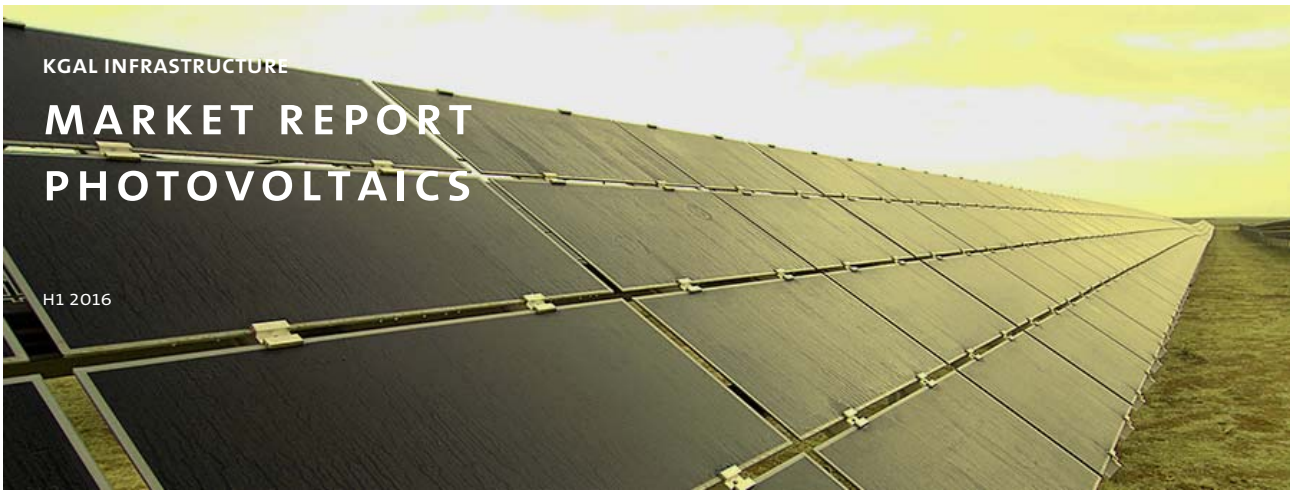


KGAL INFRASTRUCTURE

MARKET REPORT PHOTOVOLTAICS

H1 2016

I. EXPERT OVERVIEW

PHOTOVOLTAICS TAKES THE LEAD

Anyone reading various media publications on the European photovoltaics industry during the first quarter of 2016 might have concluded that photovoltaics was on a downward slope:
The industry publication PV-Magazine ran a story titled "Less than 1500 MW of new photovoltaic capacity in Germany in 2015", while the French Environment Ministry also reported a decline in France. By comparison, in 2012 the added capacity reached 8.200 MW. Only the UK bucked the trend, with record additions in 2015, but even here a decline is expected for 2016 due to substantial changes in government support policies. Spain and Italy, previously among the leaders of the solar revolution, again added virtually no new capacity in 2015.

Mixed trends in European PV →

Is the photovoltaics industry dying? Quite the opposite. Worldwide capacity additions have increased again. After additions of approximately 40 GW in 2014, 2015 marked another record of approximately 50 GW. China's installed capacity reached 40 GW, overtaking the world leader Germany for the first time. All projections agree, on the basis of capacity additions as a percentage of installed capacity, photovoltaics will over the next years be the growth leader among conventional and renewable energy. In 2040, solar energy is expected to account for half of all capacity additions.

Record capacity additions worldwide ↗

In 2040, photovoltaics will account for 50% of global capacity additions

That said, the solar revolution will not be stopped, despite this disadvantage. Because of their constantly declining production costs, renewable energies will in the near future be competitive even without any support mechanisms. The very European countries where growth in photovoltaics is currently at a standstill – Spain, Italy and Greece – will soon be home to the first fully commercially operated photovoltaics facilities. Media reports on the European photovoltaics industry will then have a more upbeat tone.

