in 2013, solar PV markets reached the 40 GW mark for the first time in 2014. This level of installations has been achieved thanks both to the growth of Asian and American markets and, to some extent, thanks to the emergence of new markets.

China officially installed 10.6 GW of PV in 2014, including 2 GW of distributed installation, with strong political support and feed-in tariff based policies. This was also the case in Japan: 9.7 GW of PV systems were installed in 2014 in a market driven by feed-in tariffs and to a lesser extent, self-consumption measures.

40 GW has been installed globally in 2014.

2 GLOBAL SOLAR MARKET:
UPDATE AND PROSPECTS / CONTINUED

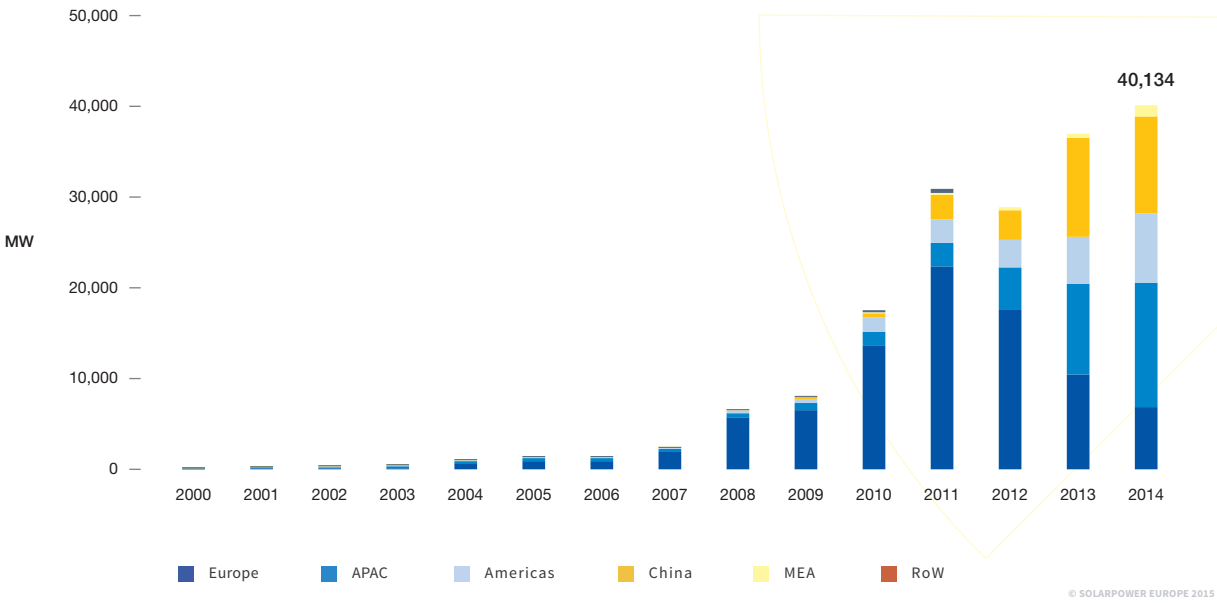
The US solar PV market continued its growth with 6.5 GW installed in 2014. While net-metering policies have been implemented in 44 States, the federal tax break policy (known as ITC – investment tax credit) continues to drive the market, together with State support. California contributed to more than 50% of all US solar PV installations in 2014, while all other States are lagging far behind.

In Europe, the UK and Germany were the two sole GW markets in 2014 in a context of reduced political support for solar PV. The UK market was driven by a combination of incentives, and installed 2.4 GW. Some unofficial sources announced higher numbers - up to 3 GW - based on an analysis of the module shipments. The PV market in Germany decreased to 1.9 GW with reduced incentives and uncertainties about market development.

Behind these 5 leading markets, several countries installed close to 1 GW in different regions of the world. In Europe, France installed more than 900 MW, after a drop in installations in 2013. In the APAC region, Korea's market doubled to more than 900 MW, almost the same level of installations as in Australia. The South African market finally took off with 800 MW installed.

In parallel, several countries contributed significantly to the market development with Canada, Taiwan, Thailand, the Netherlands and Chile installing close to 500 MW each. PV is now progressing in all regions of the world.

FIGURE 2 EVOLUTION OF GLOBAL SOLAR PV ANNUAL INSTALLED CAPACITY 2000-2014



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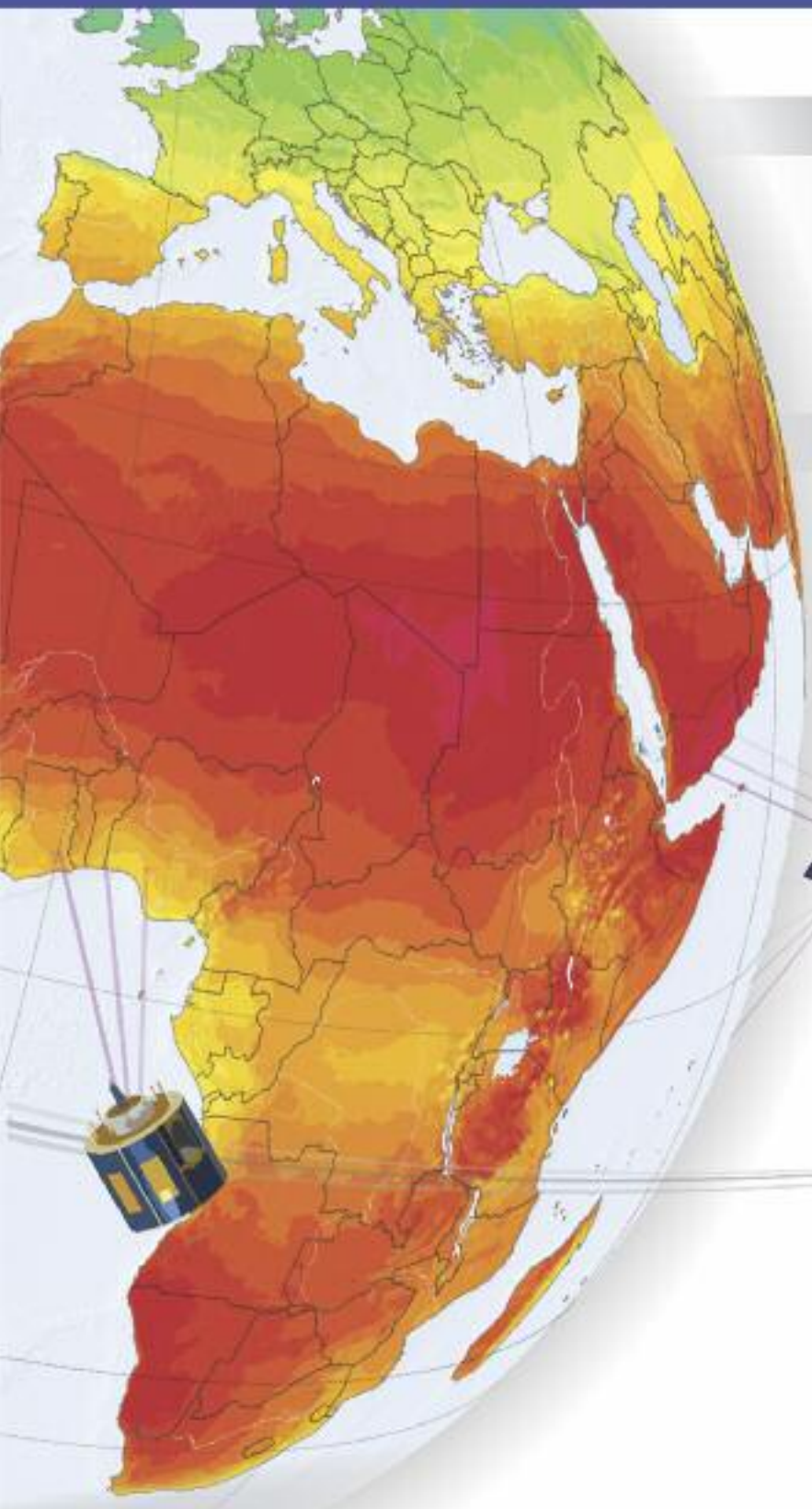

