

2013

GLOBAL MARKET OUTLOOK FOR PHOTOVOLTAICS UNTIL 2013

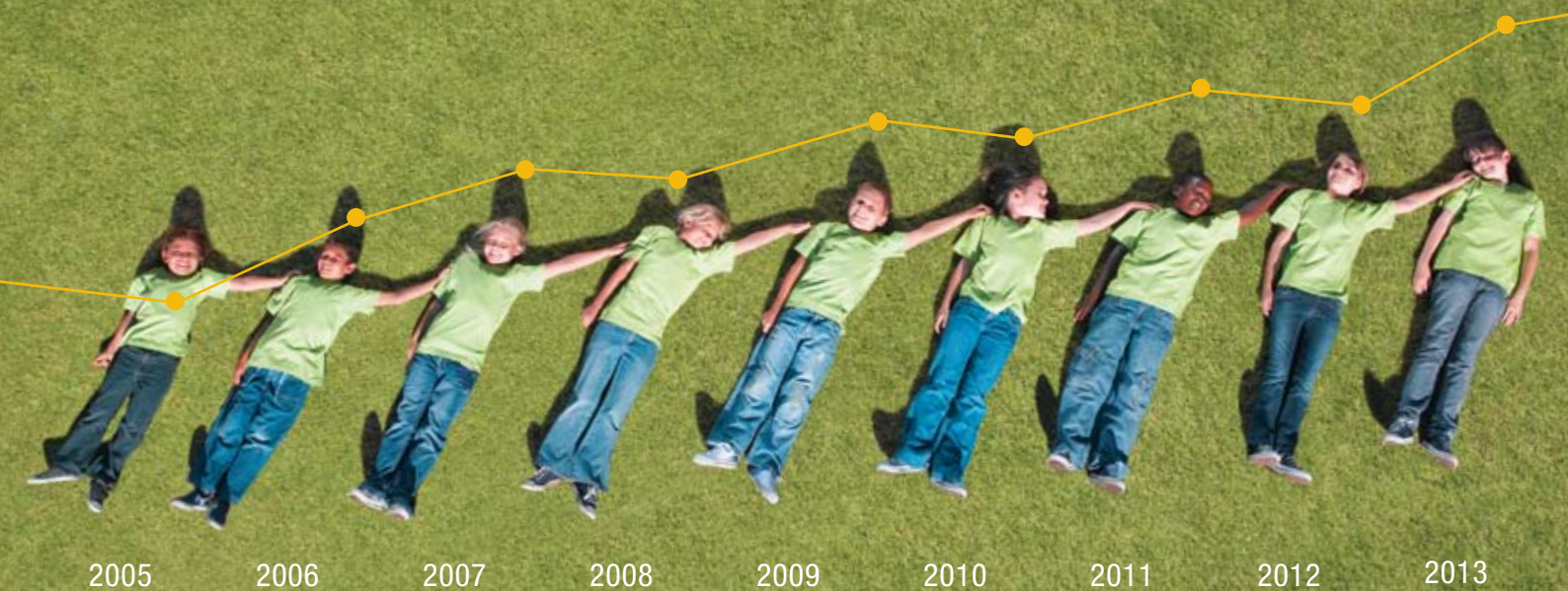


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EXECUTIVE SUMMARY

In 2008, the Global Photovoltaic (PV) market reached 5.6 GW and the cumulative PV power installed totalled almost 15 GW compared to 9 GW in 2007. Spain represented almost half of the new installations in 2008 with about 2.5 GW of new capacities, followed by Germany with 1.5 GW of additional connected. The US confirmed its trend with 342 MW of newly-installed PV systems, followed by South Korea which registered 274 MW of PV installations over the year. Italy connected almost 260 MW while France, Portugal, Belgium and the Czech Republic made good scores confirming Europe's Global leadership in the deployment of solar PV energy.

A diversification of the market is taking place with countries adopting appropriate support policies, this is very good news for the PV industry and the environment.

Given the current crisis context, high uncertainties over the 2009 market exist. Experts believe the market could reach up to 7 GW in 2009, each individual country's development influencing the final figure. The PV sector is hoping markets such as the US, Germany, France and Italy will pull the demand. Favourable policy frameworks are expected to further accelerate PV deployment in these countries. In 2013, the Global PV market could reach 22 GW if appropriate policies, such as Feed-in Tariffs (FiT), are in place.

Disclaimer

Please note that all historical figures provided in this brochure are valid at the time of publication and will be revised when new and proven figures will be available. All forecast figures are based on EPIA knowledge at the time of publication and should be considered as approximate values only as they come from a mathematical model.

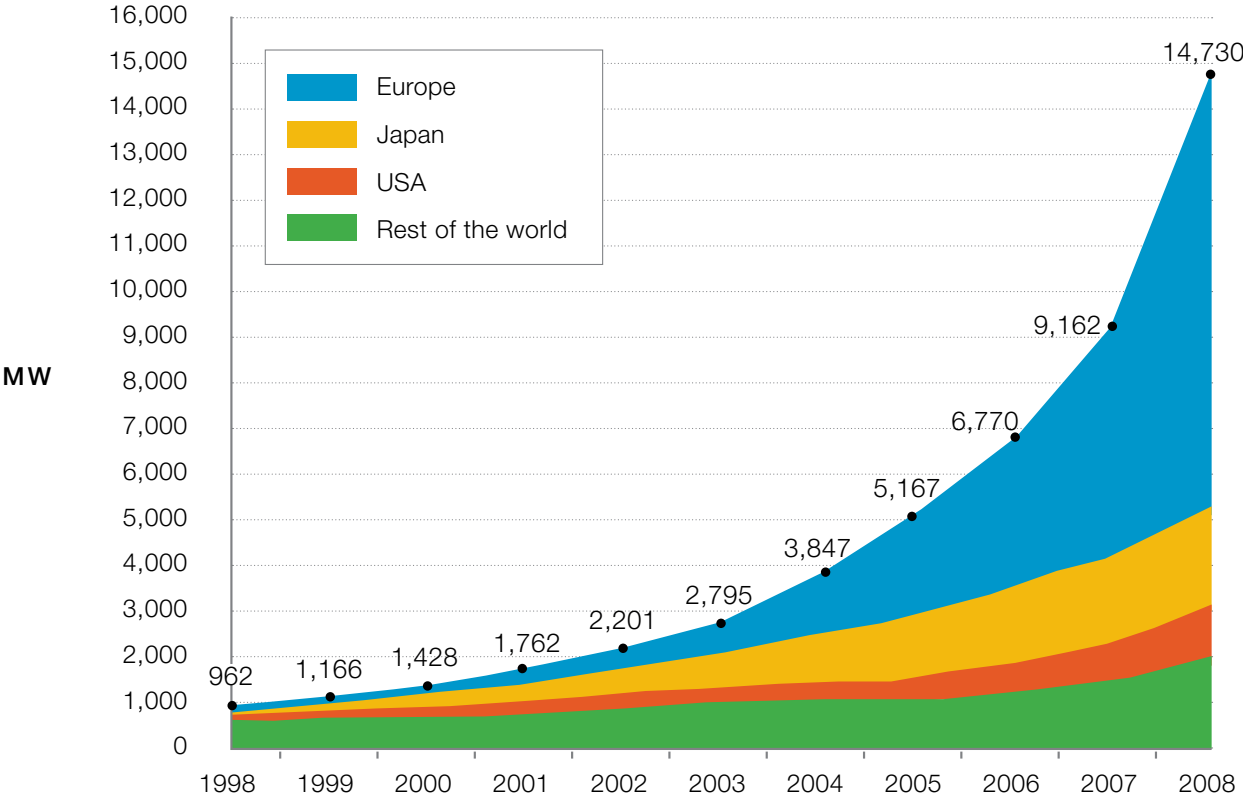


GLOBAL HISTORICAL PV MARKET DEVELOPMENT



The solar PV market has been booming over the last decade and is forecast to confirm this trend in the coming years. By the end of 2008 the Global cumulative capacity was approaching 15 GW. Today, Europe is leading the way with more than 9 GW representing over 65% of the Global cumulative PV installed capacity. Japan (2.1 GW) and the US (1.2 GW) are following behind, representing 15% and 8%, respectively, of the Global cumulative PV power installed.