Renewable energies at the threshold to grid parity ↗

Michael Ebner
Managing Director Infrastructure

KGAL

II. FOCUS ON MARKET DATA

GROWING WORLDWIDE CAPACITY ADDITIONS

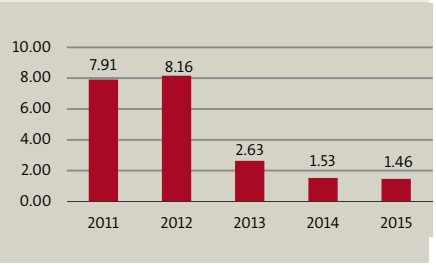
Germany

Plants with a total capacity of 1.46 GW were installed in 2015, marking another year with low capacity growth.

Approx. installed capacity at the end of 2015: 39.7 GW

Added capacity in 2015 approx.:
+ 1.46 GW
Trend: ➔

Outlook: We don't expect any fundamental changes over the next years.



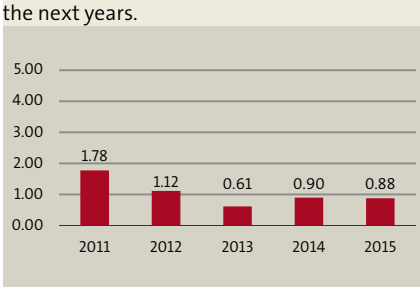
France

As in the previous year, 0.9 GW in new capacity were installed in 2015.

Approx. installed capacity at the end of 2015: 4.7 GW

Approx. capacity added in 2015:
+ 0.9 GW
Trend: ➘

Outlook: France is again facing a paradigm shift, with a substantial expansion of renewable energy production expected over the next years.



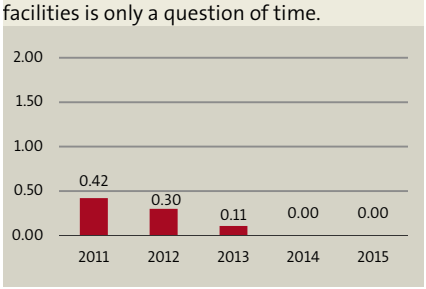
Spain

The Spanish market has been stagnating for years. As in the previous year, no new photovoltaics facilities were installed in 2015.

Approx. installed capacity at the end of 2015: 4.7 GW

Approx. capacity added in 2015:
+ 0 GW
Trend: ➔

Outlook: The Spanish market will recover in the medium term. The introduction of the first commercially operated photovoltaics facilities is only a question of time.



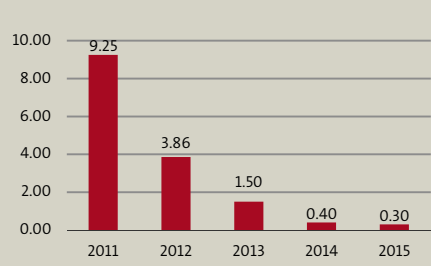
Italy

The photovoltaics market in Italy has also been suffering for several years from changes in support policies.

Approx. installed capacity at the end of 2015: 18.9 GW

Approx. capacity added in 2015:
+ 0.3 GW
Trend: ➔

Outlook: Similar to Spain, Italy has the potential of developing a grid-parity market in the foreseeable future.



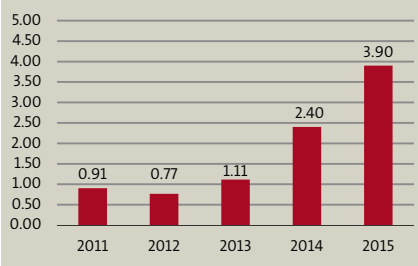
England

In contrast to continental Europe, England is reporting record capacity additions.

Approx. installed capacity at the end of 2015: 9.2 GW

Approx. capacity added in 2015:
+ 3.9 GW
Trend: ➔

Outlook: Changes in support policies will lead to a significant decline in the photovoltaics market no later than 2017.