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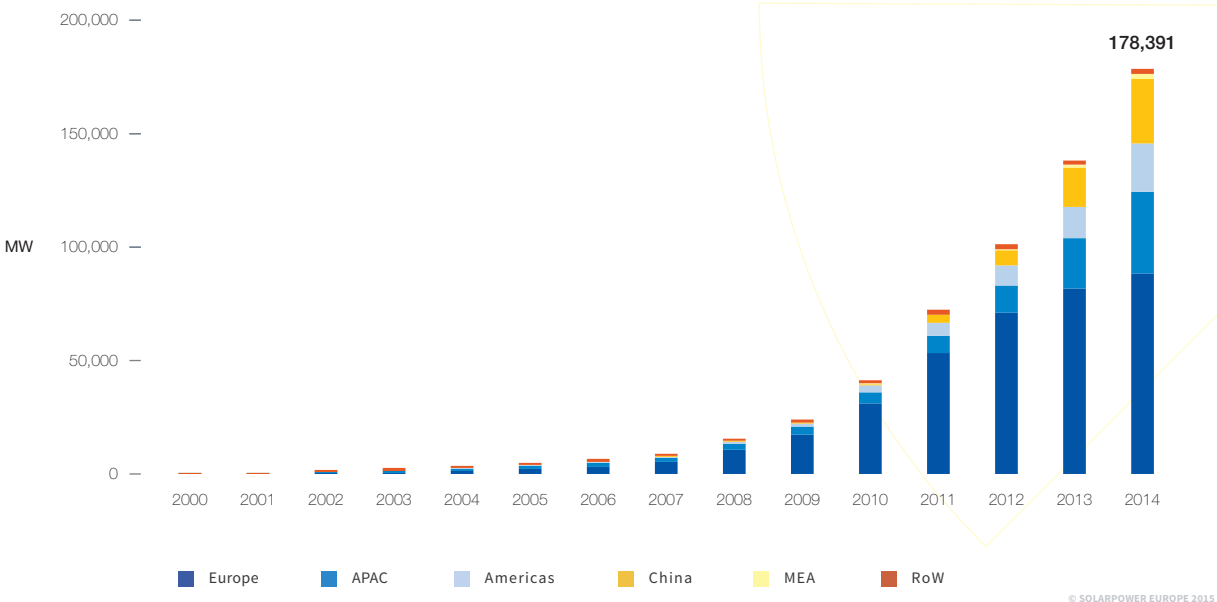
2 GLOBAL SOLAR MARKET:
UPDATE AND PROSPECTS / CONTINUED

Since 2000, the Solar Power capacity has been multiplied by a factor of 100

With more than 178 GW installed globally at the end of 2014, Solar Power continued its impressive growth. After years of tremendous developments, the market in Europe slowed down in 2013 and this trend continued in 2014. It can be explained in part by the influence of transitioning policies. With around 7 GW installed, Europe as a whole is now installing less solar power capacity than China or Japan individually, but more than the USA. However Europe, as highlighted in Figure 3, is still the predominant player with more than 88 GW installed at the end of 2014.

The 2014 solar PV markets showed a perfect balance between utility scale installations and distributed ones. Despite the huge interest in competitive calls for tender, the PV market remained balanced between producers and prosumers, demonstrating this unique capability of solar PV to offer a solution to diverse needs: powering a light bulb with a few watts, to offering an alternative to new conventional plants of hundreds of Megawatts.

FIGURE 3 EVOLUTION OF GLOBAL SOLAR PV CUMULATIVE INSTALLED CAPACITY 2000-2014



Solar Power covers more than 1% of the world electricity demand or the equivalent of 33 large coal fired power plants of 1 GW.

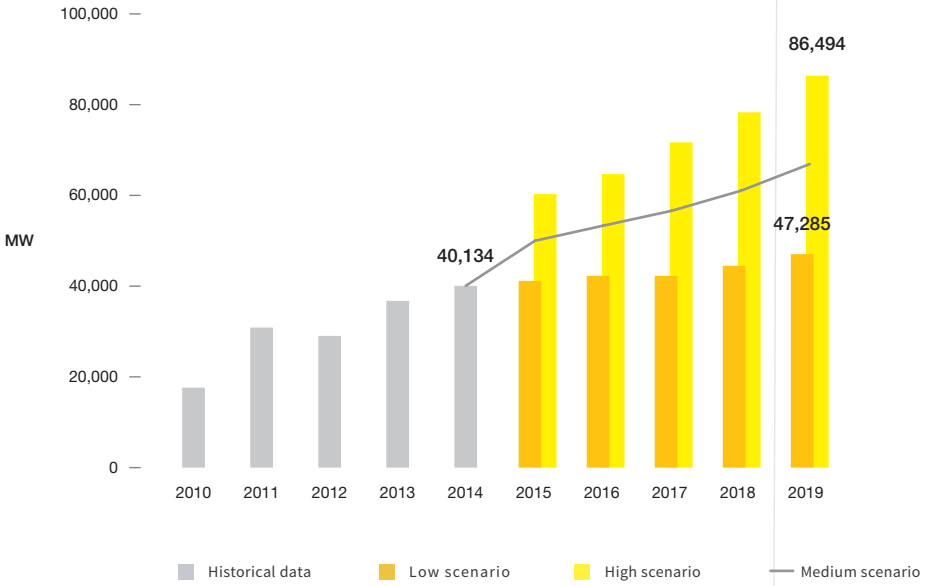
Almost 200 GW of Solar Power could be installed over the next three years

While an important part of the 2014 growth was shadowed by the decrease of the European market, 2015 could see a major increase in solar installation numbers globally as highlighted in Figure 4. Two scenarios are considered, namely high and low. The former assumes a favourable environment, accompanied by strong political will. The low scenario assumes rather a pessimistic behaviour with no improvements of the investment conditions in most of the markets.

A third indicator, the medium scenario, is indicated as the weighted probability defining the most probable market development forecast. The expectations for PV development in China, the US, Europe and a stabilisation of the Japanese market could lead to a market above 50 GW in 2015 and 2016, possibly close to 60 GW if all markets react positively.

2 GLOBAL SOLAR MARKET:
UPDATE AND PROSPECTS / CONTINUED

FIGURE 4 GLOBAL SOLAR PV ANNUAL MARKET SCENARIOS UNTIL 2019



In 2015, the level of installations in China will frame the global growth. After two years below targets, the Chinese government decided to raise the official PV installation target to 17.8 GW in 2015. The probability of seeing this target being reached remains conditional on many developments, and especially the take-off of distributed solar power. Without unlocking this market segment, China could have difficulties to achieve this ambitious 2015 target despite the impressive 5 GW installed in Q1 2015.

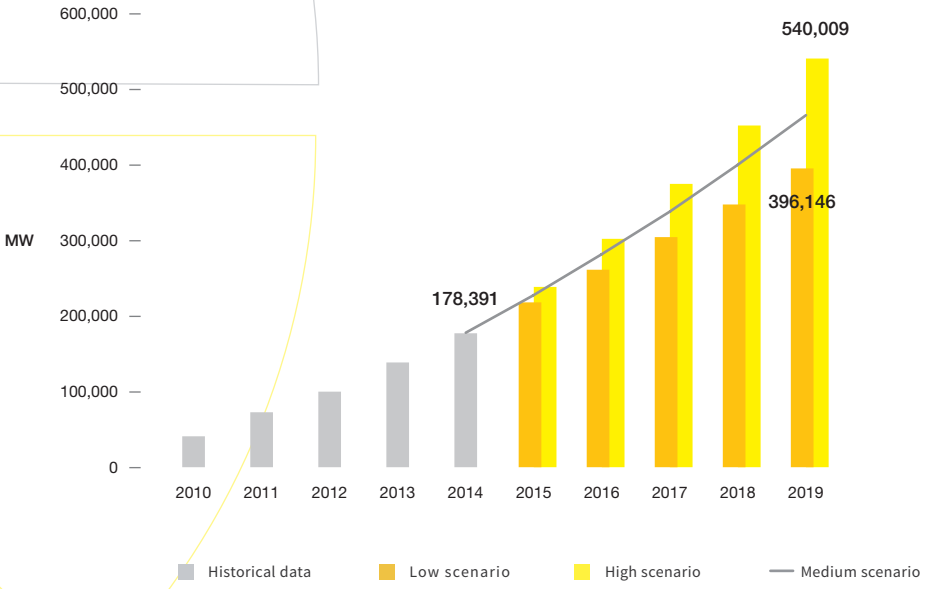
2017 could then be a year of market stagnation with the expected end of the ITC tax break regulation in the US and the end of the market boom in Japan. While none of them can be taken for granted, they illustrate the uncertainties on the medium-term PV market development.

In the longer term, after 2018, growth should resume based on the expected contribution of dozens of countries attracted by competitive PV, including India and its ambition to develop solar PV.

The probability of experiencing an important market growth in 2015, followed by two years of stable installations remains quite high. However a combination of negative policy decisions in key countries, or the difficulties of PV to take off fast enough in emerging markets, could lead to a market stagnation around 40 to 50 GW in the future. This hypothesis is by far not the most probable but needs to be borne in mind.

