IEA INTERNATIONAL ENERGY AGENCY

Photovoltaic Power Systems Technology Collaboration Programme

Task 1 Strategic PV Analysis and Outreach

PVPS

2019 Snapshot of Global PV Markets

Report IEA PVPS T1-35: 2019

Cover picture:

Courtesy of Iñigo Santos, TECNALIA, PVSITES European Horizon 2020 Project, BIPV façade, San Sebastian, Spain.

WHAT IS IEA PVPS TCP

The International Energy Agency (IEA), founded in 1974, is an autonomous body within the framework of the Organization for Economic Cooperation and Development (OECD). The IEA carries out a comprehensive programme of energy cooperation among its 30 member countries and with the participation of the European Commission. The IEA Photovoltaic Power Systems Programme (IEA PVPS) is one of the collaborative research and development agreements (technology collaboration programmes) within the IEA and was established in 1993. The mission of the programme is to "*enhance the international collaborative efforts which facilitate the role of photovoltaic solar energy as a cornerstone in the transition to sustainable energy systems.*"

In order to achieve this, the Programme's participants have undertaken a variety of joint research projects in PV power systems applications. The overall programme is headed by an Executive Committee, comprised of one delegate from each country or organisation member, which designates distinct 'Tasks,' that may be research projects or activity areas. This report has been prepared under Task 1, which deals with market and industry analysis, strategic research and facilitates the exchange and dissemination of information arising from the overall IEA PVPS Programme.

The IEA PVPS participating countries are Australia, Austria, Belgium, Canada, Chile, China, Denmark, Finland, France, Germany, Israel, Italy, Japan, Korea, Malaysia, Mexico, Morocco, the Netherlands, Norway, Portugal, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, and the United States of America. The European Commission, Solar Power Europe, the Smart Electric Power Alliance (SEPA), the Solar Energy Industries Association and the Copper Alliance are also members.

Visit us at: **www.iea-pvps.org**

Authors:
Data: IEA PVPS Reporting Countries, Becquerel Institute (BE), RTS Corporation (JP) and Arnulf Jaeger-Waldau (EU-JRC).
Analysis: Gaëtan Masson, IEA PVPS Task 1, Izumi Kaizuka, RTS Corporation, Alice Detollenaere and Johan Lindahl, Becquerel Institute.
Editing: Mary Brunisholz, IEA PVPS.
Design: Becquerel Institute.

Data for non-IEA PVPS countries are provided by official contacts or experts in the relevant countries.
Data are valid at the date of publication and should be considered as estimates in several countries due to the publication date.

ISBN 978-3-906042-83-1 : 2019 Snapshot of Global PV Markets

PHOTOVOLTAIC POWER SYSTEMS PROGRAMME

IEA PVPS
Task 1 – Strategy PV Analysis and Outreach

Report IEA-PVPS T1-35:2019
April 2019

ISBN 978-3-906042-83-1

2018 PV MARKET HIGHLIGHTS

Preliminary reported market data shows a global annual PV market at a similar level as in 2017. At least 99,8 GW of PV systems have been installed and commissioned in the world last year. While these data will have to be confirmed in the coming months, some important trends can already be discerned:

- The total installed capacity for PV crossed the **500 GW mark** in 2018, or half a TW.
- The global annual PV market was at least 97,9 GW in 2018. With non-IEA PVPS reporting countries, this number could grow up to 99,9 GW, compared to 76,4 GW in 2016 and 98,9 GW in 2017. The 2,0 GW difference comprises non-IEA PVPS markets countries such as most unreported African, Asian and Latin American countries.
- This year saw the Chinese PV market contracting, from 53,0 to 45,0 GW. China is the leader in terms of total capacity with 176,1 GW installed.
- Outside of China, the global PV market grew from 48,6 GW to 54,9 GW.
    - India progressed significantly, as the annual market grew to 10,8 GW, becoming the second-largest PV market, including around 2 GW of distributed and off-grid installations.
    - The US market decreased slightly to 10,6 GW, with utility-scale installations accounting for roughly 60% of additions.
    - The European Union installed 8,3 GW and the rest of Europe added roughly 1,1 GW.
      The largest European market in 2018 was Germany (3,0 GW), followed by the Netherlands (1,3 GW), and France (862 MW).
    - Japan ranks fourth, with around 6,5 GW annual installed capacity.
    - Other markets increased spectacularly in 2018, especially Australia, with close to 3,8 GW, Mexico with close to 2,7 GW, Korea with 2,0 GW, followed by a declining Turkish market, still above 1,6 GW.
    - The MEA markets experienced growth, but a large part of this will be visible in 2019 when most plants will be commissioned, especially in the UAE and Egypt.
- In the top 10 countries, there are now five Asia-Pacific countries (China, India, Japan, Australia and Korea), two European Union countries (Germany and the Netherlands) plus Turkey, and two countries in the Americas (the USA and Mexico).
- The level to enter the top 10 markets in the world in 2018 was around 1,3 GW, the highest level ever and the first time significantly above the GW mark.
- The top 10 countries represented 87% of the global annual PV market.
- Honduras, Chile, Germany, Greece, Italy, Japan, Australia, India and Morocco now have enough PV capacity to theoretically produce more than 5% of their annual electricity demand with PV.
- PV represents around 2,6 % of the global electricity demand and 4,3 % in Europe.
- 32 countries had at least 1 GW of cumulative PV systems capacity at the end of 2018 and 10 countries installed at least 1 GW in 2018.