Figure 1: Historical development of Global cumulative PV power installed per Region



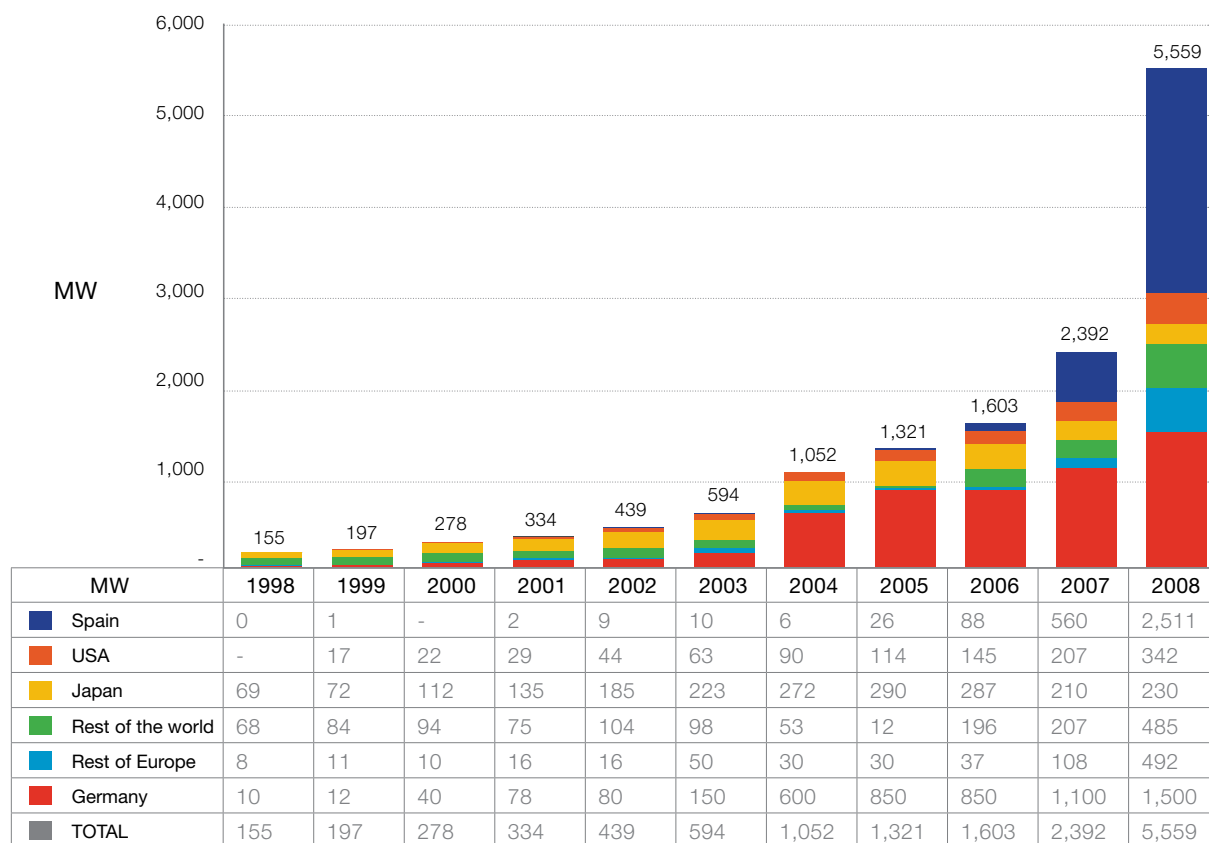
In 2008, with more than 5.6 GW, the Global PV market has more than doubled compared to 2.4 GW in 2007.

2008: an exceptional year for the PV Market

The impressive progression in 2008 is mainly due to the development of the Spanish market which almost quintupled in one year from 560 MW in 2007 to more than 2,511 MW in 2008, representing more than 45% of the Global PV market.

Besides the development in Spain, other countries continued their progression in 2008. Germany installed around 1.5 GW, the US 342 MW and 230 MW were connected in Japan. Major developments were seen in other countries like Italy (258 MW) and South Korea (274 MW) as well as the emergence of new PV markets such as France (105 MW were installed, 46 MW of which were connected in 2008), the Czech Republic (51 MW), Portugal (50 MW) and Belgium (48 MW).

Figure 2: Historical development of the Global annual PV market per Region



2008 was an exceptional year due to the continuous development of PV in established markets (like Germany, the US and Japan), an astonishing growth in Spain and the emergence of new markets mainly in the rest of Europe and in South Korea.

GLOBAL PV MARKET OUTLOOK



PV market deployment is, to a large extent, dependent on the political framework of any given country. Support mechanisms are defined in national laws. The introduction, modification or fading out of such support schemes can have profound consequences on PV industries. PV market forecasts therefore depend on a deep understanding of the political framework. EPIA puts a great deal of effort into analysing PV markets. Due to its close contact with key players in the industry, with national PV associations and its deep knowledge of PV policy and support schemes, EPIA market scenarios are a credible and well-known source of short-term market forecasts as well as long-term scenarios.

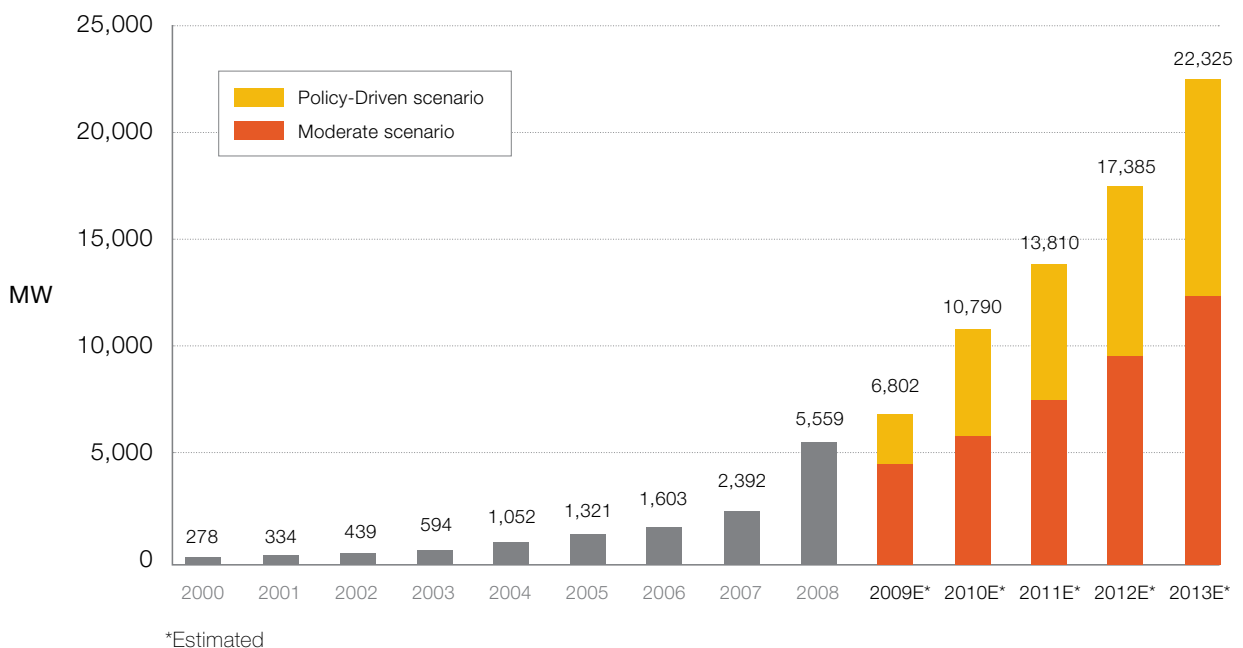
In March 2009, EPIA went through an extensive data gathering exercise among a highly representative sample of the PV industry, national associations and energy agencies. Based on the cross-checking of data and the consolidation of complementary market projection methods, EPIA has derived 2 representative scenarios for the future development of the PV industry.

The Moderate scenario is based on the assumption of a 'business as usual' scenario which does not assume any major enforcement of existing support mechanisms.

The Policy-Driven scenario is based on the assumption of the follow-up and introduction of support mechanisms, namely FiT, in a large number of countries.

These two scenarios analyse, on a country basis, the historical development of the PV market, existing support policies, their attractiveness and expected developments, administrative procedures in place, national renewable energy objectives and the potential for solar PV.

Figure 3: Global annual PV market Outlook until 2013



For 2009, EPIA expects the Global PV market to grow to around 6.8 GW under the Policy-Driven scenario. Under the Moderate scenario, EPIA expects the Global PV market to stagnate at around 4.6 GW.

Until 2013, EPIA foresees the market to reach 22 GW by 2013 under the Policy-Driven scenario which would mean a Compound Annual Growth Rate (CAGR) of 32% over the period 2008-2013. For the Moderate scenario, the annual market is expected to range just above 12 GW with a CAGR of 17% over the period 2008-2013.