Depending on the evolution of the solar markets in the coming years, the total installed capacity in 2019 could reach between 396 and 540 GW with the highest probability scenario being around 450 GW.

FIGURE 5 GLOBAL SOLAR PV CUMULATIVE MARKET SCENARIOS UNTIL 2019

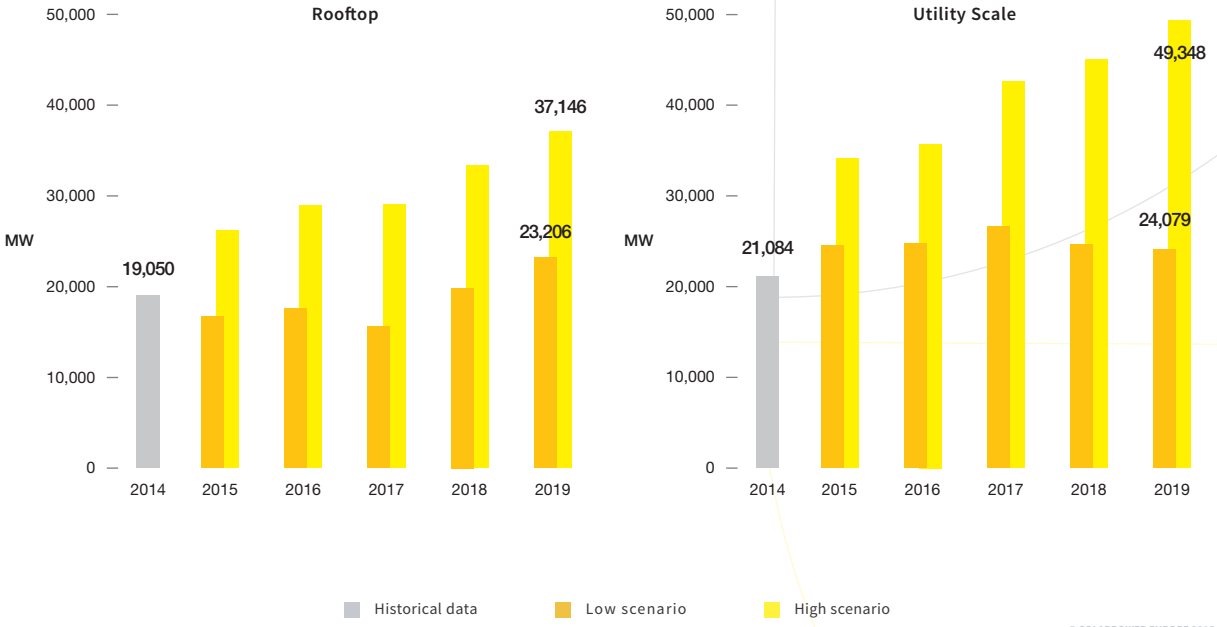


2 GLOBAL SOLAR MARKET:
UPDATE AND PROSPECTS / CONTINUED

Historically PV development has been driven by distributed installations. The price decrease and the rise of feed-in tariff policies have rapidly rebalanced distributed and centralized installations. In 2013, utility scale PV grew to the extent of becoming the first segment installed globally, while in 2014, both types of installations were balanced, with around 20 GW each.

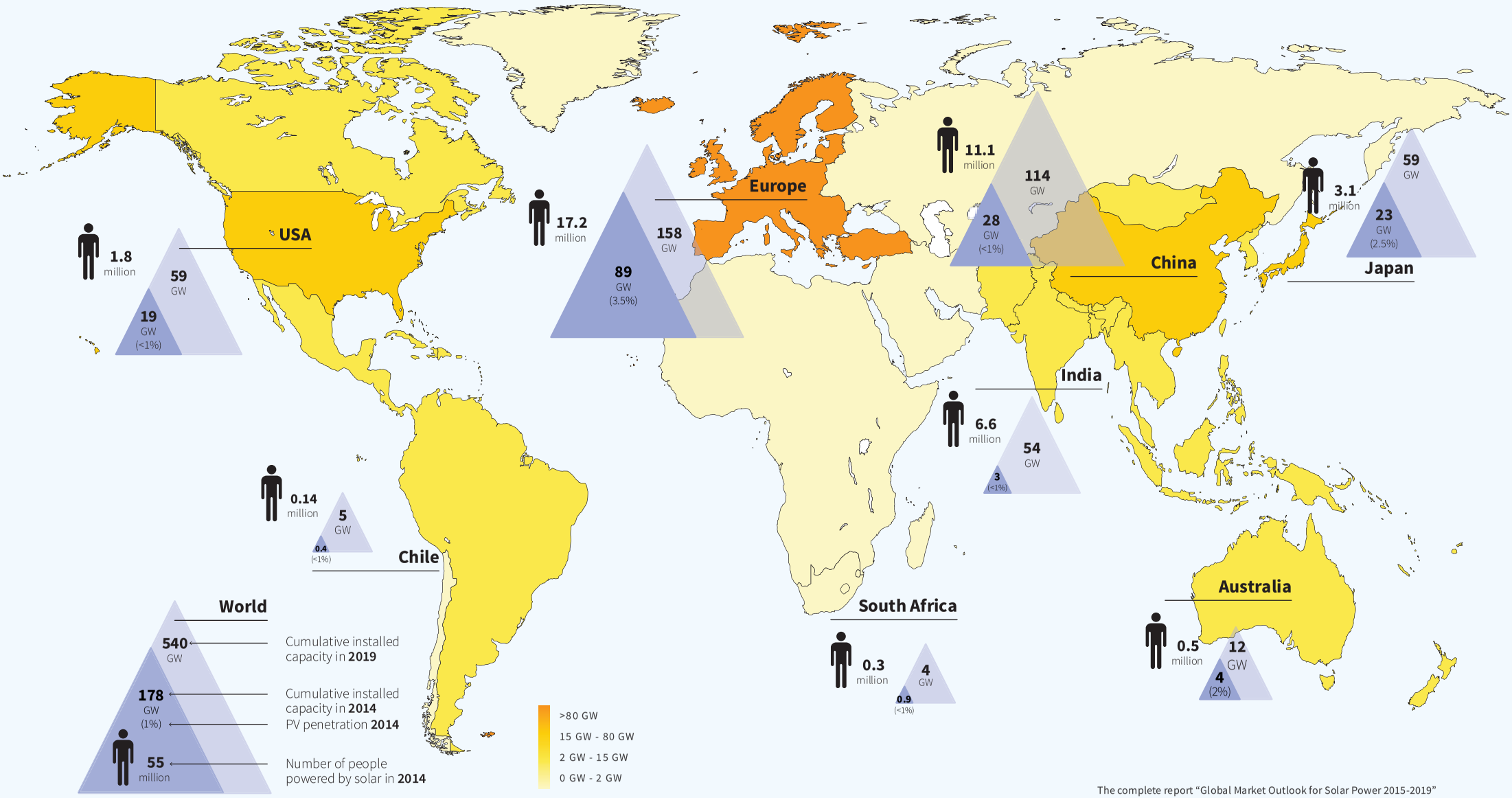
The respective development of each segment will depend on regulatory choices but looking at current trends the global development of utility scale solar power seems to be favoured, driven by its increasing cost-competitiveness.

FIGURE 6 SCENARIOS FOR SOLAR PV ROOFTOP AND UTILITY SCALE SEGMENTS DEVELOPMENT UNTIL 2019



The rate of PV penetration has been repeatedly forecast, and in most cases the final results were underestimated. In 2014, the International Energy Agency published scenarios in which solar (PV and Concentrated Solar Power) could become the first source of electricity in the world. This is dependent on several key conditions, but it reflects the growing awareness of PV's capability to offer cheap and reliable electricity. In 2011, the PV industry already stated that PV could represent up to 21% of the global electricity demand before 2050, under an assumption of managed electricity growth.

More and more energy stakeholders realise the true potential of PV.



The complete report "Global Market Outlook for Solar Power 2015-2019" and all figures can be downloaded on www.solarpowereurope.org

*All figures included in the map have been rounded.

GLOBAL SolarPower MAP

2014 Cumulative installed capacity and 2019 Scenarios for solar PV

SolarPower Europe

3

THE EUROPEAN SOLAR MARKET:

STATE OF PLAY AND OUTLOOK

In a continuously growing global solar PV market, Europe makes for interesting analysis: in 2014, installations in Europe slowed to the same level as in 2009. In a context of transitioning from feed-in tariff support policies towards a more market-based development framework, the European solar PV sector is the first to experience this dynamic. There is a general move to progressively integrate solar PV in electricity markets, while several countries introduced retroactive measures which impacted the investor confidence in developing new capacities.