TABLE OF CONTENTS

1 A SNAPSHOT OF THE GLOBAL PV MARKET IN 2018

IEA PVPS has distinguished itself throughout the years by producing unbiased reports on the development of PV all over the world, based on information from official government bodies and reliable industry sources. This seventh edition of the "Snapshot of Global PV Markets" aims at providing **preliminary information** on how the PV market developed in the last year. The 24th edition of the PVPS complete "*Trends in Photovoltaic Applications*" report will be published in Q4 2019.

In 2017, in a similar basis to 2016, the PV market broke several records and continued its global expansion, by reaching almost the 100 GW threshold. One might have expected a similar market behaviour in 2018. However, the preliminary results show a stabilization of the global market as the annual installation once again was about 100 GW in 2018.

For some years, the level of market development in China has been driving the global PV market to a large extent. Nevertheless, while the Chinese PV market grew until 2017, it experienced a limited decline in 2018. However, this decline in the Chinese PV market was compensated with larger installation volumes outside of China. With around 45,0 GW installed in China in 2018 compared to 53,0 GW in 2017, the global PV market showed a stable situation with 99,8 GW compared to 98,9 GW in 2017.

Behind China, India ranked second with around 10,8 GW of annual installations in 2018, followed by the US market that contracted slightly at 10,6 GW. The European Union follows with some growth at 8,3 GW and Japan with 6,5 GW where the market declined slightly.

Apart from the change of position of some countries, the top five were quite similar to 2017. Then again, the major development of the year 2018 was the growth of several other countries behind the top five: Australia installed 3,8 GW, Mexico 2,7 GW and Korea 2,0 GW. Turkey followed with 1,6 GW in a declining market. Looking a bit more in depth at European Union countries, Germany experienced the best year since 2013, with about 3,0 GW installed and the Netherlands entered in the top 10 with 1,3 GW installed during the year.

Asia continues to dominate the global PV market. Some already established major Asian markets, such as Taiwan or Malaysia, experienced a growth in 2018, while the development in other markets, such as Thailand, Indonesia, the Philippines and Vietnam, has been intermittent over the years. Asian markets represented slightly less than 70% of the global PV market, a decrease in 2018 as compared to 2017.

In the Americas, the decline of the US market (10,6 GW) was balanced by Mexico that installed about 2,7 GW in 2018. Brazil, which installed 1,0 GW in 2017, saw its market contracting to less than 400 MW. Chile installed 461 MW, a decline compared to the 657 MW in 2017. Canada experienced a new market decline in 2018, as the market went down to 100 MW in 2018 as compared to 249 MW in 2017. The Americas represented around 15% of the global PV market in 2018.

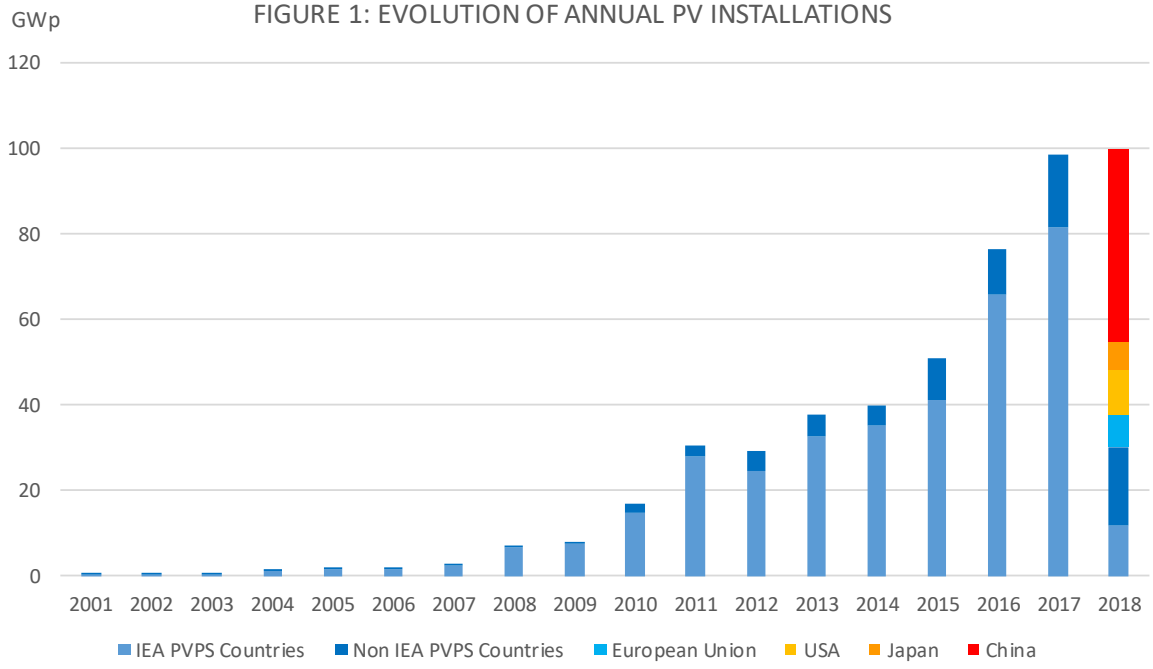
In Europe, Germany confirmed its leading position on the continent and installed close to 3,0 GW in 2018. The Netherlands with 1,3 GW was the major event of the year, followed by France still below the GW mark. Other countries in Europe experienced interesting developments but at a lower level: Ukraine (more than 700 MW), Hungary (400 MW) and Belgium (405 MW). Italy (435 MW) and Spain (374 MW) both made small comebacks after years of almost complete market absence. The UK went down to a very low level as compared with previous years (268 MW), while the market in Poland increased (214 MW). Some medium-size European market remained stable, such as Switzerland (260 MW) and Austria (153 MW). In the Nordic countries, Sweden (155 MW), Denmark (91 MW), Finland (59 MW) and Norway (23 MW), saw a growth of their PV markets in 2018. The Portugal market also grew slightly (88 MW). Turkey installed 1,6 GW, a major decline compared to 2017. Europe as a whole represented slightly more than 9% of the global PV market in 2018.