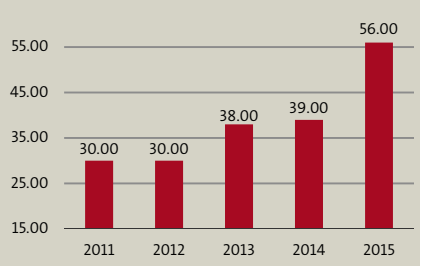
Global

Global capacity additions reached a record high of 56 GW in 2015.

Approx. installed capacity at the end of 2015: 233.0 GW

Approx. capacity added in 2015:
+ 56 GW
Trend: ↗

Outlook: The ongoing decline in production costs supports the positive trend for solar energy. The development of new markets is expected to drive further growth.



III. ON CLOSER SCRUTINY

THE RENEWABLE ENERGY REVOLUTION IS DEVOURING ITS SOLAR CHILDREN

Is there such a thing as *the* electricity price? Is it the price paid by consumers to their utility company each month? Is there an officially quoted price, as in the exchange rate of the dollar? Or is there an exchange price, which is fixed once per day?

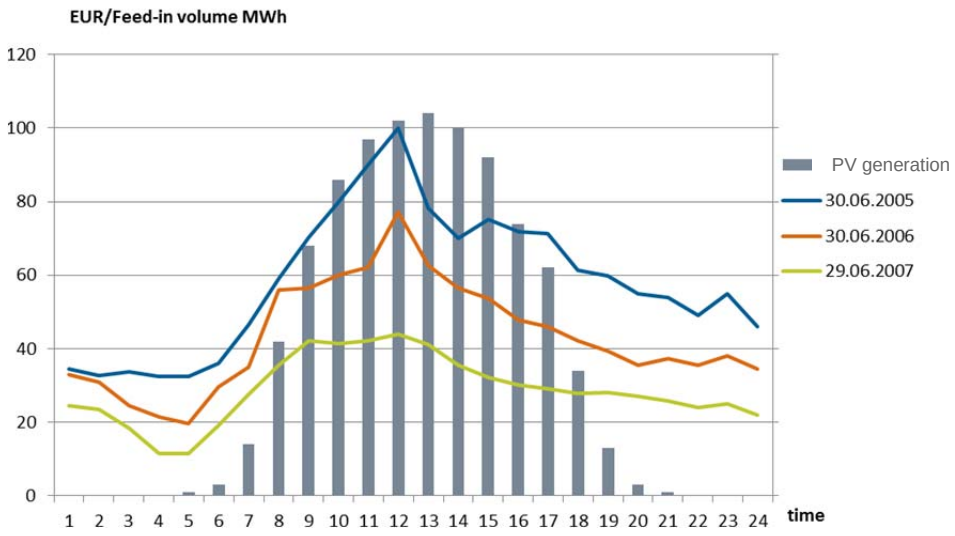
None of the above is either completely right or wrong: There is no such thing as one electricity price. The current discussion about the falling electricity price refers to wholesale prices, at which utilities and electricity producers trade electricity. Electricity is bought and sold in different time intervals: In 15-minute periods, in periods of days but also over longer periods of several years. This can be accomplished through contracts, the so-called power purchase agreements (PPAs), but often happens on the energy exchanges. The energy exchange EEX in Leipzig standardises trading in electricity just like any other trading exchange and provides a platform for buyers and sellers.

Despite lower electricity prices, final consumers often pay more

What are the implications for photovoltaics? Electricity generated by photovoltaic facilities in countries such as Germany is still paid based on fixed feed-in tariffs in accordance with applicable renewable energy laws; this electricity is already influencing market pricing. Early on in the solar era, there were only a few photovoltaics facilities, and they were producing electricity in line with the daily demand profile, thus generating electricity at those times of the day when prices were highest. At the time, photovoltaic electricity generation was an ideal match with the demand profile and solar electricity benefited from being available during the hours of the day when electricity was expensive.