While this context led to a deceleration of the European PV market, it also steered more innovative approaches by which the global PV industry seeks adaption for the future. Europe represents today a world-class demonstration project for the integration of PV into the energy sector.

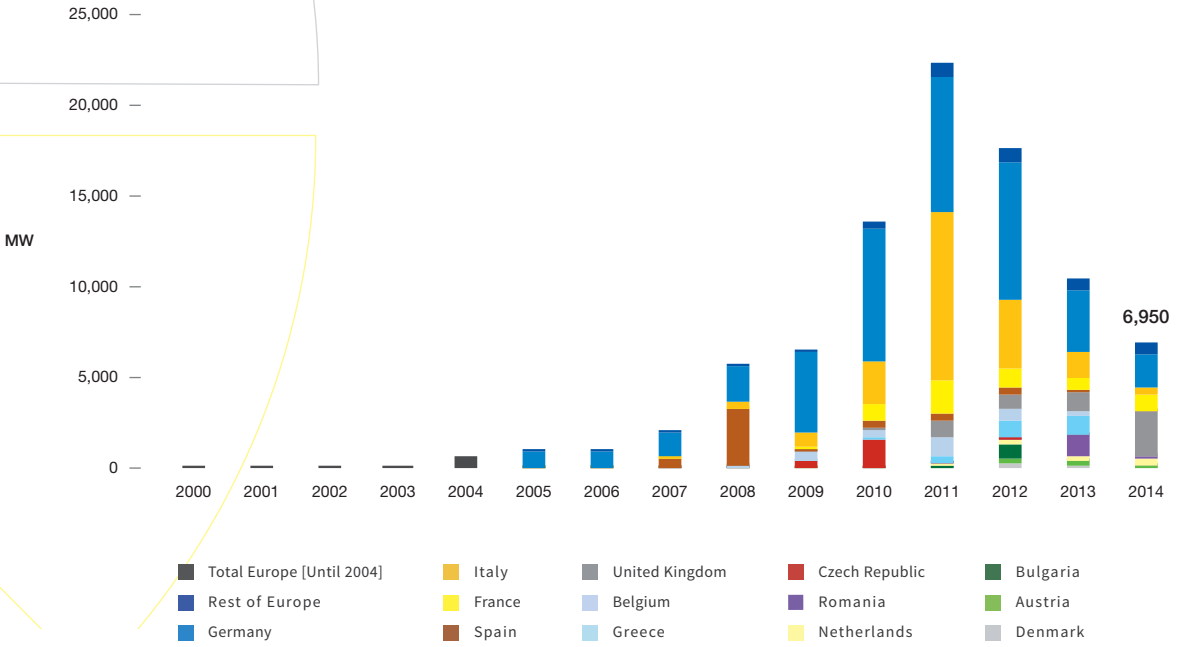
Looking at the leading markets, the UK took the first place in Europe with 2.4 GW installed. Moreover, while these 2.4 GW represent the official figure in terms of connections; real installations could have been higher based on the module shipment recorded in the country. Second in 2014, Germany installed less than 2 GW (1.9 GW), below the official target of 2.5 GW. The global PV leader was under pressure to lower the costs of the support system, with new regulations leading to a 75% reduction of the market over two years (from 7.6 GW to 1.9 GW). France, the third European market in 2014 installed close to 1 GW, driven by tenders granted in the past and the growing distributed market.

Beside the top three countries, Italy is in a transition period with less than 400 MW installed despite a good regulatory framework. In markets driven by net-metering, the evolution was rather negative in Belgium and Denmark, while the market in the Netherlands increased in 2014. Portugal and Austria installed more than 100 MW.

Figure 7 illustrates the evolution of the annual installed capacity since 2000. The ramping effect of support policies is well shown in this figure: the period 2006 -2011 saw the effectiveness of feed-in tariffs to kick off markets, reaching an unsustainable climax in 2011 followed by a period of transition between 2012 and 2014.

There is a general move to progressively integrate solar PV in electricity markets.