Table 1: Global annual PV market Outlook until 2013

Country	Type	2006	2007	2008	2009E	2010E	2011E	2012E	2013E
Belgium	EPIA Moderate	2	18	48	100	70	80	90	100
	EPIA Policy-Driven				175	125	130	140	160
Czech Republic	EPIA Moderate	0	3	51	80	90	110	140	170
	EPIA Policy-Driven				100	160	200	220	240
France	EPIA Moderate	8	11	46	250	340	600	900	1,000
	EPIA Policy-Driven				300	500	850	1,200	1,400
Germany	EPIA Moderate	850	1,100	1,500	2,000	2,000	2,300	2,600	3,000
	EPIA Policy-Driven				2,500	2,800	3,200	3,600	4,000
Greece	EPIA Moderate	1	2	11	35	100	100	100	100
	EPIA Policy-Driven				52	200	450	700	900
Italy	EPIA Moderate	13	42	258	400	600	750	950	1,250
	EPIA Policy-Driven				500	800	1,100	1,400	1,600
Portugal	EPIA Moderate	0	14	50	40	50	100	160	230
	EPIA Policy-Driven				50	80	180	350	500
Spain	EPIA Moderate	88	560	2,511	375	500	500	550	800
	EPIA Policy-Driven				375	500	600	650	1,500
Rest of Europe	EPIA Moderate	12	17	28	120	140	200	300	450
	EPIA Policy-Driven				250	325	400	525	625
Japan	EPIA Moderate	287	210	230	400	500	700	1,000	1,100
	EPIA Policy-Driven				500	1,000	1,200	1,500	1,700
USA	EPIA Moderate	145	207	342	340	1,000	1,200	1,500	2,000
	EPIA Policy-Driven				1,200	3,000	3,400	3,900	4,500
China	EPIA Moderate	12	20	45	80	100	300	600	1,000
	EPIA Policy-Driven				100	150	600	1,200	2,000
India	EPIA Moderate	12	20	40	50	60	80	120	300
	EPIA Policy-Driven				100	200	250	300	600
South Korea	EPIA Moderate	20	43	274	100	150	220	300	400
	EPIA Policy-Driven				200	350	450	700	1,000
Rest of the world	EPIA Moderate	153	125	126	250	300	300	300	350
	EPIA Policy-Driven				400	600	800	1,000	1,600
TOTAL	EPIA Moderate	1,603	2,392	5,559	4,620	6,000	7,540	9,610	12,250
	EPIA Policy-Driven				6,802	10,790	13,810	17,385	22,325

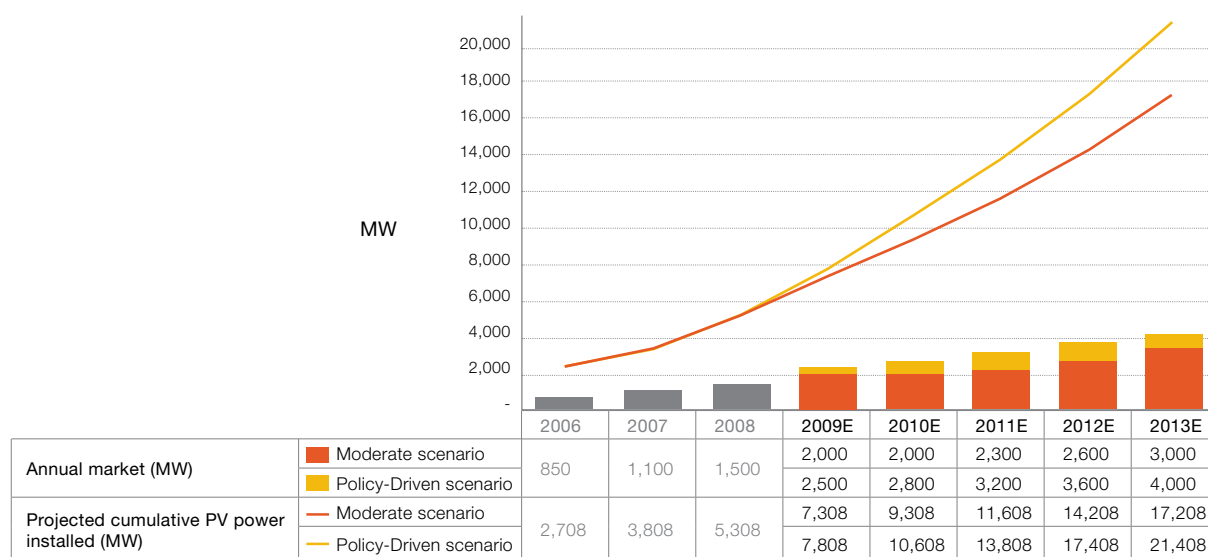
Profiles of 13 Leading Markets

13 major markets have been analysed in detail.

Germany

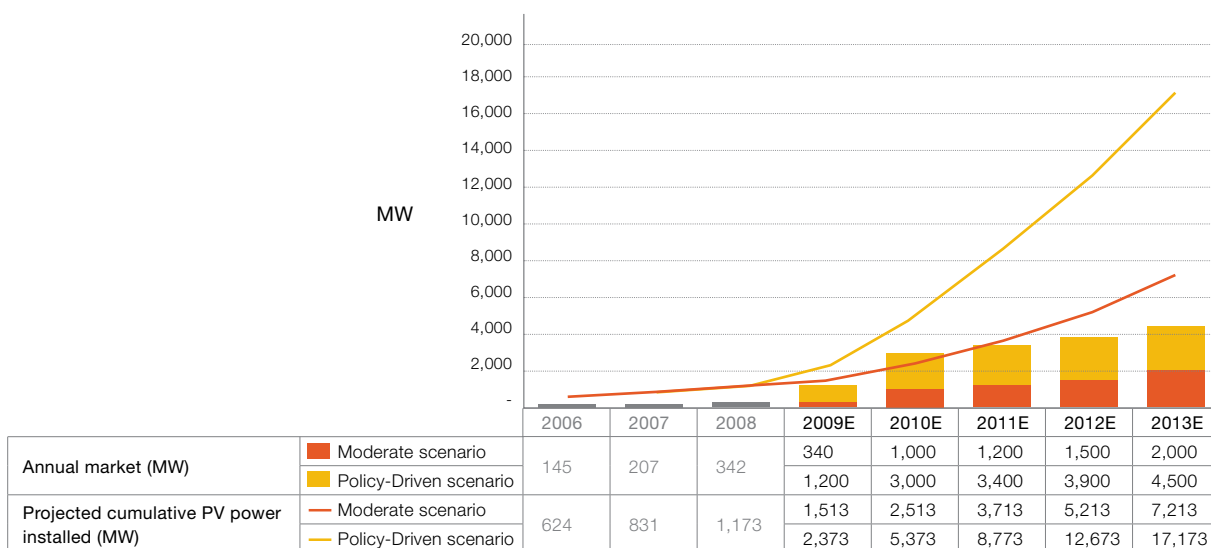
Due to the Spanish cap which has been set at 500 MW for 2009, Germany is expected to take back its number one position as the most mature market with a proven FiT scheme, good financing opportunities via Kreditanstalt für Wiederaufbau (KfW), high potential for future development, good availability of skilled PV companies and good awareness of the PV technology.

Seeing as the degression rates of the Feed-in Tariffs will be increased by 1% if the German PV market develops to a size larger than 1,500 MW in 2009, the German market growth will probably slow down in 2010. EPIA estimates that the German market could weigh up to 4 GW annually by 2013 if the present support scheme is maintained, considering that the price of PV systems will decrease accordingly with the FiT degression rates.



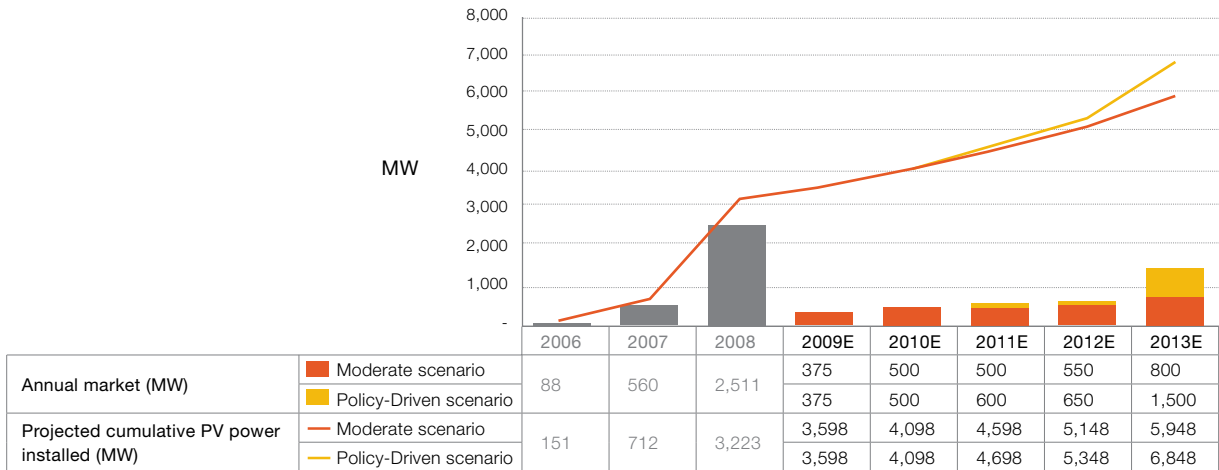
United States

EPIA believes the US will emerge as one of the top PV markets worldwide by 2013. Seeing the extension of the Investment Tax Credit (ITC), the continuation of existing state-level support programmes (i.e. California), the emergence of local support schemes (first FiT in Gainesville), the immense potential of US territory and strong commitment of new President Obama, the US could represent a multi GW market by 2010 already. The performance of the US PV market in 2009 will depend mainly on the possibility to finance PV projects.