In the Middle East, Israel installed an additional 432 MW, the highest performance in years. Morocco installed 591 MW, while plans are being made for significantly more. Several other countries in the region experienced a rapid growth and hundreds of MW of installations, which will mostly be connected in 2019. In the UAE and

Egypt alone, we can expect more than 2 GW to be connected on plants in 2019, which have been already partially developed by the end of 2018.

In Africa, South Africa became the first African country to install close to 1 GW of PV in 2014, but the market has declined significantly since then, as only 60 MW was installed in 2018. Projects have popped-up a bit everywhere, but few countries have actually installed significant amounts in 2018. Africa and the Middle East represented around 6% of global PV installations in 2018.

FIGURE 1: EVOLUTION OF ANNUAL PV INSTALLATIONS



Overall, the global PV market almost hit the 100 GW mark. With a similar market level in China, the growth would have been significantly above the installation level of 2017. The growth of the market outside of China amounted to more than 17% in 2018 compared to 15% in 2017.

In 2018, 10 countries passed the GW mark with respect to the annual installed PV capacity. Eight countries now have more than 10 GW of total capacity, four more than 40 GW and China alone represented 176,1 GW. Germany, which used to lead the rankings for years, lost its leading position in 2015 and now ranks fourth (45,4 GW), with Japan third (56,0 GW) and the USA second (62,2 GW). With more than 120,4 GW of total capacity, Europe is now significantly behind the Asian leader that runs at least 294,1 GW, and much more to come in the coming years.

In some parts of the world the development remains irregular as former GW markets, such as Thailand, South Africa, the Philippines, Czech Republic, Greece, Romania and Bulgaria for instance, in 2018 deployed close to nothing or just a few dozens of MW.

The key event of 2018 was the decision by China to constrain its market. To avoid an overheating PV market and to limit the influence on retail electricity prices, the Chinese central government limited the development of PV as of May 31, 2018. At the end of the year, the result is not as low as one could have expected, but the result was the same: driven by the fear of a declining market, components' prices went down rapidly and especially module prices. This decrease in prices accelerated somehow the deployment at the end of the year and contributed at least partially to stabilize the market.

2 THE TOP 10 MARKETS IN 2018

In the major evolutions, 10 out of the top 10 markets for PV in 2018 have installed at least 1 GW of PV systems. Looking at the total installed capacity, 32 countries are now in the 1 GW club.

The five key markets have exchanged their positions in the last years, but show different evolutions. Several countries which in previous years installed significant capacities have left the top 10 for annual installed capacities.

The top 10 of total installed capacities shows more inertia due to past levels of installations.

As mentioned in the next section, capacities for a few countries that report PV installations in AC power, have been converted into DC power to facilitate comparison. This can lead to discrepancies with official PV data in several countries such as Spain, Japan or India.

TABLE 1: TOP 10 COUNTRIES FOR INSTALLATIONS AND TOTAL INSTALLED CAPACITY IN 2018

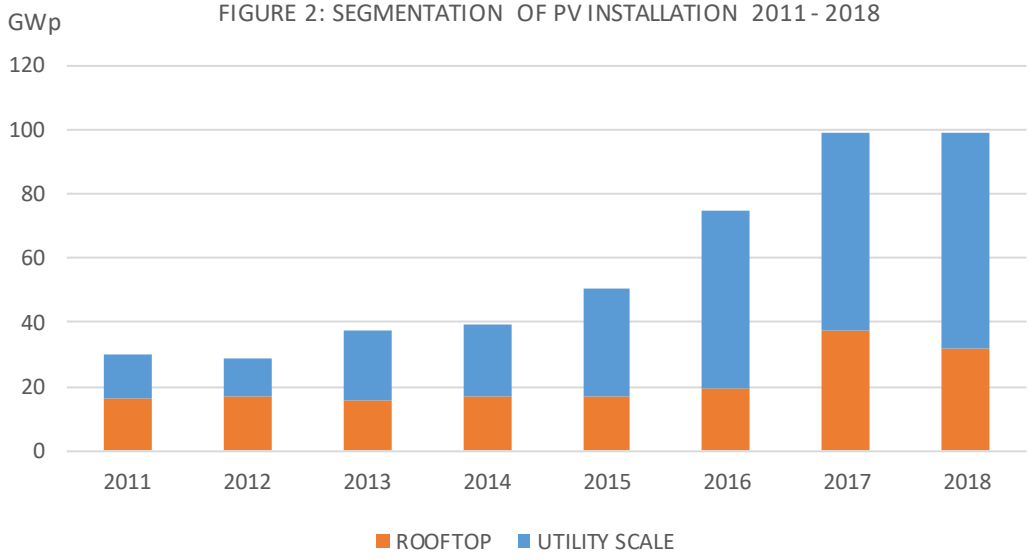
FOR ANNUAL INSTALLED CAPACITY				FOR CUMULATIVE CAPACITY			
1		China	45,0 GW	1		China	176,1 GW
2		India	10,8 GW	2		USA	62,2 GW
3		USA	10,6 GW	3		Japan	56,0 GW
4		Japan	6,5 GW	4		Germany	45,4 GW
5		Australia	3,8 GW	5		India	32,9 GW
6		Germany	3,0 GW	6		Italy	20,1 GW
7		Mexico	2,7 GW	7		UK	13,0 GW
8		Korea	2,0 GW	8		Australia	11,3 GW
9		Turkey	1,6 GW	9		France	9,0 GW
10		Netherland	1,3 GW	10		Korea	7,9 GW
		EU*	8,3 GW			EU*	115,0 GW

* The European Union should come in the fourth place for the capacity installed in 2018 and in the second place for the cumulative capacity.