FIGURE 7 EVOLUTION OF EUROPEAN SOLAR PV ANNUAL INSTALLED CAPACITY 2000-2014



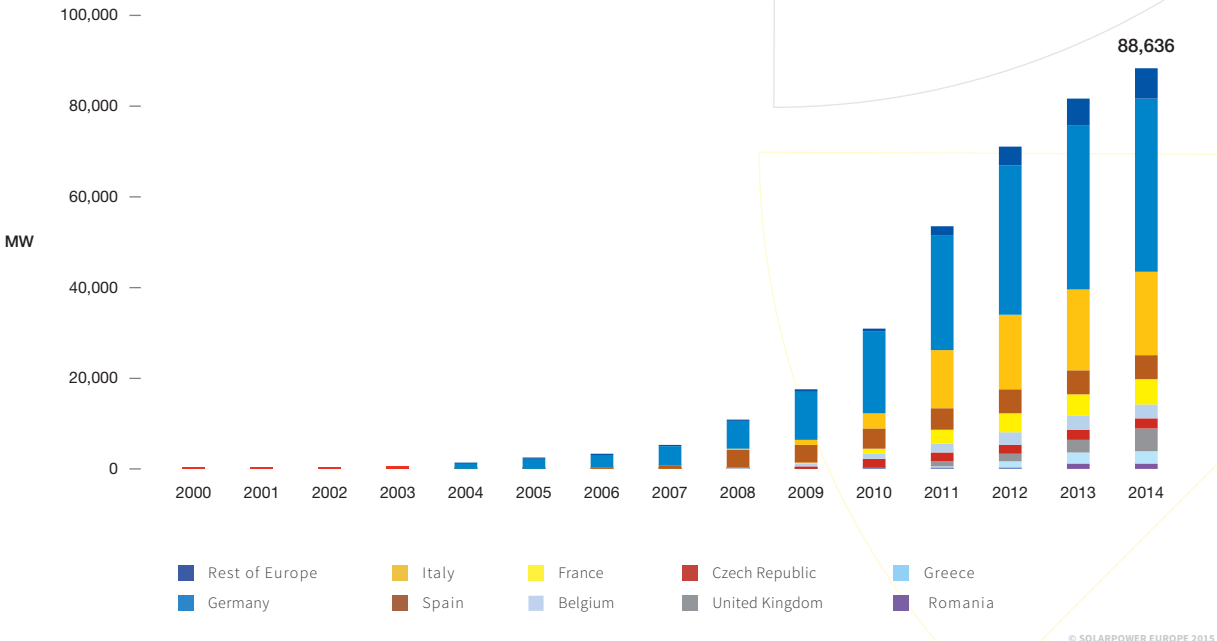
3 THE EUROPEAN SOLAR MARKET:
STATE OF PLAY AND OUTLOOK / CONTINUED

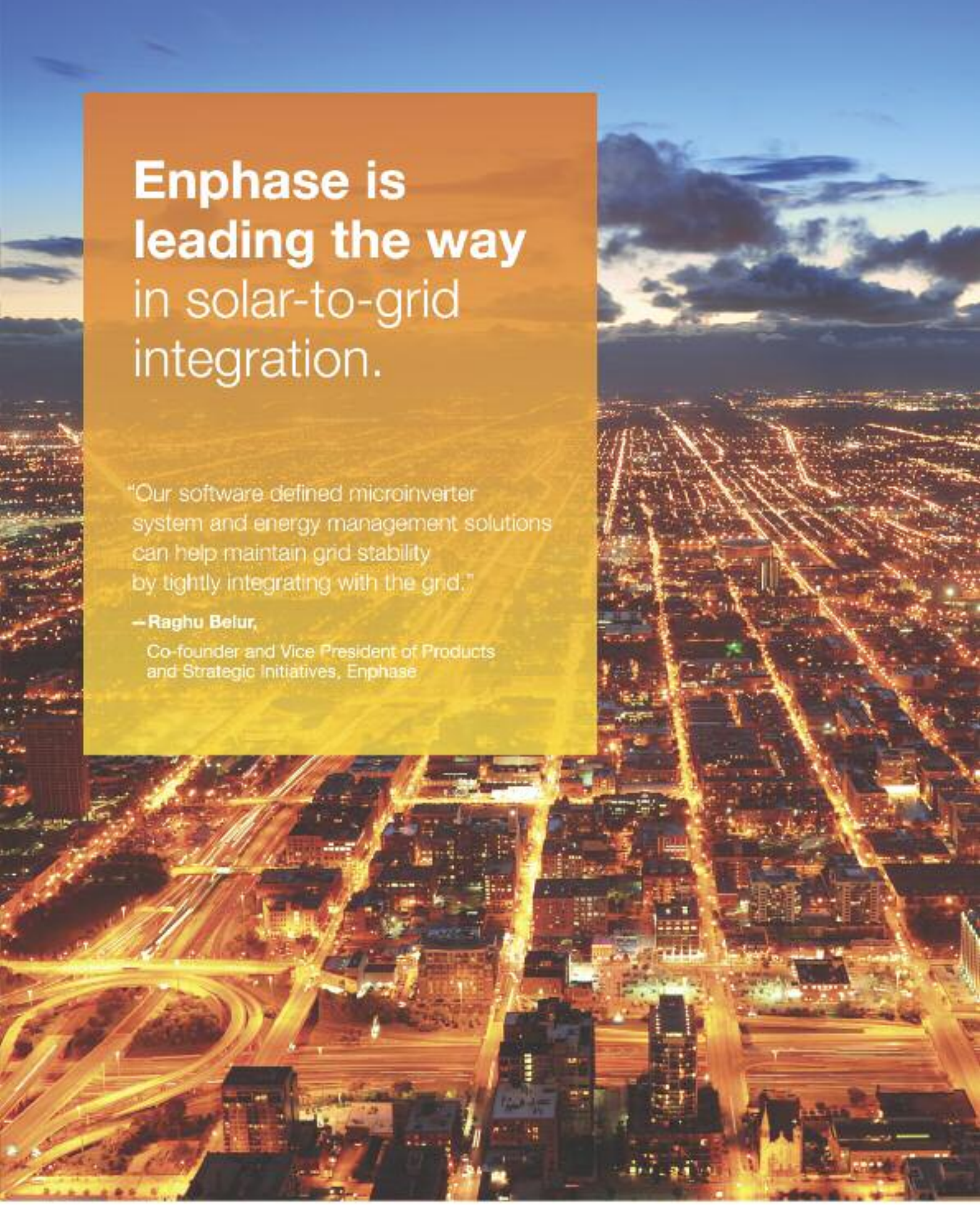
The most concerning trend is the current holdup of once-booming markets. Retrospective measures and new barriers have transformed several countries into investment deserts: Spain, Bulgaria and the Czech Republic are now considered as unreliable countries for investements.

While Spain drove the global market in 2008, the country has virtually disappeared from the European PV map. After many retroactive changes, the authorities decided to reduce the emerging self-consumption market with a solar tax and very high fines for non-declared prosumers. Belgium, Bulgaria, Czech Republic and Greece are experiencing to different degrees the effects of already in place or expected retroactive measures.

With close to 90 GW of PV capacity in European countries, the 2020 targets defined in 2009 have been reached in 2014, 6 years ahead of the target date.

FIGURE 8 EVOLUTION OF EUROPEAN SOLAR PV CUMULATIVE INSTALLED CAPACITY 2000-2014





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—Raghu Belur,
Co-founder and Vice President of Products and Strategic Initiatives, Enphase

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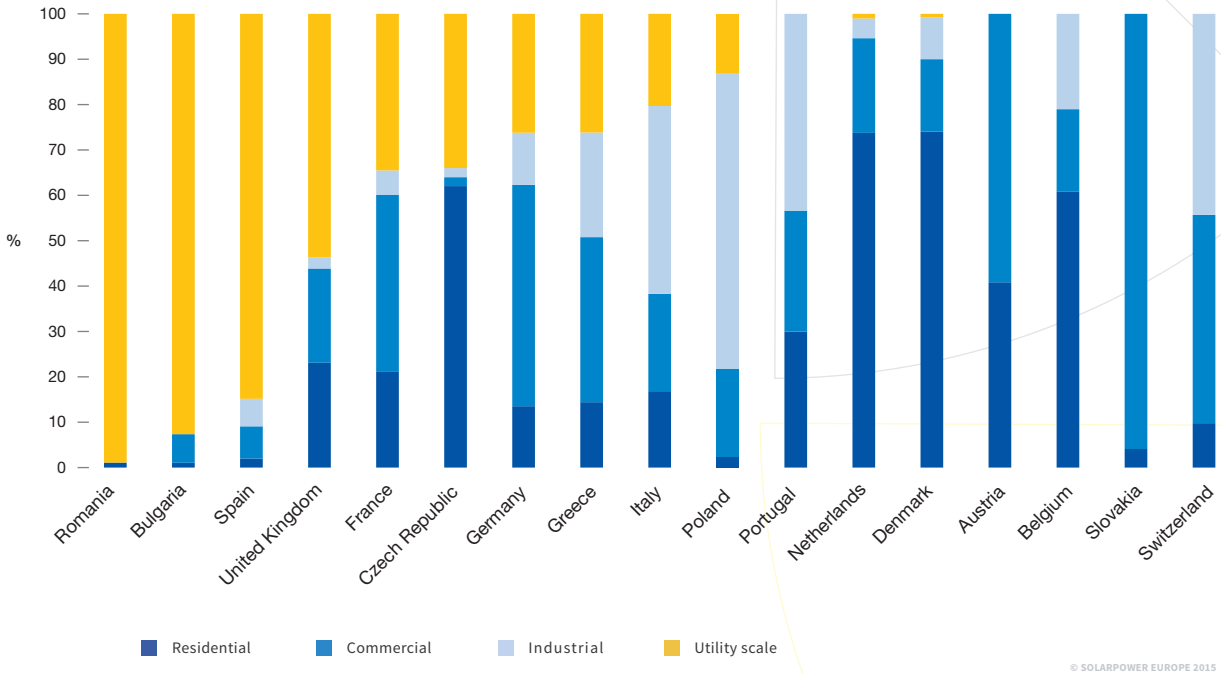
3 THE EUROPEAN SOLAR MARKET:
STATE OF PLAY AND OUTLOOK / CONTINUED

The European solar PV market remains quite varied, with very diverse segmentation from one country to another. The market segmentation has been split to distinguish between utility scale systems, commercial and industrial rooftop applications and residential applications. However, since the size of system largely depends on the respective structure of support schemes, the segmentation has no standard definition among markets. In order to satisfy the need to compare markets according to system size installations, assumptions have been taken in the figure below.

FIGURE 9 EUROPEAN SOLAR PV CUMULATIVE CAPACITY SEGMENTATION BY COUNTRY IN 2014



RESIDENTIAL: systems below or equal to 10 kWp
COMMERCIAL: systems with a capacity between 10 and 250 kWp
INDUSTRIAL: systems with a capacity above 250 kWp
UTILITY SCALE: systems with a capacity above 1000 kWp and built on the ground

Electricity market integration and self-consumption, two drivers of PV redevelopment in Europe

The diversity in the market developments and segmentation between countries is a consequence of the various support policies and contexts in which solar PV developed in recent years. While it would be difficult to summarise past developments, Table 1 provides an overview of the support framework status in the most relevant European markets in early 2015 together with the market development until end 2014.

The quest of European institutions to increase the integration of renewable energy sources into the electricity market has pushed several countries to already modify their regulatory framework to support PV. The Guidelines on state aid for environmental protection and energy that entered into force on 1 July 2014 stipulate feed-in premiums and tenders, except in exceptional cases. In that respect, Germany, the UK and France in 2016 will use feed-in premiums in addition to a remuneration based on electricity market prices to support a part of the PV market. In a similar way, mono or multi-technology tenders are also on the rise again in France, the UK and Germany, with

the idea to better control the evolution of the PV market in the related segments.

Distributed PV is evolving slowly in the direction of self-consumption: Prosumers are on the rise. In 2013, more than 50% of distributed PV installations were achieved due to measures allowing or supporting self-consumption. In most cases, such measures were not the main driver for PV installation, but self-consumption of PV electricity is becoming the backbone of distributed PV development.

The question of grid financing and more generally incomes at the retail level is vital in several countries.

Where network tariffs are based on a consumer's purchase of electricity from the grid, self-consumed electricity implies a decrease in grid financing. While adaptations are being discussed in various countries, a bad design and implementation of changes could be detrimental to self-consumption. For example, Spain implemented a kind of "solar tax" that is almost prohibitive for any investments in self-consumption, while countries such as Belgium are going to oblige prosumers to contribute to grid costs for their self-consumed electricity, even from existing systems.

Changes of grid tariffs – if they include existing systems without transitory compensation - can already be considered as a retroactive measure, by reducing the erstwhile guaranteed cash flows associated with self-consumption.