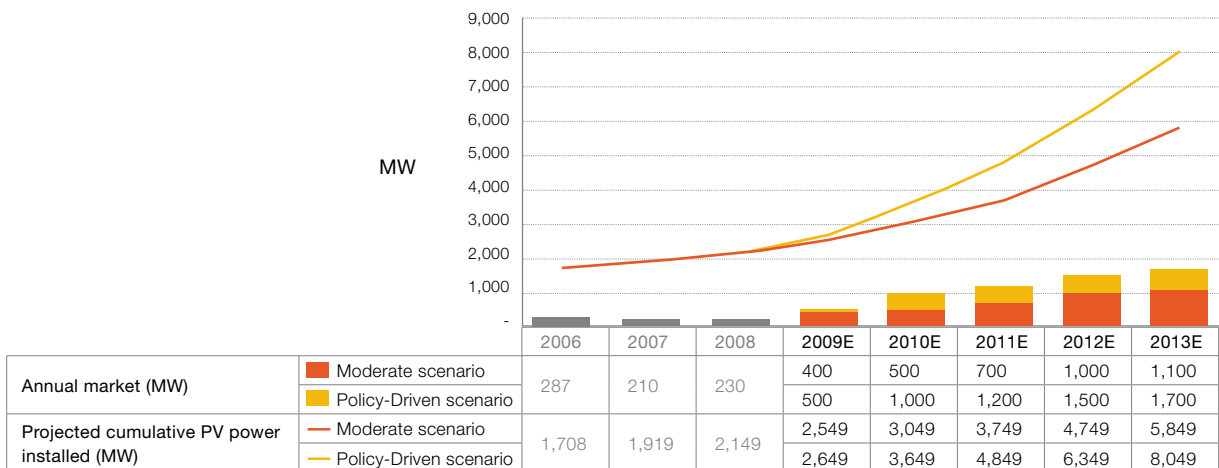
Spain

Considering the unexpected growth of the PV market in 2008, the Spanish government has put in place a strict cap which allows only a 500 MW annual market from 2009 to 2011. Considering the quarterly calls for projects, the 2009 market will probably be limited to 375 MW. Under the current scheme, EPIA expects little room for market growth in the next 5 years. Seeing the solar potential in Spain and the high national renewable targets, in the Policy-Driven scenario EPIA expects a removal of the cap which would allow a GW market by 2013.



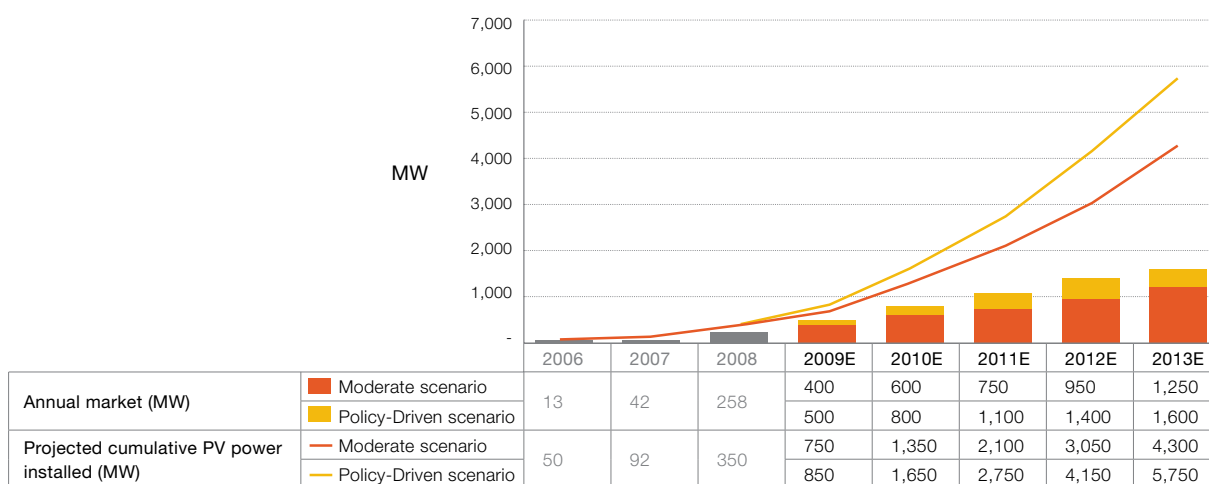
Japan

For several reasons, EPIA expects Japan to become a GW market in 2010 already for the Policy-Driven scenario and in 2012 for the Moderate scenario. Firstly, Japan has set ambitious objectives to reach 14 GW of installed PV power by 2020 and 53 GW by 2030. Secondly, PV technology is well-established and widely integrated in the building environment. Thirdly, while the development of the Japanese PV market has been dominated by residential systems, there have been many announcements to build multi-MW PV plants, which is very promising for the future. Last but not least, Japan has recently reinforced its existing support mechanisms at national and regional levels mainly with investment subsidies and a new power purchase programme has been announced for public, commercial and industrial grid-connected applications.



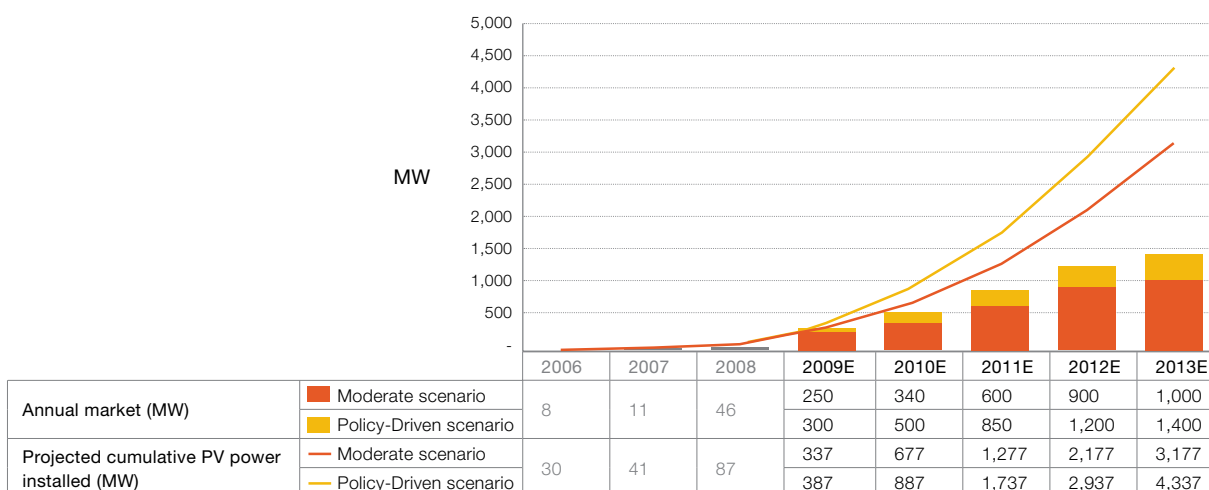
Italy

Besides high sun irradiation, Italy offers a very attractive support scheme, mixing net-metering and a well-segmented premium FiT. In January 2009, the Italian government extended the net-metering ('Scambio sul posto') to PV systems up to 200 kW. This means the PV system owner can valorise the electricity he produces himself at the same price as the electricity he consumes traditionally from the grid. If, over a time period, there is an excess of electricity fed into the grid, the PV system owner gets a credit (unlimited in time) for the value of the excess of electricity. This measure is very attractive for the residential, public and commercial sectors. On top of the valorisation of the electricity itself, the PV system owner also gets a premium FiT on the total electricity produced by the PV system. Under the present FiT scheme valid until the end of 2010, EPIA expects continuous growth of the Italian PV market. In the Policy-Driven scenario, EPIA expects the Italian PV market to reach the GW scale by 2011, assuming that the administrative procedures will be harmonised at regional level, that the net-metering will have a strong impact on the demand for PV systems and that the new FiT will have no cap limitation and will remain consistent with the existing one.



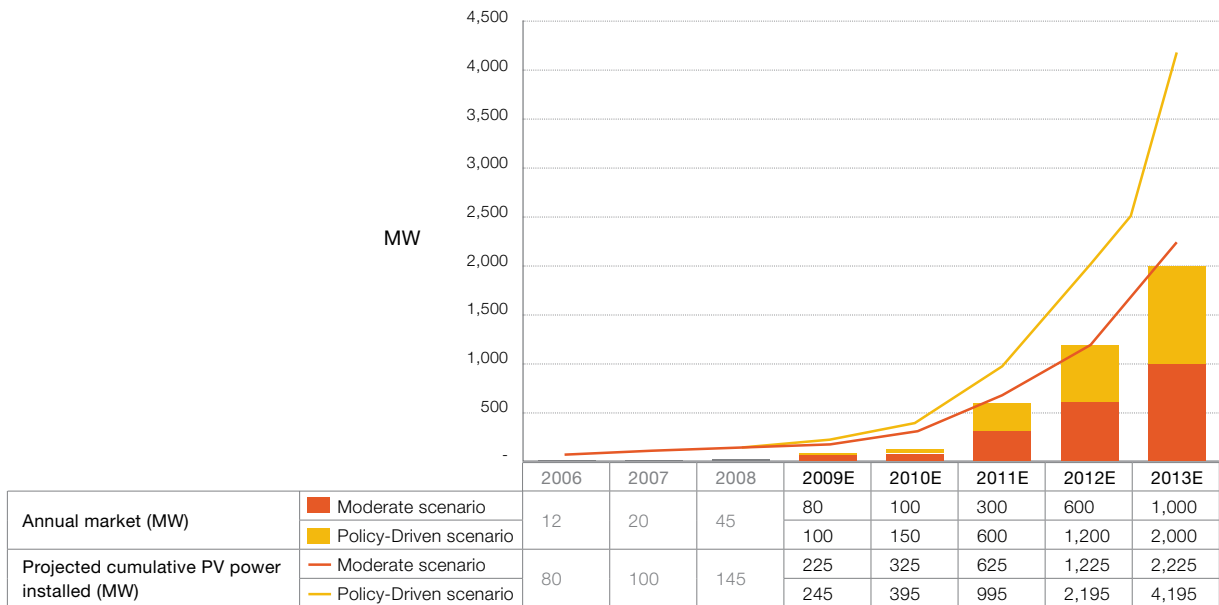
France

Due to its favourable BIPV Feed-in Tariff, the French PV market is dominated today by BIPV applications for residential and commercial applications. In 2008, 105 MW were installed but only 46 MW were connected to the grid due to long administrative procedures. EPIA expects all PV systems installed in 2008 to be connected in 2009 and a great majority of the new installed PV power in 2009 to be connected within the year. This is why some PV power installed in 2008 has not been fully integrated into the 2008 figures but will be included in the 2009 figures. In its Policy-Driven scenario, EPIA expects a simplification of these procedures in 2009 and the introduction of a new tariff for non-BIPV applications on large commercial roofs. Under this scenario, the French PV market would become a leading country in the deployment of solar PV energy in Europe and worldwide.