3 AC OR DC NUMBERS AND SEGMETATION OF THE MARKET

IEA PVPS counts all PV installations, both grid-connected and off-grid, when numbers are reported. By convention, the numbers reported refer to the nominal power of PV systems installed. These are expressed in W (or W_p). Some countries are reporting the power output of the PV inverter (the device converting DC power from the PV system into AC electricity compatible with standard electricity networks) or the grid connection power level. The difference between the standard DC power (in W_p) and the AC power can range from as little as 5% (conversion losses, inverter set at the DC level) to as much as 50%. For instance, some grid regulations in Germany limit output to as little as 70% of the peak power from the PV system. Most utility-scale plants built in 2018 have an AC-DC ratio between 1,1 and 1,5. Canada, Chile, Japan (since 2012) and Spain report only AC numbers officially. The numbers indicated in this report have been transformed to DC numbers to maintain the coherency of the overall report.

FIGURE 2: SEGMENTATION OF PV INSTALLATION 2011 - 2018



Preliminary data show that the distributed PV market declined compared to 2017, but is still largely above the levels seen in between 2011 and 2016, thanks to policies implemented mostly in China. The utility-scale market did grow in 2018, but not as fast as in the previous years. In the same way, the market has started to diversify, with floating PV adding to utility-scale and BIPV starts to complement BAPV in the built environment. Other emerging segments such as agricultural PV or PV integrated in vehicles are showing the potential for further diversification of PV components, but their current market level remains too low to be considered in this publication.

4 TOTAL INSTALLED CAPACITY IN THE WORLD

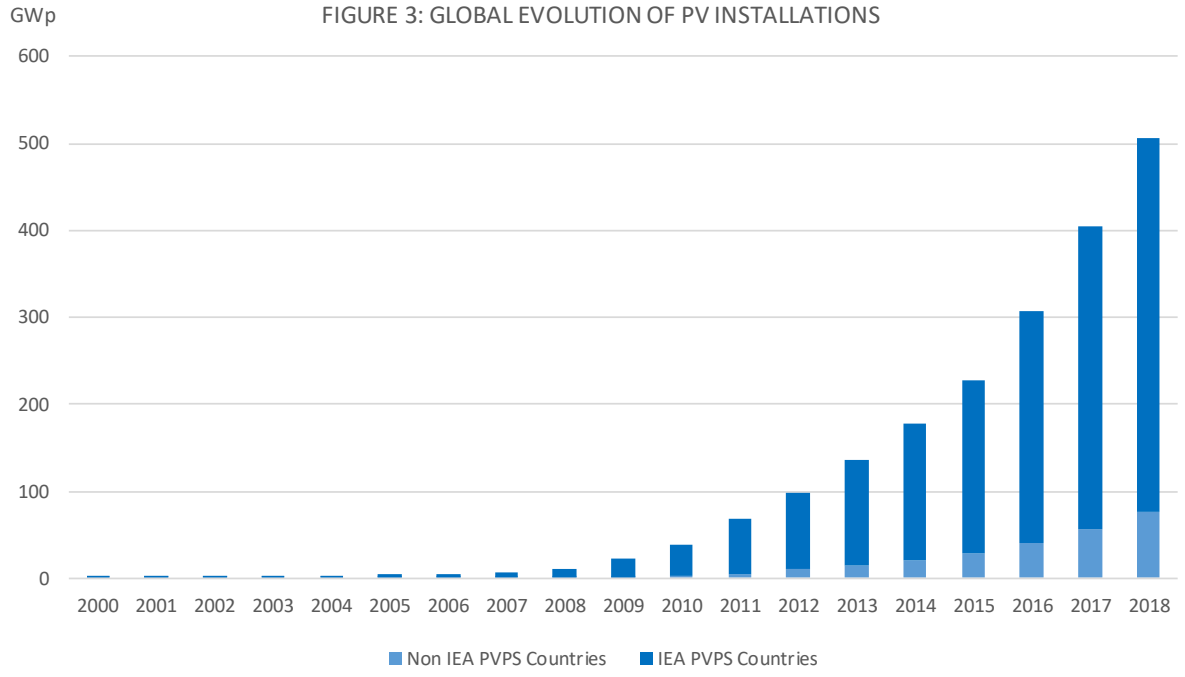
The total installed capacity (see Figure 2) at the end of 2018 globally amounted to at least 500 GW, or in other words, half a TW. On a worldwide level, China continues to lead with a cumulative capacity of 176,1 GW, followed by the European Union (115,0 GW), the USA (62,2 GW), Japan (56,0 GW) and India (32,9 GW). In the European Union, Germany leads with 45,4 GW, followed by Italy (20,1 GW) and the UK (13,0 GW). Australia reached 11,3 GW. All other countries are below the 10 GW mark.

The IEA PVPS countries represented 429,6 GW of cumulative PV installations together, mostly grid-connected, at the end of 2018. The IEA PVPS continues to cover 27 countries with at least 85% of the global PV capacity.

Additional countries that are not part of the PVPS programme represent at least 75,9 additional GW: India with at least 32,9 GW, UK with 12,9 GW, Greece with 2,7 GW, Taiwan with 2,7 GW, Pakistan with 2,4 GW, the Czech Republic with 2,2 GW, Brazil with 1,6 GW, Ukraine with 1,6 GW, Romania with 1,4 GW, and Bulgaria with 1,0 GW. Many other countries have installed PV systems, but none have reached the GW scale.