TABLE 1 EUROPEAN SOLAR PV MARKET AND PROSPECTS

	Annual Installed Capacity 2014 (MW DC)	**Cumulative Installed Capacity 2014** (MW DC)	**Political support prospects**
Austria	140	767	
Belgium	65	3,104	
Bulgaria	2	1,022	
Croatia	13	33	
Czech Republic	2	2,134	
Denmark	47	608	
France	927	5,632	
Germany	1,898	38,235	
Greece	17	2,596	
Italy	385	18,313	
Malta	0	23	
Netherlands	400	1,042	
Poland	27	34	
Portugal	115	414	
Romania	72	1,223	
Slovakia	0.4	524	
Spain	22	5,388	
Switzerland	320	1,046	
Turkey	40	58	
United Kingdom	2,402	5,230	

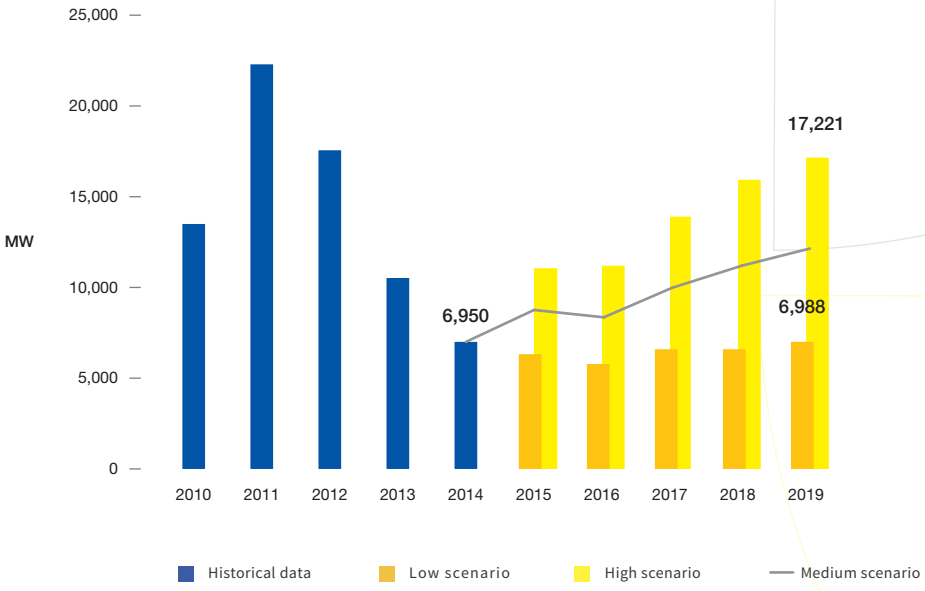
3 THE EUROPEAN SOLAR MARKET:
STATE OF PLAY AND OUTLOOK / CONTINUED

Solar Power could grow in Europe by 80 % by 2019

2014 may represent the slowest year for European solar PV installations. In 2015, the level of installations in the UK and Germany will frame the growth. Italy and other former GW installing countries, could sustainably return to a significant market level thanks to new support schemes that have been introduced in 2014.

The European market would first grow between 6 GW (low scenario) and 11 GW (high scenario) in 2015, before increasing again at a slower pace with installations ranging between 7 GW and 17 GW five years from now.

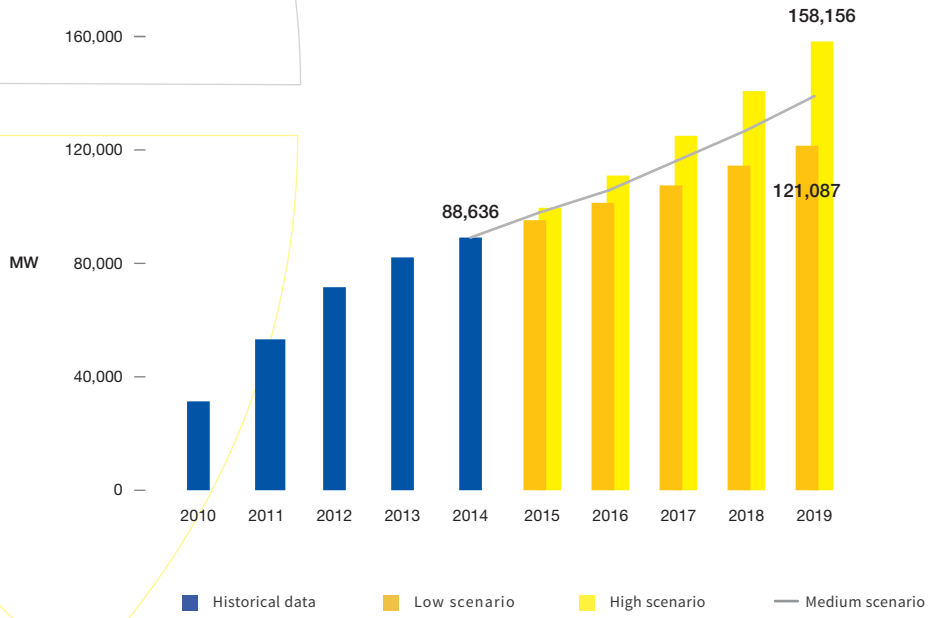
FIGURE 10 EUROPEAN ANNUAL SOLAR PV MARKET SCENARIOS UNTIL 2019



As highlighted in the figure on the following page, according to the high scenario, the European market could reach a total installed capacity of 158 GW by 2019, an almost 80% market increase compared to today. In the Low Scenario, total installed capacity would be above 120 GW by 2019.

Outside of the European Union, solar power developed in Switzerland, where 320 MW were installed and the prospects continue to look bright. In Turkey the 40 MW installed remain extremely low considering the country's potential. Many still believe this market could really start in 2015, but some years could be necessary to see it becoming a major PV market. In 2015 Q1 the government announced a target of 5 GW of solar PV by 2023.

FIGURE 11 EUROPEAN CUMULATIVE SOLAR PV MARKET SCENARIOS UNTIL 2019



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4

SOLAR IN THE EUROPEAN ELECTRICITY SYSTEM:

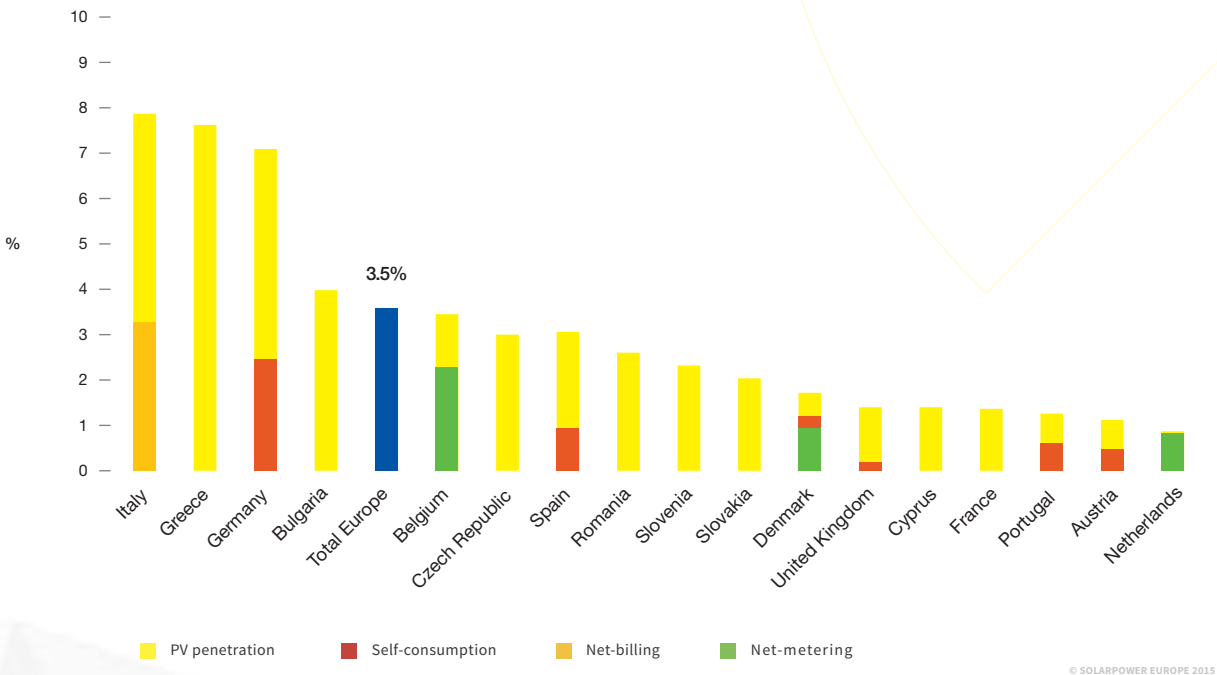
A DEMO-PROJECT FOR THE WORLD

The share of solar PV in the European electricity demand reached 3.5 %, based on the installed capacity at the end of 2014. This means that the 2015 solar production in Europe will represent more than 105 TWh of electricity, or the equivalent yearly production of 17 coal fired power plants of 1 GW.