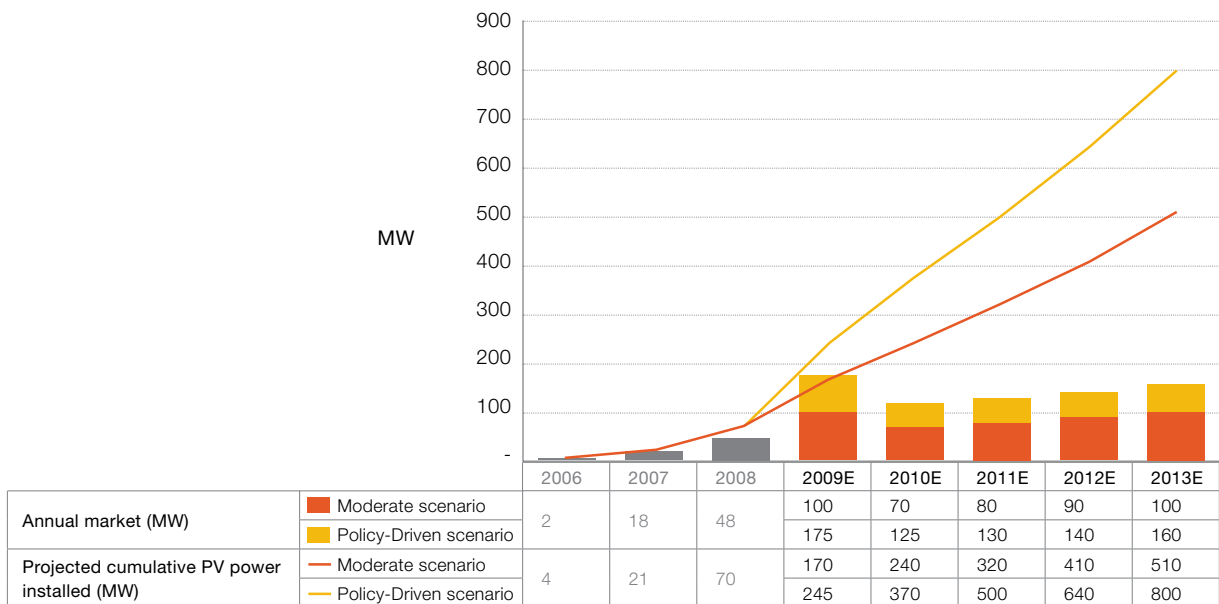
China

Due to its high potential for renewables, its existing energy challenge and the presence of important players in the PV sector, many experts are expecting China to initiate a support policy for PV. In its Policy-Driven scenario, EPIA foresees China as one of the top PV markets by 2013 alongside Europe and the US.



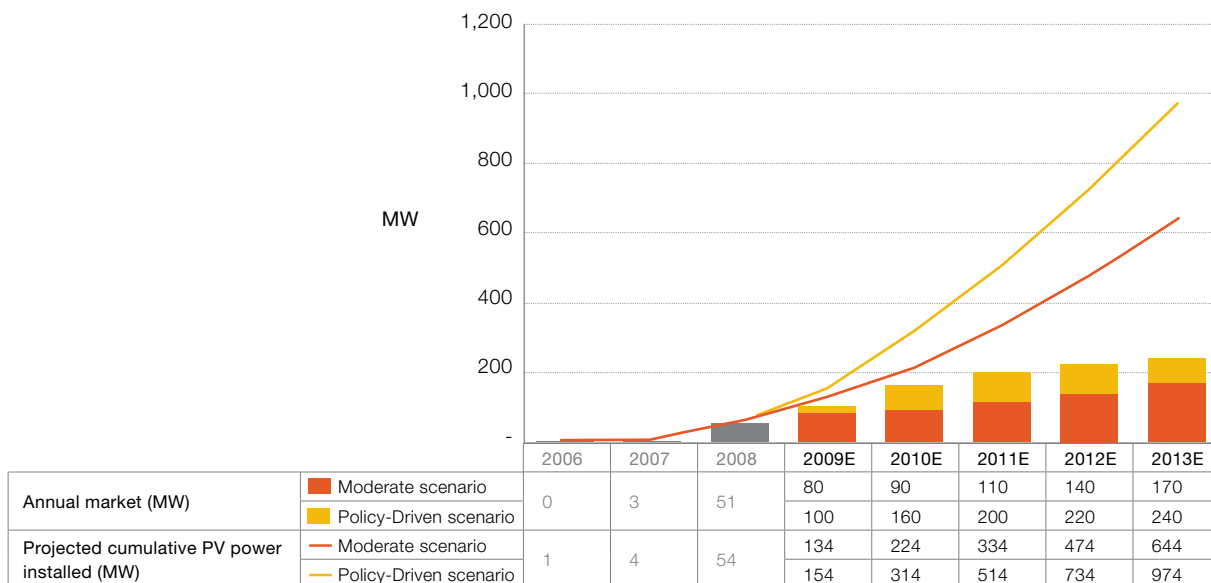
Belgium

PV has become a highly political topic in all regions of Belgium and PV is expected to grow further in the coming years mainly for rooftop systems. Due to a sharp decrease in support in 2010 in its leading market (Flanders), EPIA expects many awaiting projects to be realised in 2009. The growing importance of the other two regions (Wallonia and Brussels) makes EPIA expect a Belgian PV market between 125 and 175 MW for the next 5 years in its Policy-Driven scenario.



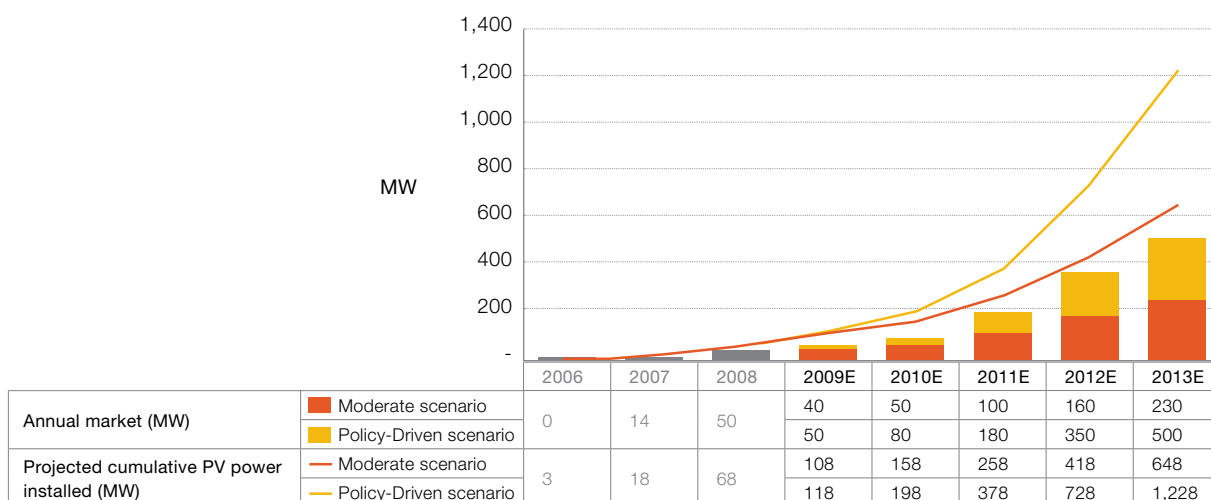
Czech Republic

The Czech Republic grew very rapidly in 2008 due to the implementation of a well-designed FIT. EPIA expects the Czech market to grow further to around 240 MW by 2013 under the Policy-Driven scenario.