While other countries around the world have reached various PV installation levels, the total of these remains hard to quantify with certainty. At present, it appears that 505,4 GW represents the minimum installed by end 2018 with a firm level of certainty. Remaining installations account for some additional 5,5 GW installed in the rest of world (non-IEA PVPS reporting countries, off-grid installations, etc.) that could bring the overall installed capacity to around 510 GW in total.

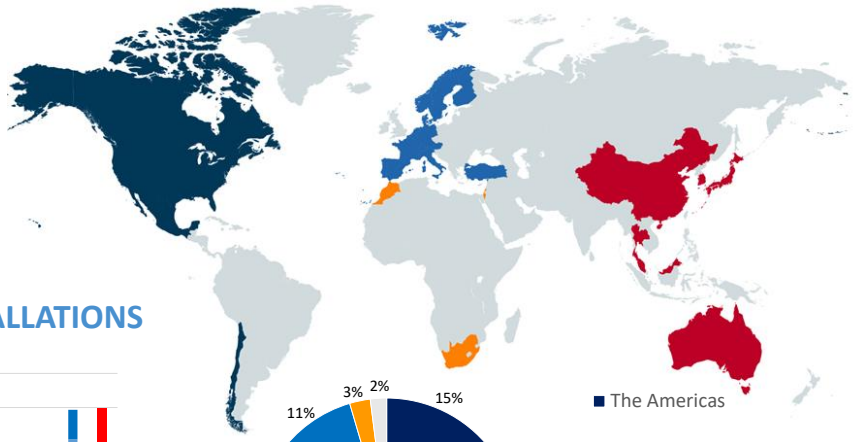
FIGURE 3: GLOBAL EVOLUTION OF PV INSTALLATIONS



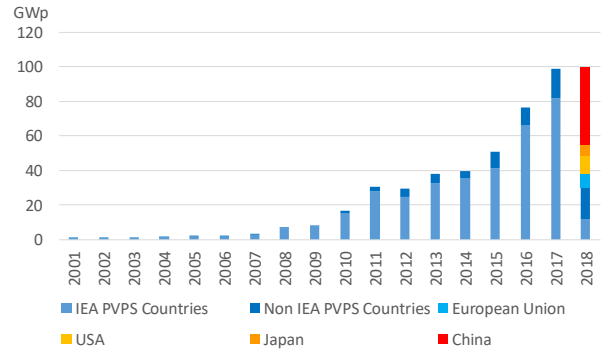
An estimate of decommissioned existing PV plants is difficult to consider at this stage and we consider in general that damaged plants are re-equipped and continue their lives. In the same way, repowering is still a marginal business due to the limited age of most power plants but could become a reality after 2020. In general, it is considered that these two aspects don't generate enough changes to be considered apart for the time being. They also imply some lack of information since official statistics often don't consider these two aspects properly.