At the beginning of the PV era, PV electricity generation matched the daily demand profile

ELECTRICITY PRICE AND TYPICAL DAILY PV GENERATION PROFILE (2005–2007)



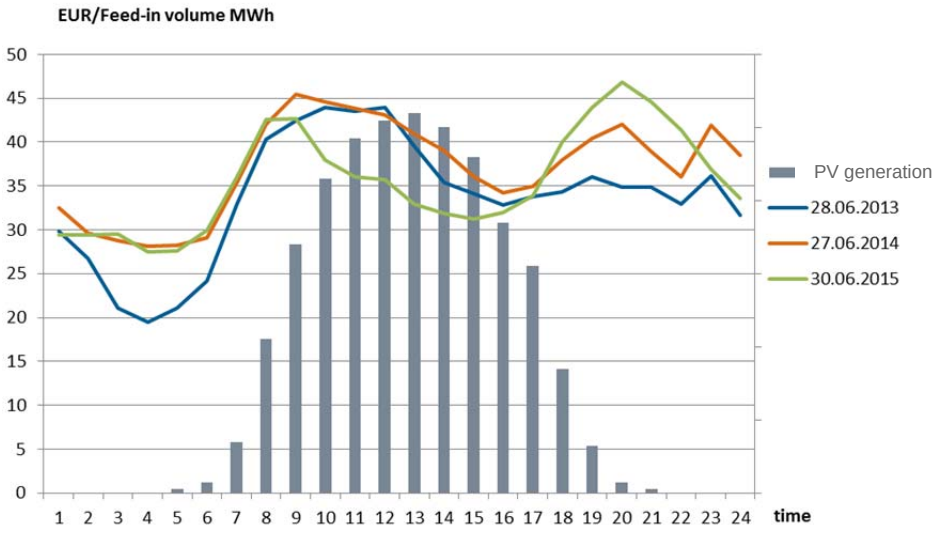
PV matched demand profile and achieved high prices

Source: EEX and internal calculations

Due to the expansion of photovoltaics in Germany, photovoltaic electricity generation is now exceeding peak demand at noon, resulting in a supply overhang and reduced prices. Instead of one price peak at noon, there are now two price peaks before and after the photovoltaic production peak. The price pattern for the formerly expensive mid-day period has shifted considerably. Photovoltaics has thus cannibalised its own market within the short space of 10 years and now faces a detrimental competition on price.

Current PV electricity generation results in lower prices during peak production

ELECTRICITY PRICE AND TYPICAL DAILY GENERATION PROFILE (2013-2015)



Source: EEX and internal calculations

This now-disadvantageous production profile of photovoltaics has resulted in a situation where solar energy will achieve market prices which are below the average, time-weighted electricity price. Electricity price projections are already taking this into account by indicating deviations from the time-weighted price projections or by simply presenting production-weighted price projections. Photovoltaics facilities which will participate in the electricity market after the feed-in tariff expires will suffer from this price effect. However, these factors are already known and can be taken into account.

Unfavourable production Profile of PV yields below-average prices

Our conclusion: The strength of photovoltaics is also its weakness. Its rapid growth is hurting its own profitability. Despite this handicap, photovoltaics will be a major factor in electricity generation of the future.