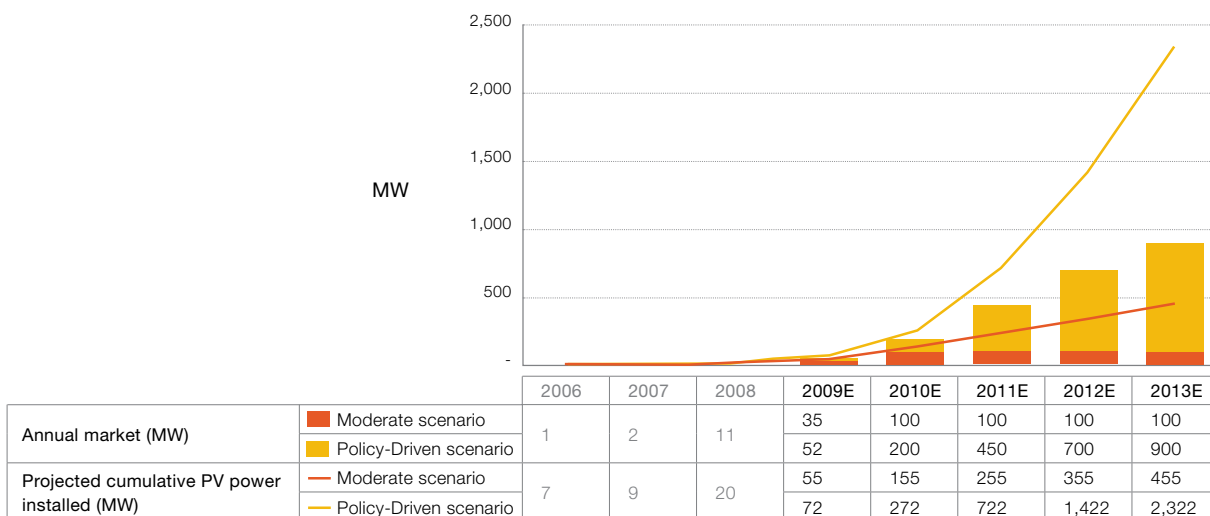
Portugal

Despite very good sun irradiation, PV in Portugal has grown timidly over the past few years, mainly with several large-scale PV plants. If Portugal sets an appropriate support scheme for the widespread use of PV, EPIA believes that the Portuguese market could reach up to 500 MW by 2013 in its Policy-Driven scenario.



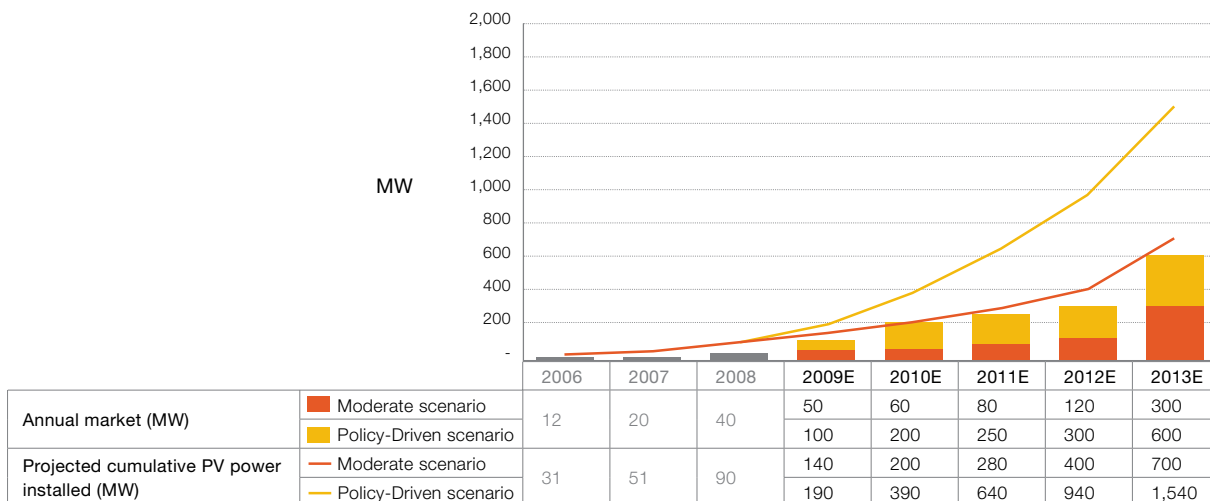
Greece

On top of very good irradiation, Greece has one of the most favourable FITs across Europe. With more than 3.5 GW of PV projects in the pipeline, Greece was expected to play a leading role for the development of PV. However, project developers were overwhelmed by bureaucracy and administrative procedures explaining why few projects were able to happen in 2008. If the Greek government can take the appropriate measures to improve administrative procedures, EPIA expects the Greek PV market to reach 900 MW annually by 2013.



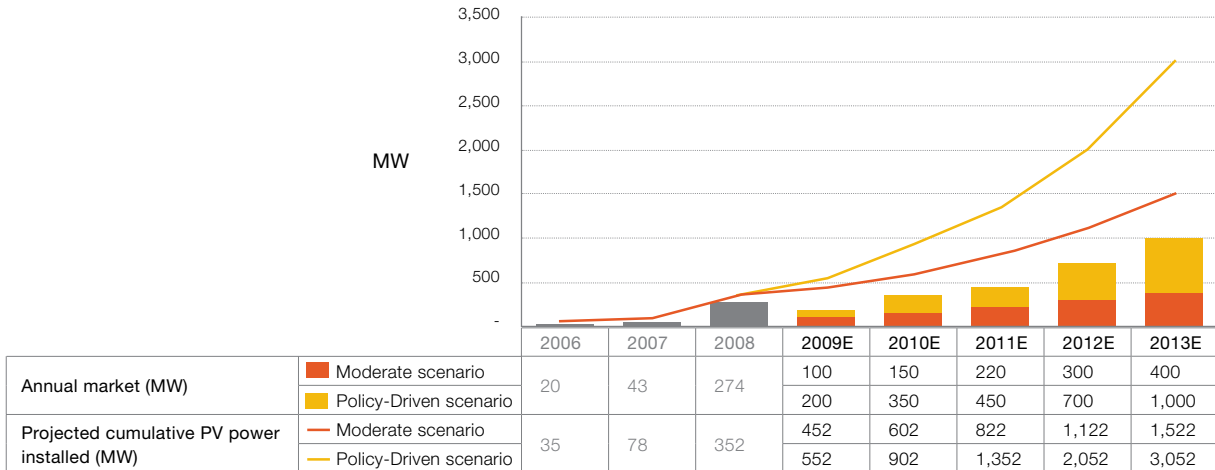
India

With its high potential for decentralised PV applications (grid-connected and off-grid) and growing energy needs, India could become a significant PV market in the coming years. Seeing only local or regional initiatives to support PV, EPIA expects the Indian market to develop slowly. If an appropriate support programme (such as a FIT mechanism) is put in place, the Indian PV market could represent up to 600 MW by 2013.



South Korea

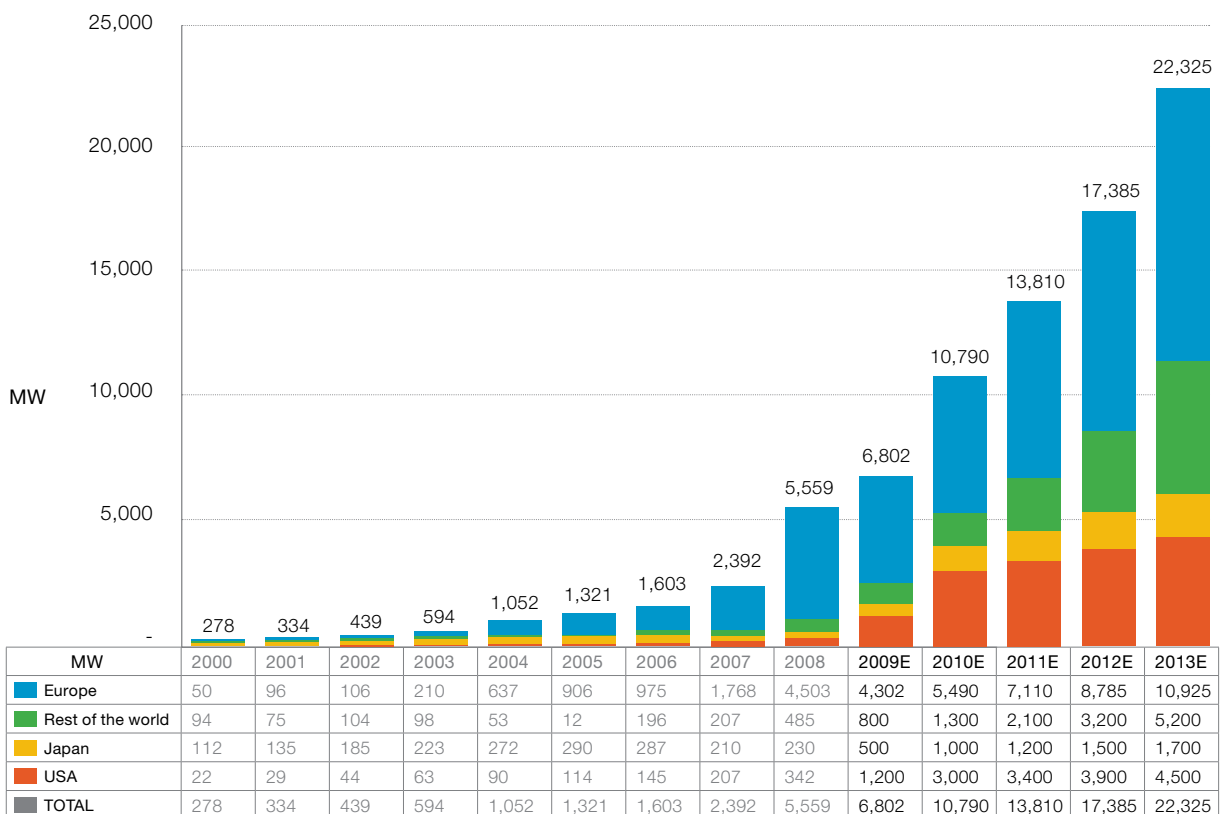
Due to a favourable Feed-in Tariff, South Korea emerged in 2008 as the fourth largest PV market worldwide. However, since the revision of the FIT in October 2008 and an unexpected devaluation of the Won (Korean currency), the PV market almost stopped with less than 10 MW installed between October 2008 and March 2009. This is why expectations for 2009 are rather low compared to historical developments. Knowing the strong political commitment to support PV in Korea, EPIA expects the PV market to recover in 2010 in the range of the 2008 results. If the 500 MW cap is removed, EPIA expects further growth of the Korean market, up to 1 GW by 2013 under the Policy-Driven scenario.