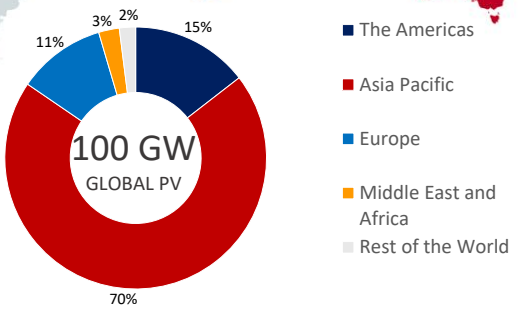
TOP PV MARKETS 2018

CHINA	45,0 GW
INDIA	10,8 GW
USA	10,6 GW

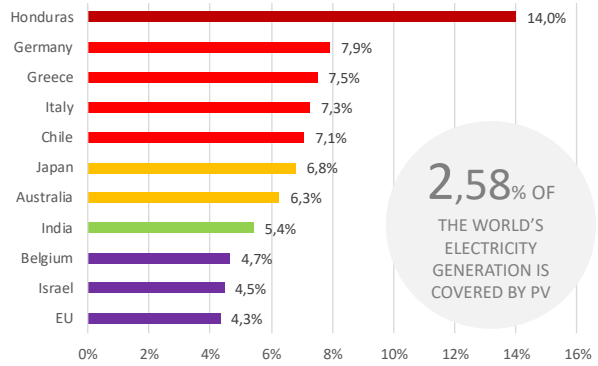


EVOLUTION OF ANNUAL PV INSTALLATIONS





COUNTRIES WITH HIGHEST PV PENETRATION



2,58% OF THE WORLD'S ELECTRICITY GENERATION IS COVERED BY PV

100 GW were installed all over the world by the end of 2018

China is the world's #1 PV market

32 countries had at least 1 GW of cumulative PV capacity at the end of 2018

10 countries installed at least 1 GW each in 2018

SOLAR PV PER CAPITA 2018 Watt/capita

1st	GERMANY	548
2nd	AUSTRALIA	459
3rd	JAPAN	442

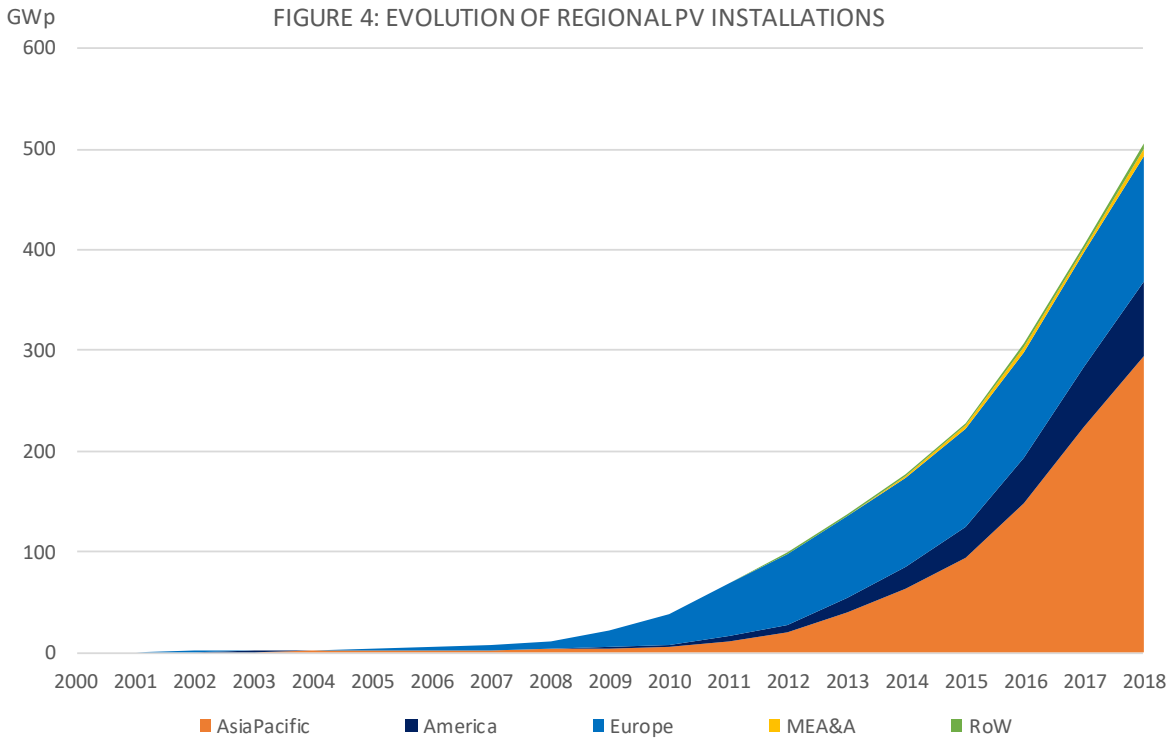
CO_2eq

298 Mt CO_2 emissions avoided in 2018

5 EVOLUTION OF TOTAL INSTALLED PV CAPACITY PER REGION

While Europe represented a major part of all installations globally, Asia's share started to grow rapidly in 2012 and it has not stopped since then (see Figure 3). Now, Asia represents around 58% of the total installed capacity and this percentage will most likely continue to increase in the coming years. With the fast growth of the Asian market, Europe is losing its share year by year. In 2018, the European market accounted for only the 24% of the global total capacity. The Americas reached 15%, thanks to the USA and some Latin American countries, while the remaining 3% comes from the MEA region and the rest of the world. The trend is clear: PV has developed in the last years in places where the demand of new electricity production is high, often due to a high population that want to increase their living standard. Many of these places are located in Asia.

FIGURE 4: EVOLUTION OF REGIONAL PV INSTALLATIONS



6 ELECTRICITY PRODUCTION FROM PV

PV electricity production is easy to measure for a power plant but much more complicated to compile for an entire country. In addition, the comparison between the installed base of PV systems in a country at a precise date and the production of electricity from PV are difficult to compare. A system installed in December, will have produced only a small fraction of its regular annual electricity output; systems installed on buildings may not be at optimum orientation or may have partial shading during the day. Furthermore, and/or the weather in 2018 may not have been typical of the long-term average. For these reasons, the electricity production from PV per country as shown below estimates what the PV production could be based on the cumulative PV capacity at the end of 2018; close to optimum siting, orientation and average weather conditions.