IV. OUTLOOK

PHOTOVOLTAICS ACHIEVES COMPETITIVENESS WITHOUT SUBSIDIES

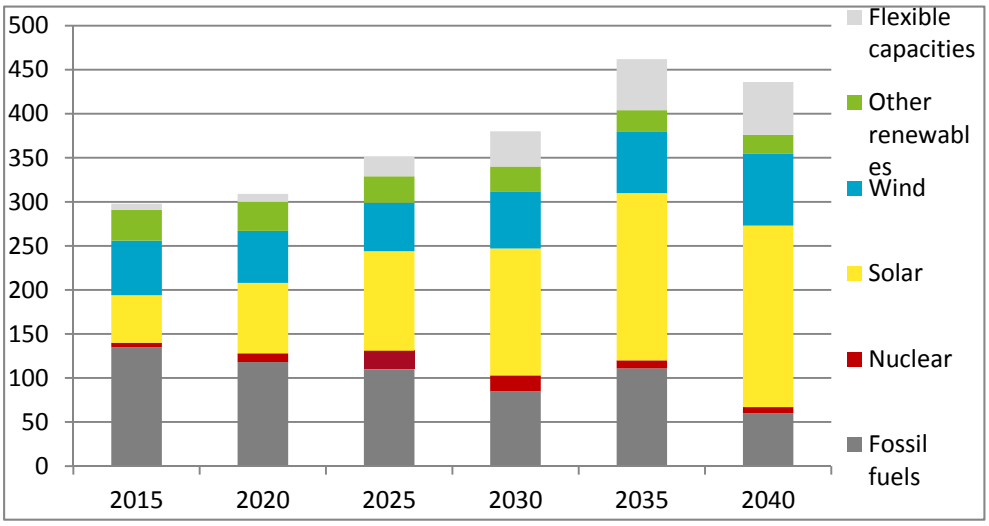
Photovoltaics with significant learning curve effects

Photovoltaics has undergone a dramatic development like no other form of electricity generation. Initially scorned as a highly subsidised peculiarity among power generation technologies, its technological efficiency has been improved and it has also in particular benefited from progress along the learning curve. Solar energy is already considered one of the cheapest technologies for renewable electricity production, second only to wind power. In addition, in contrast to other forms of electricity production, solar power still has cost-saving potential.

Photovoltaics as the dominant electricity production technology of the future

In sunny countries photovoltaics will therefore become competitive in the near future, able to operate without subsidies. With electricity production costs of under 5ct/kWh, photovoltaics will become the price leader both among renewable as well as conventional energy technologies. While a technical lifespan of 25 years and more means that considerable patience is required until the necessary investments are amortised and the returns can be booked, the success story of photovoltaics will continue. Projections for the development of the photovoltaics industry consequently show a clear trend. Photovoltaics will take the lead in capacity additions among renewable energy technologies in 2020. No later than 2025, growth in photovoltaics will outstrip growth in conventional power plants.

ANNUAL GENERATING CAPACITY ADDITIONS IN GW



Source: Bloomberg

KGAL expertise in photovoltaics sector

- Active in the photovoltaics sector since 2005
- 63 solar parks with a total output of around 384 MW
- Investment volume of approximately EUR 1.3 billion

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Sources:
Bloomberg New Energy Finance: 2015 New Energy Outlook (2015), www.bnef.com/dataview/new-energy-outlook/index.html (09.05.2016). Gov UK: Solar photovoltaics deployment (2016): www.gov.uk/government/statistics/solar-photovoltaics-deployment (09.05.2016). GSE Osservatorio Statistico (2016): www.gse.it/it/Dati%20e%20Bilanci/GSE_Documenti/osservatorio%20statistico/Stime%20preliminari%202015.pdf (09.05.2016). Red Electrica de Espana (2016):Potencia instalada: www.ree.es/sites/default/files/11_PUBLICACIONES/Documentos/SeriesEstadisticas/julio_2015/2_potencia_instalada_jul15.csv (09.05.2016). PV-Magazine: Photovoltaik-Zubau 2015 in Deutschland unter 1500 Megawatt (1.2.2016) www.pv-magazine.de/nachrichten/details/beitrag/photovoltaik-zubau-2015-in-deutschland-unter-1500-megawatt_100021885/:(09.05.2016). Bundesnetzagentur: Vergütungssätze für PV-Anlagen (2016) www.bundesnetzagentur.de/cln_1411/DE/Sachgebiete/ElektrizitaetundGas/Unternehmen_Institutionen/ErneuerbareEnergien/Photovoltaik/DatenMeldgn_EEG-VergSaetze/DatenMeldgn_EEG-VergSaetze_node.html#doc405794bodyText2 (09.05.2016).