Regional distribution of Global PV markets

Considering the regional distribution of the Global Market Outlook under the Policy-Driven scenario, EPIA foresees the EU PV market to grow from 4.5 GW in 2008 to 11 GW by 2013, US from 0.3 GW to 4.5 GW, Japan from 0.23 GW to 1.7 GW and the rest of the world (i.e. including China, South Korea) to grow from 0.5 GW to more than 5 GW by 2013.

Figure 4: Global annual PV market Outlook per Region (Policy-Driven scenario)



EUROPE: GLOBAL PV MARKET LEADER



Since 2004, Europe has been leading the global market for PV applications. In 2008, Europe represented over 80% of the Global PV market. Among European countries, Germany has been leading the way for several years but Spain took over the number 1 position worldwide with around 45% of the Global market and 56% of the EU market. Numerous countries are developing brilliant support schemes for PV, out of which Italy and France are emerging as the new high-potential markets. Some, such as the Czech Republic, Belgium, Bulgaria, Portugal and Greece among others, are following with promising support schemes.

Figure 5: Regional distribution of Global annual PV market in 2008

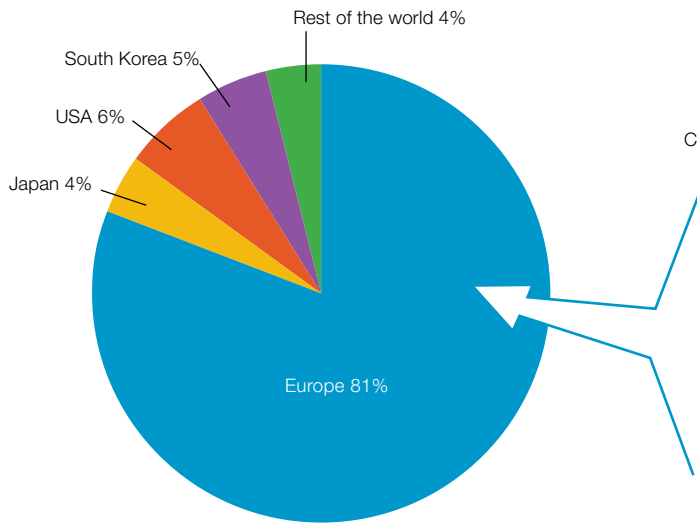
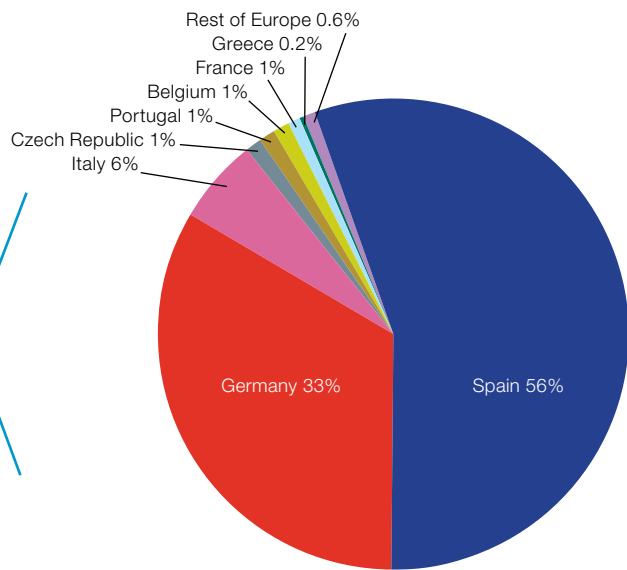
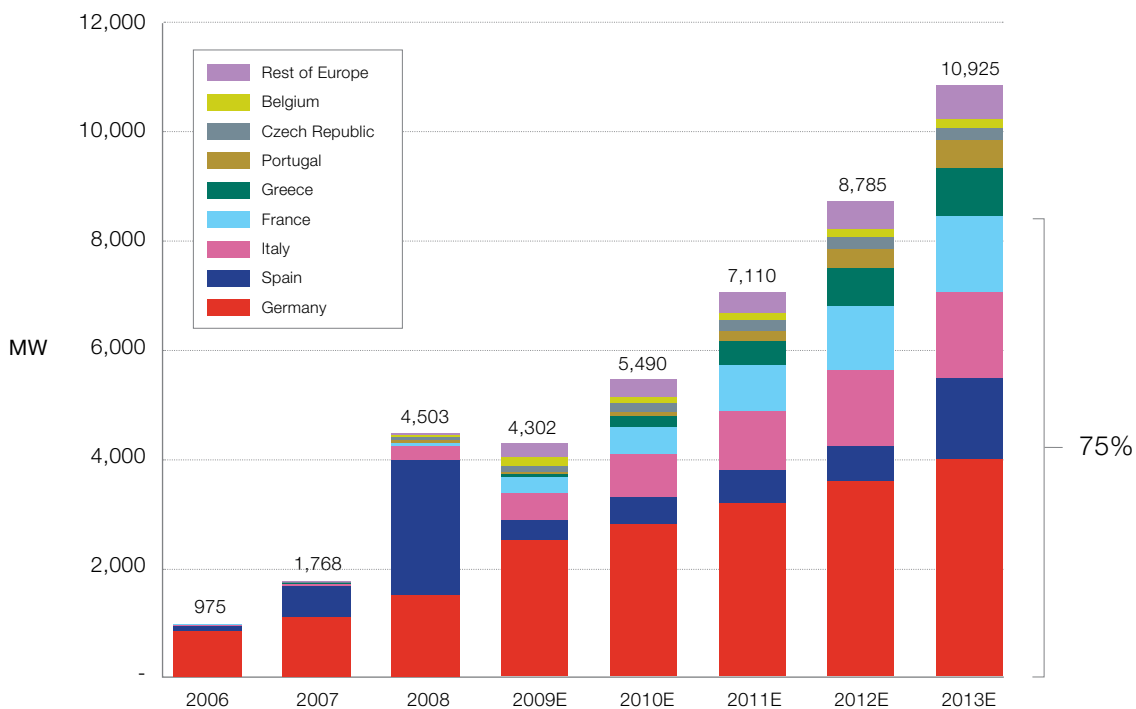


Figure 6: Regional distribution of European annual PV market in 2008



In its Policy-Driven forecast for Europe, EPIA expects Germany to remain as the major PV market in Europe with increasing roles from France and Italy. If the cap is removed in Spain, EPIA expects these 4 countries to represent more more than 75% of the European market by 2013.

Figure 7: European annual PV market Outlook until 2013 (Policy-Driven scenario)



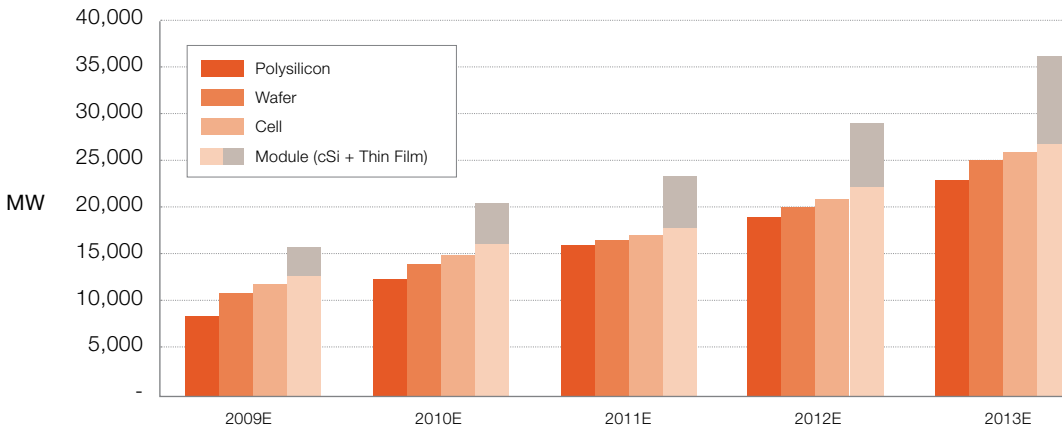
PRODUCTION CAPACITY OUTLOOK

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According to a survey conducted among EPIA Members, production capacities along the PV value chain are expected to grow with a Compound Annual Growth Rate (CAGR) of 20 to 30% in the short-term (during the period 2009-2013).