FIGURE 5: THEORITICAL PV PRODUCTION 2018

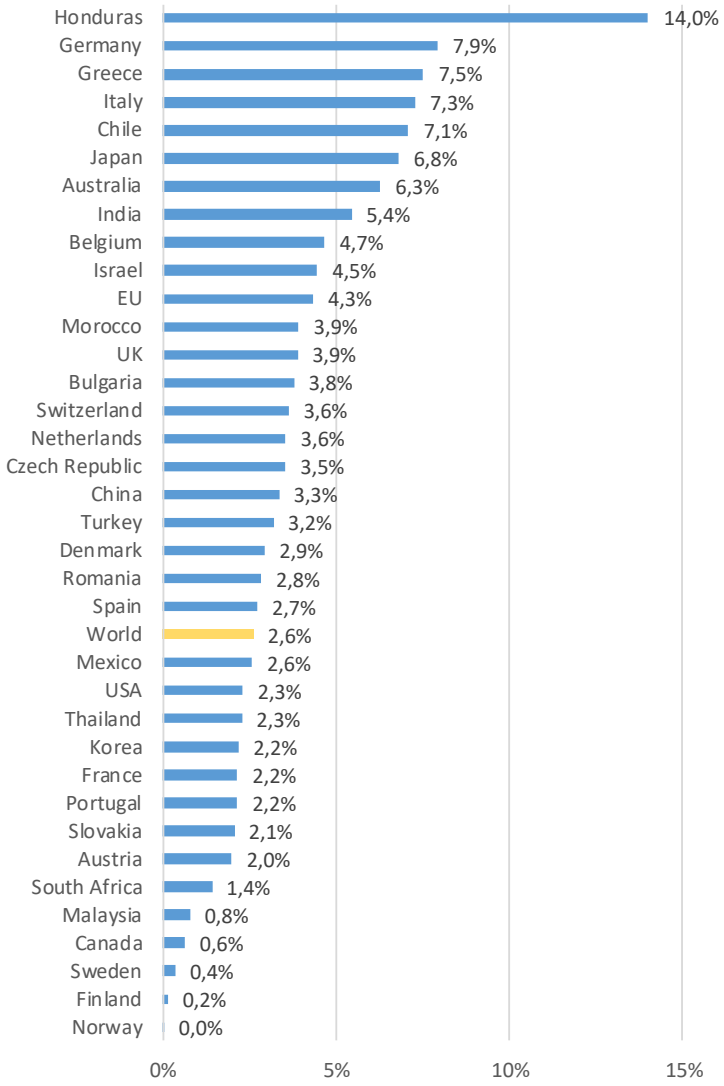


Figure 5 shows how PV theoretically contributes to the electricity demand in key countries (IEA PVPS and others), based on the PV capacity installed by the end of 2018. Since these numbers are estimates based on the total capacity at the end of the year 2018, they can slightly differ from official PV production numbers in some countries. These numbers should be considered as indicative, aiming at comparing different situations in different countries rather than official data.

In several countries, the PV contribution to the electricity demand has passed the 5% mark with Honduras in the first place with almost 14%. Germany is second with an estimated 7,9% and Greece third with a theoretical penetration level of 7,5%. India reached the 5,4% mark and China reached 3,3% in 2018.

In total, PV contribution amounts to close to 2,6% of the electricity demand in the world.

7 POLICY & MARKETS TRENDS

7.1 Competitive Tenders

Tenders continued to be granted in several places in the world with extremely competitive electricity prices, around 20 USD/MWh in the sunniest places. Bids below that threshold have been seen in 2018 but not granted due to uncertainties on the technology of these projects. However, the trend continues, and most believe prices will continue to go down in the coming years. In places with limited or no incentives, tenders are going through the floor and setting new standards for PV competitiveness.

In some countries, cost-based tenders evolve towards multiple-factors tenders. Environmental or industrial constraints are introduced to favour local companies or to push for a better environmental footprint of the products. In Spain, tenders were used as a simple way to fulfil 2020 renewable energy targets and in France environmental constraints have reduced the low CO_2 content in utility-scale PV plants.

7.2 Prosumers Policies

The idea that PV producers could be considered as "prosumers" – both producers and consumers of energy – is evolving rapidly and policies are being adapted accordingly in several countries. The most popular policies are called "net-metering" policies and are adopted in a growing number of countries, with different definitions. The genuine "net-metering" which offers credits for PV electricity injected into the grid, have previously supported market development in the USA, Canada, Denmark, the Netherlands, Portugal, Korea and partially in Belgium. Many countries around the world are either discussing its introduction or a variant through self-consumption. For instance, France has recently introduced (within its new norms of the energy code) further regulations for allowing self-consumption both at the individual and collective level. Therefore, self-consumption is becoming a major driver of distributed PV installations, often completed with a feed-in tariff (or feed-in premium in addition the spot price) for the excess PV electricity fed in to the grid.

The use of self-consumption in collective buildings is not yet widespread but exists in the Netherlands, Sweden and France. In Italy, PV systems connected through a private transmission line to a single end user are allowed under specific conditions, and several countries are testing the concept. The idea of virtual self-consumption between distant points has been tested in Mexico, Brazil and Australia, and it is now possible under certain circumstances in France and the Netherlands. In other countries, such policies encounter a fierce resistance from many distribution system operators who fear for their future financing.

7.3 Measures Penalizing Existing Installations and Retroactive Measures

In 2018, the existing PV plants did not experience significant retroactive measures and the situation has therefore improved compared to policy changes in previous years. The most important changes took place in Spain when the infamous Solar Tax was abandoned last year. However, the imposed retroactive measures to PV system owners arguing about difficult economic conditions will stay in place. These measures reduced in some cases the revenues of PV system owners by 50%. In Italy, in order to reduce the impact of PV costs to the electricity consumers, the government imposed a decrease of the FiT level compensated by an increase of the payment years. Other countries also applied retroactive measures that reduced the level of financial support or changed the conditions applying to already existing PV systems. Bulgaria, Romania and the Czech Republic have discussed or applied such measures in the last three years, often with the consequence of destroying investors' confidence and bringing down the PV market. In Belgium, retroactive measures were integrated in the law granting green certificates, which legally allowed a decrease of the number of years during which the certificates were granted. These measures, sometimes legally justified, have significantly decreased the confidence of investors and in all cases reduced the PV markets mentioned above. The biggest barrier to PV development for prosumers is now the fear that self-consumption or net-metering policies already granted could be changed, downgraded or taxed for existing PV installations. However, given the increased competitiveness of PV solutions, such measures are vanishing rapidly from the agenda of policymakers in most countries.

7.4 Anti-dumping and Local Content Policies

The anti-dumping and anti-subsidy policies that have been undertaken in Europe and the USA against Chinese manufacturers have been followed by similar policies from Chinese authorities, for instance for polysilicon from the USA. Many other countries stepped into these policies in order to protect their local industry. For example, while the USA and India continued with import measures, the European Union went against the trend by scrapping the import duties and MIP system for Chinese modules and cells in 2018.