Solar PV is covering more than 7 % of the electricity demand in 3 countries: Italy, Germany and Greece. In parallel, 13 other countries are producing more than 1 %. Solar power is significantly contributing to the electricity needs of 16 out of 28 EU Member States.

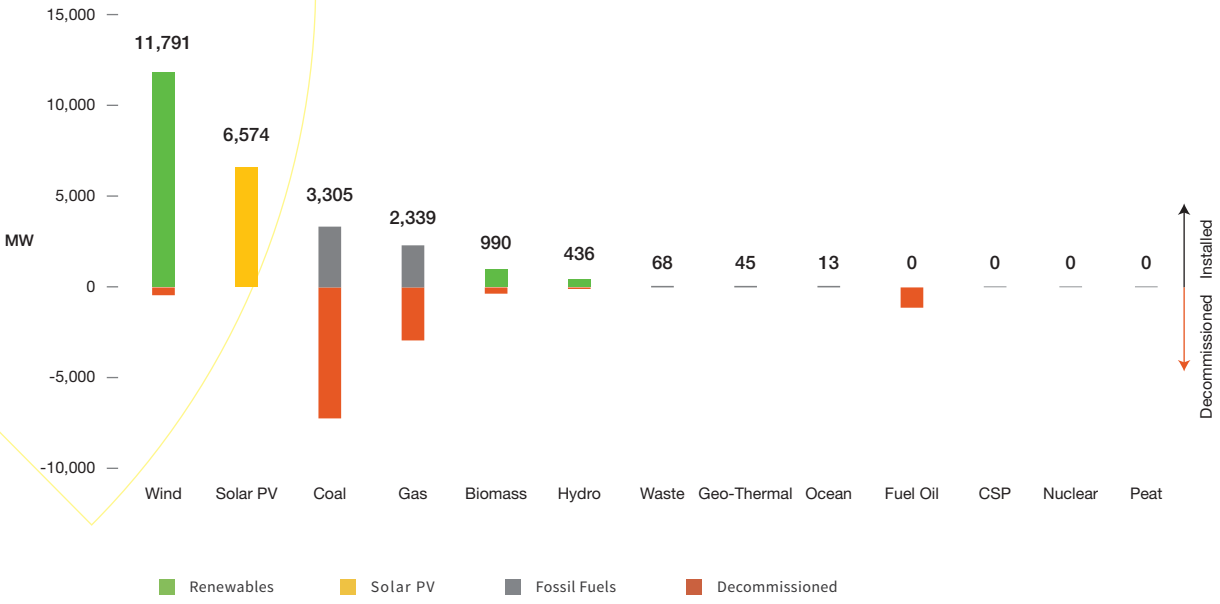
Solar PV is covering more than 7% of the electricity demand in 3 countries.

FIGURE 12 EUROPEAN SOLAR PV PRODUCTION AND SELF-CONSUMPTION IN 2014



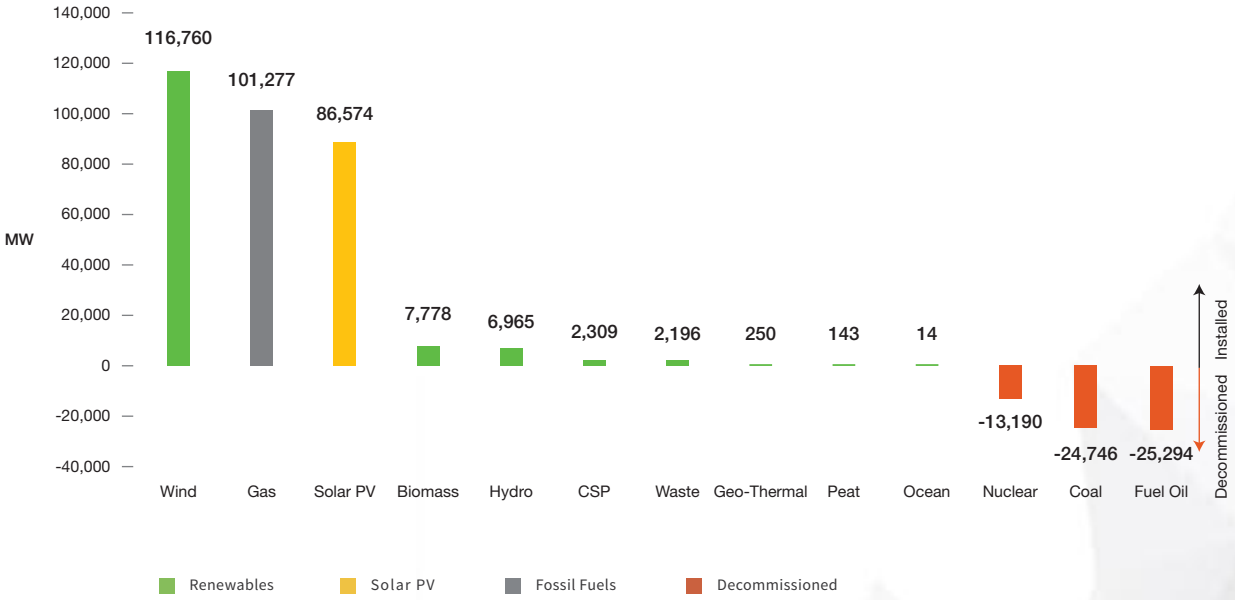
For the fifth year in a row, PV was one of the three most installed sources of electricity in Europe together with wind and gas. Since 2000, these three energy sources have topped cumulative installations while fuel oil, coal and nuclear experienced massive decommissioning.

FIGURE 13 POWER GENERATION CAPACITIES ADDED IN THE EU 28 IN 2014



Source: SolarPower Europe, EWEA.

FIGURE 14 NET POWER GENERATION CAPACITIES ADDED IN THE EU 28 BETWEEN 2000 AND 2014

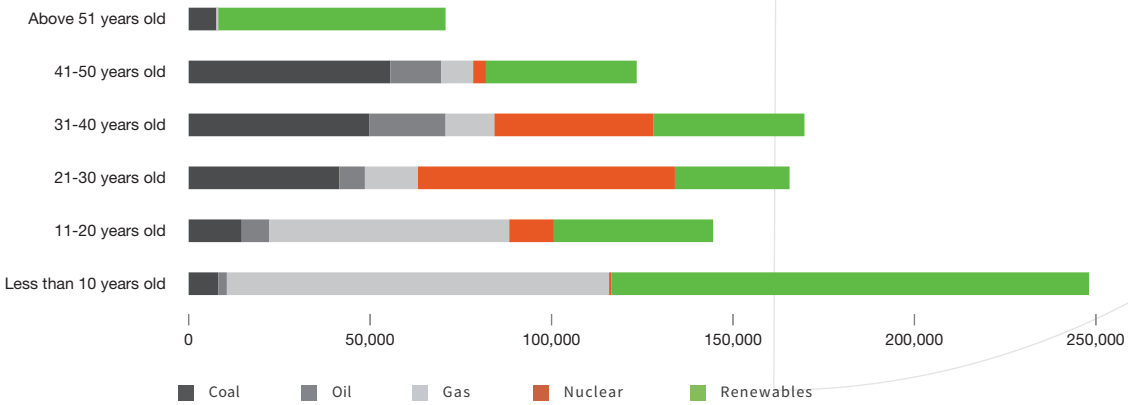


Source: SolarPower Europe, EWEA.

4 SOLAR IN THE EUROPEAN ELECTRICITY SYSTEM:
A DEMO-PROJECT FOR THE WORLD / CONTINUED

The trend of solar and wind leading the way in terms of added capacity is expected to continue also for the foreseeable future, as the existing power plant fleet is reaching the end of its lifetime. Figure 15 illustrates the structure of the European power mix, reflecting the different investment cycles over the last 5 decades. While many of the existing hydro power plants have already been built more than half a century ago, the graph shows how most of today's coal power plants stem from around the 1960s to the 1990s, while nuclear experienced its peak in the 1970s to 1990s. As these plants retire, more recent investments were clearly focussed on gas, and now also on renewables, like wind and solar power, that are dominating the new investment cycle in the electricity sector.