It is important to note that "end-of-year production capacities" along the value chain (from silicon to modules) are always larger than actual production and much larger than installed systems in the field. Why? Firstly, because a considerable part of the capacity is added during the year while capacities are always stated as end-of-year capacities. Secondly, as capacities are often stated by assuming a 365-day 24-hour operation, maintenance periods and periods of lower capacity usage have to be considered when comparing actual production and capacity figures. Thirdly, one should consider the delay (a few weeks) between the production of the modules and their effective installation in the field.

Figure 8: Production Capacity Outlook until 2013



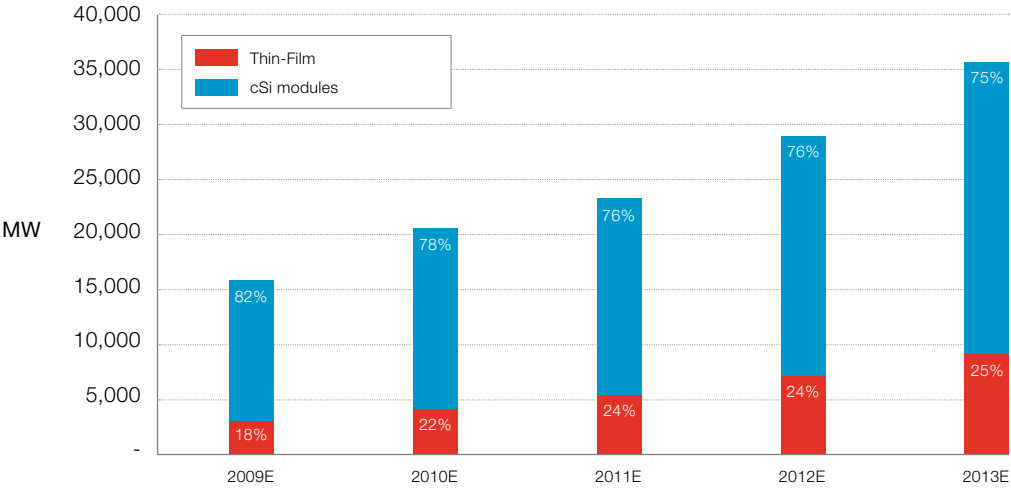
Due to a strong continuous growth of the Global PV market and a slower process to establish new silicon production facilities than for downstream processes in the supply chain, polysilicon supply has represented the main bottleneck of the PV industry since 2005. Over the last 3 years, established polysilicon producers have more than doubled their total production capacity and many new players have entered the polysilicon business. Due to this impressive increase in polysilicon production, EPIA expects the silicon shortage to end most probably by the end of 2009 or beginning of 2010.



Ramping up processes for wafer, cell and module production is much faster than for polysilicon. This explains why the difference between cell and polysilicon capacities was relatively high in the past and is expected to narrow in the near future. Upstream processes like polysilicon production are characterised by a higher concentration of actors due to the high-level of investments and by a lower flexibility of equipment than downstream processes (cell or module production) which are characterised by a large number of actors due to the limited level of investment and a higher flexibility to adapt to the demand. As a result, utilisation rates in upstream processes are generally higher than in downstream processes.

This polysilicon shortage, which has limited the growth of crystalline technologies in the last few years, has offered a great opportunity for the PV Thin Film industry to grow and establish Thin Film as a major PV technology solution. Whereas Thin Film shares represented less than 5% of the total production capacity in 2005, with around 90 MW, these shares will reach more than 20% in 2010 with little more than 4 GW and will represent around 25% in 2013 with about 9 GW.

Figure 9: Production Capacity Outlook – Crystalline technologies vs. Thin Film



EPIA expects all Thin Film technologies (CdTe, Cl(G)S and silicon based) to further develop during the coming years as each one presents different characteristics and will cover the needs of different market segments.

In summary, during the last few years the PV industry has shown its capability to ramp up on time at each step of the value chain to cover the demand, except for polysilicon production. However, polysilicon shortage will soon become history. Considering the current expansion plans of PV companies, the Global PV industry is expected to grow at an average annual growth rate of 20% to 30% between 2009 and 2013 in response to an increasing demand in the same range. If the demand increases faster, both technologies (crystalline and Thin-Film) are ready to grow even faster, as they demonstrated in the past.

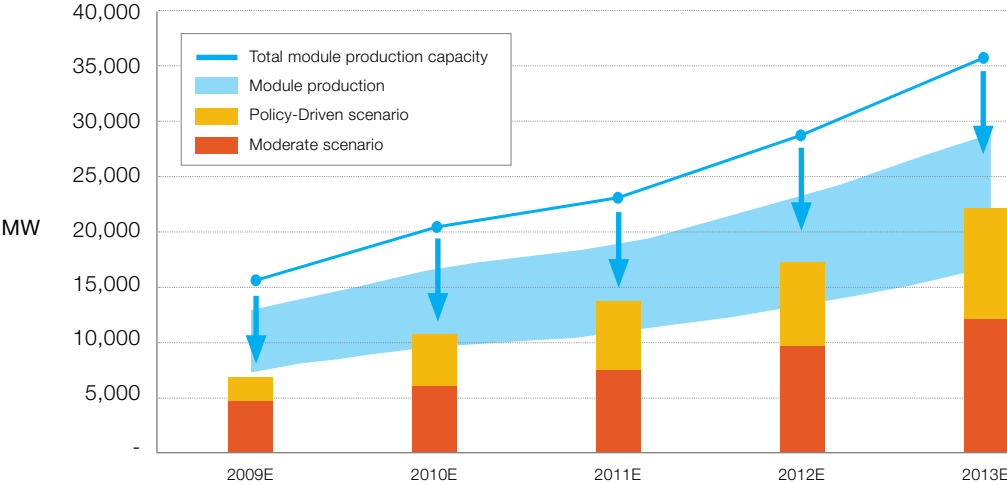
GLOBAL OUTLOOK: PRODUCTION CAPACITY MEETS DEMAND



As explained before, effective module production during the year is lower than the module production capacity expressed at the end of the year. Comparing the expected module production with the expected demand, EPIA foresees that the PV industry is prepared to deliver large quantities (GW-scale) of modules and to follow the future PV demand in the short-term.

Nevertheless, these results should be handled with care as investments in new production capacities will only take place if the PV demand increases as expected by the industry, which supposes, among others, the putting in place of appropriate policy frameworks for PV, low administrative barriers and easy procedures to connect PV to the grid.

Figure 10: Global Outlook – Production Capacity vs. Market



With the end of the polysilicon shortage, EPIA expects that module prices will fall back on their historical learning curve which showed over the last 3 decades a 20% module price reduction each time the cumulative PV power installed was doubled. The first signs of this price decrease became visible during the first quarter of 2009. If the module price decrease is passed on to the final customer and leads to a decrease in PV system prices (which is not always the case today in every market), the generation cost (€/kWh) of PV electricity will compete sooner with conventional retail electricity prices from the grid. If grid parity (the point at which the generation cost of PV electricity equals the retail price of electricity) is reached sooner, EPIA believes that the Global PV market will grow even faster than expected in its Policy-Driven scenario and that the PV industry will be able to grow accordingly.

DEFINITIONS



PV power installed

PV power installed is measured in Wp (watt peak) and refers to the nominal power under Standard Test Conditions STC (1000W/m², 25°C, 1.5 AM). To ease the reading of its publications, EPIA voluntarily omits the “p” symbol for “peak”. The reader should understand that W, kW, MW or GW stand for Wp, kWp, MWp or GWp.

Grid-connected cumulative PV power installed

Grid-connected cumulative PV power installed refers to the total PV power installed which is connected to the grid and registered by the energy regulator at the end of the year.

Off-grid cumulative PV power installed

Off-grid cumulative PV power installed refers to the total PV power installed which is not connected to the grid. Typical off-grid applications are repeater stations for mobile phones, electrification for remote areas or rural electrification in developing countries.

Cumulative PV power installed

Cumulative PV power installed refers to the sum of grid-connected and off-grid cumulative PV power installed.

Annual PV power installed

Annual PV power installed (= annual PV market) refers to the difference of cumulative PV power installed between 2 consecutive years. Due to delays for installation and administrative procedures (for grid-connected systems), the annual PV power installed may differ from the annual shipments to a specific market. Note that according to EPIA's definitions, retrofit of end-of-life PV systems and second-hand PV market are not considered, but these quantities are still very marginal. EPIA has chosen this methodology to avoid double counting the same quantities.

Feed-in Tariff (FiT)

A Feed-in Tariff is an incentive structure to encourage the adoption of renewable energy through government legislation. The regional or national electricity utilities are obliged to buy renewable electricity (electricity generated from renewable sources, such as solar PV) at above-market rates set by the government over a period of 20 to 25 years from the day the system is connected to the grid. The utilities are authorised to pass on this extra cost, spread equally, to all electricity consumers through their regular electricity bill. This means that the feed-in programme works independently from the state economy, and the extra cost which each electricity consumer has to pay, in order to increase the share of renewable energy in the national electricity portfolio, is very small.

CREDITS

Images

BP Solar (page 3)

ECN - Energy research Centre of the Netherlands (page 15)

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The European Photovoltaic Industry Association is the world's largest industry association devoted to the solar electricity market. The association aims to promote photovoltaics at the national, European and worldwide levels and to assist its Members in the development of their businesses in both the European and in export markets.



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