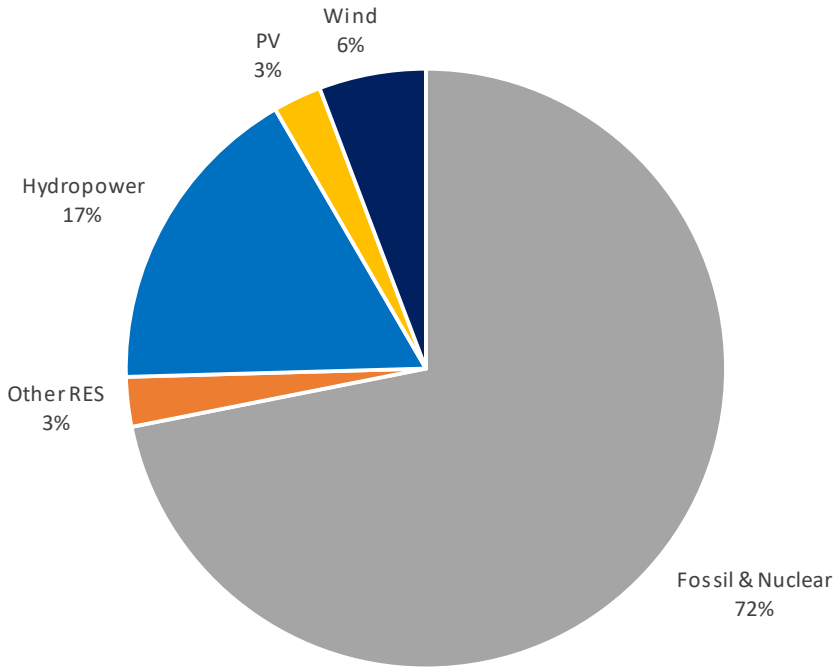
Several countries adopted specific measures aiming at favouring the local content of PV components over the last years. Started by the province of Ontario in Canada, it has continued with Italian, French, Malaysian, Moroccan, South African and Turkish regulations aiming at promoting their local industry. In general, measures blocking the market from foreign producers have disappeared while those adding some incentives for local producers or penalizing foreign actors with duties have been continued.

8 PV IN THE BROADER ENERGY TRANSITION

Renewables continue to grow strongly globally. However, the growth is still unable to make a significant change and overcome the growth in fossil-based energy sources. In 2018, renewable electricity production stood for approximately 28 % of the total electricity production. As discussed above, PV stood for about 2,6% of the total electricity demand, a significant increase from 2,2 % in 2017.

In the last 15 years, PV technology has shown an extraordinary fast market, technology and price development. In these recent years, PV has gone from being a niche technology mostly used for electricity production either in space or in remote places to a mainstream energy source. However, to really be able to tackle climate change and fulfil the temperature limit goals set by the world community, larger yearly volumes of PV (and other renewable energy sources) must be deployed in the coming years, while the growth of fossil-based energy sources must come to an end quickly.

FIGURE 6: SHARE OF PV IN THE GLOBAL ELECTRICITY DEMAND IN 2018

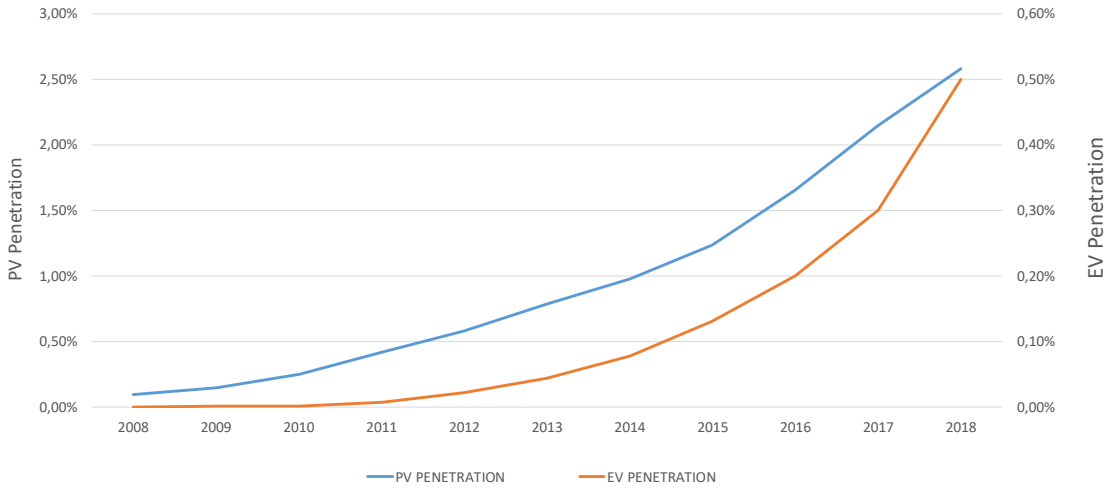


Sources: IEA PVPS, IEA, GWEC & REN21 (GSC 2018)

In addition to directly fight rising CO_2-eq emissions by offering an alternative to fossil-based electricity production, the deployment of PV technology can also work as a catalyst for other technologies with a potential to tackle climate change. One example is the link between PV and electric vehicles.

The electrification of transport accelerates in many countries; and almost all of which are active in the IEA PVPS programme. The link between PV development and EVs is not straightforwardly understood yet, but it is simply becoming a reality. Charging electric vehicles during peak load hours implies to rethink power generation, while concepts such as virtual self-consumption could rapidly provide a framework for rapid PV development. The accelerated development of the EV market could be compared to the development of the PV market (Figure 7). With more than 2 million electric vehicles sold in 2018 (or 2,2% of the global car market), the penetration of EVs is following a trend that is even faster than the one of PV.

FIGURE 7: COMPARISON BETWEEN PV PENETRATION AND EV PENETRATION



Source: IEA until 2017 and compilation of official national sources or estimates for 2018

ISBN 978-3-906042-83-1