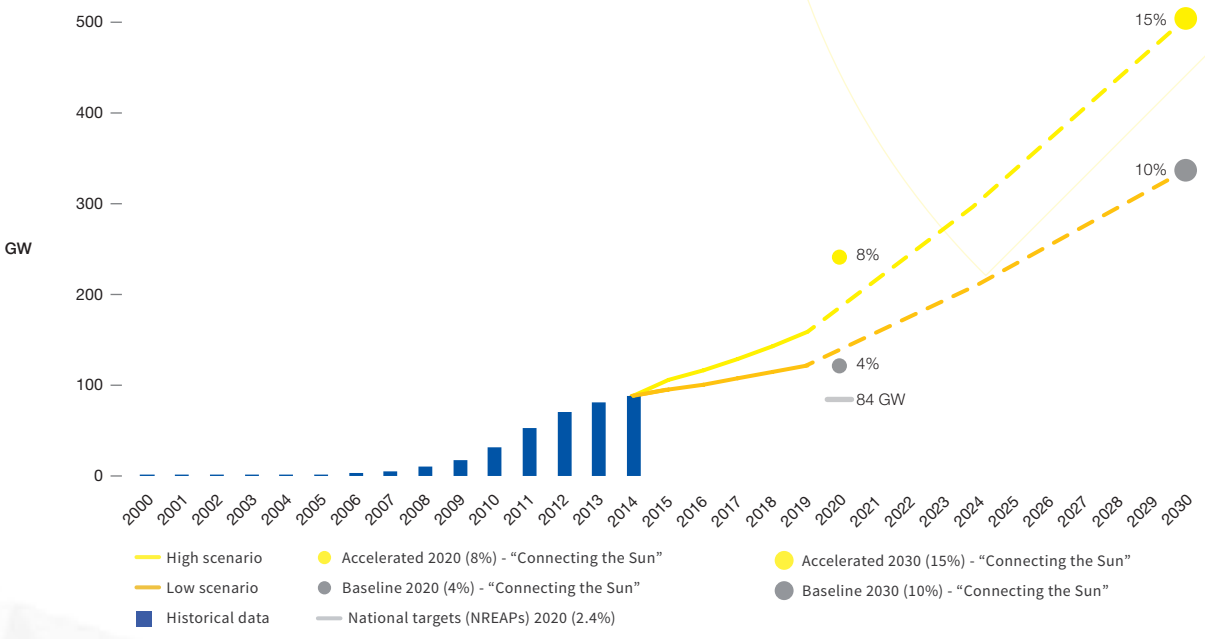
FIGURE 15 AGE OF POWER PLANTS IN EUROPE



Source: SolarPower Europe elaboration.

A rapid assessment of European renewable electricity targets shows that PV was underestimated in the 2020 targets and continues to be in the 2030 targets. This could be easily understood considering the high cost of PV installations in 2009, combined with the subsequent dramatic decline in PV electricity generation cost over the past few years. The targets defined by SolarPower Europe three years ago seem now perfectly reachable (10 to 15% of the electricity demand by 2030).

FIGURE 16 SOLAR PV CUMULATIVE CAPACITY FORECAST COMPARED TO SOLARPOWER EUROPE'S 2030 SCENARIOS



EPIA, "Connecting the Sun: Solar photovoltaics on the road to large-scale grid integration", 2012.
The percentage indicates the share of electricity demand.

EUROPEAN SolarPower MAP

2014 Cumulative installed capacity and 2019 Scenarios for solar PV

SolarPower Europe

All figures included in the map have been rounded.

5

AN OUTLOOK FOR SOLAR POWER

© Photo courtesy of First Solar

An expensive curiosity in labs and on space satellites in the 1980s, solar PV has become a challenger to conventional electricity generation technologies. Solar power has shown in these last years its ability to adapt to most climates, system sizes and regulatory frameworks all over the world. Every day, large utility scale solar PV systems are built on all continents and tenders reveal how cheap and competitive PV electricity has become.

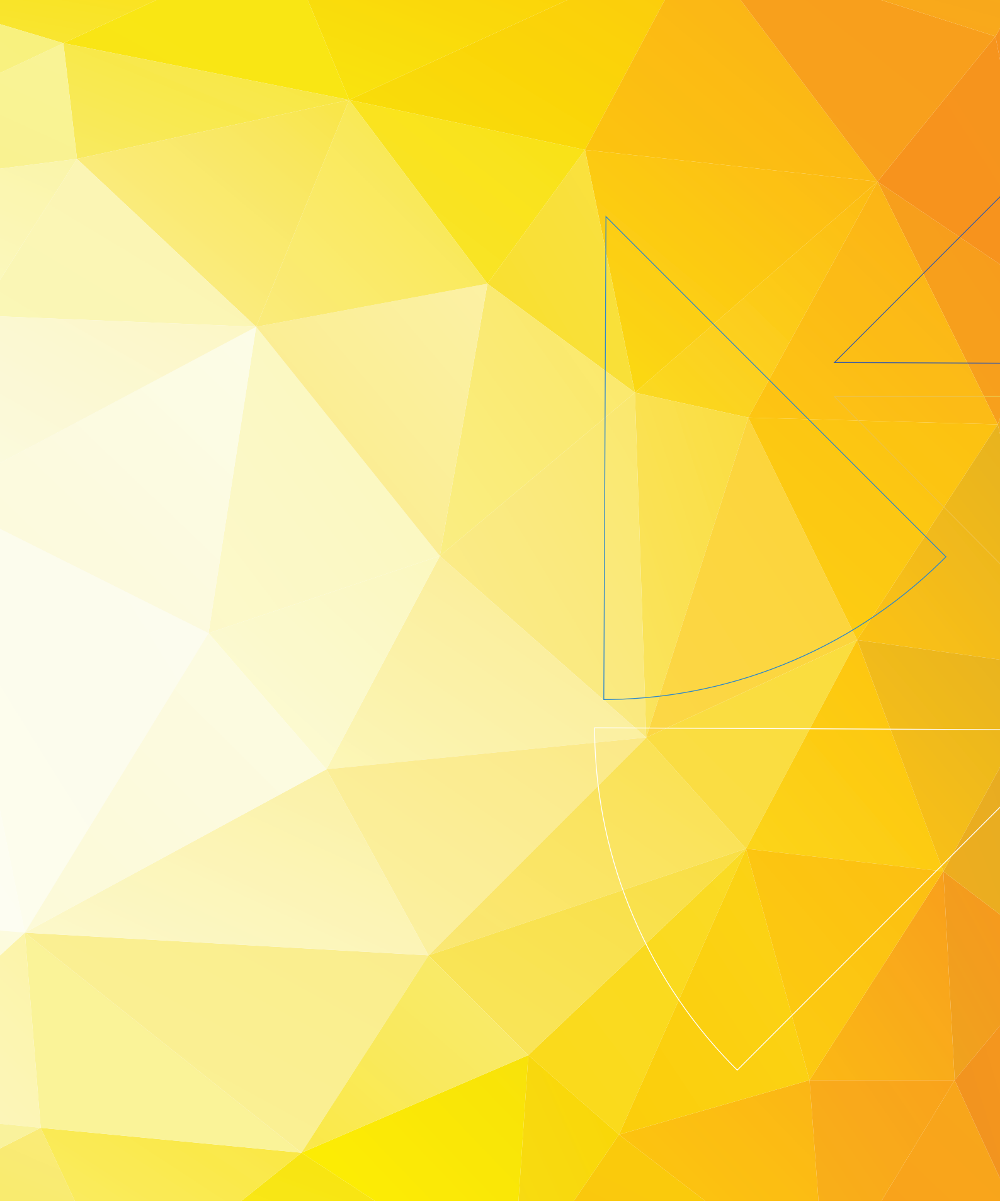
A large part of solar power development until the end of 2014 has been driven by financial incentives or ad hoc support schemes. In the end, its sustained deployment will depend on its ability to compete with conventional sources of electricity. In the short term, the global solar market will remain driven by countries using supporting frameworks, e.g. in Asia and America. Low and decreasing prices are changing the mentalities of policymakers across the world, and the recognition that solar PV is a low-cost, low carbon power source, which could become a significant part of the electricity mix of the future, is spreading fast.

The existence of forward-looking and reliable framework conditions for this transition of the electricity mix will be a key factor of success. With solar PV system prices decreasing at a slower pace than in the past years, the main driver for lower solar electricity generation costs will be the decrease of the cost of capital. To bring down these costs, investor certainty benefits from the inherently low risk of the technology, but it also depends on the external market conditions.

An integrative perspective on the evolution of the energy system and market design will be essential to allow for the sustainable and increasingly market-driven uptake of solar power, and the move towards a flexible, clean and affordable energy supply. A new paradigm will emerge, in which variable but predictable power generation from solar and wind power will form the new basis of our energy system, complemented with flexibility resources like a smart grid network, flexible power generation technologies like gas, the use of storage, and a more active participation of the demand-side.

Solar power needs a forward-looking investment and market framework just as much as the society and our economies need reliable, clean and sustainable energy sources. Understanding this fact will pave the way for a bright solar PV future, in Europe and globally.

Power generation from
solar & wind
will form the new basis of our energy system.



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