German Solar Market
Recent Trends and Outlook

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Amman
Agenda

1. German Solar Association
2. Photovoltaics (PV) in Germany
   - Global Market figures
   - German Market figures
   - Recent trends in the German PV Market
The German Solar Association
BSW-Solar
German Solar Association

**TASK** To represent the solar industry in Germany in the thermal and photovoltaic and storage sector

**VISION** A sustainable global energy supply provided by solar (renewable) energy

**ACTIVITIES** Lobbying, political advice, public relations, market observation, standardization

**EXPERIENCE** Active in the solar energy sector for over 30 years

**REPRESENTS** More than 800 solar producers, suppliers, wholesalers, installers and other companies active in the solar business from all over the world

**HEADQUARTERS** Berlin
The Association serves the interests of its members within two scopes

**National:**
- Lobbying
- Stimulation of market
- Quality

**International:**
Development of international markets and removing barriers

- **Policy Support**
  - Cooperation & collaboration on international energy policy
- **Market Intelligence**
  - Analysis of solar in emerging markets
- **Enabling Business**
  - Mediation of business opportunities
BSW-Solar: Working worldwide to improve frameworks for the use of solar energy!

Partnerships, business networks
Projects, Market reports, esp. “Enabling PV”
both

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International Association Cooperation Partnerships of BSW

- ABSOLAR (Brazilian Photovoltaic Solar Energy) from Brazil
- ACESOLAR (Costrican Solar Association) from Costa Rica
- ACERA (Chilean Renewable Energy Association) from Chile
- AMISOLE (Wind and Solar Energy Association of Morocco) from Morocco
- ANES (Mexican Solar Energy Association) from Mexico
- APES (Association des Professionnels en Energie Solaire au Mali) aus Mali
- AREU (Afghanistan Renewable Energy Union) from Afghanistan
- ASOLMEX (Asociación Mexicana de Energía Solar) from Mexico
- BSREA (Bangladesh Solar and Renewable Energy Association) from Bangladesh
- Cluster Solaire (Moroccan Solar Cluster) from Morocco
- CSPV (Tunisian PV Installer Chamber) from Tunisia
- EDAMAJ (Jordanian Association for Energy, Water & Environment) from Jordan
- GÜNDER (Turkish Solar Energy Association) from Turkey
- H.R.H. Princess Abze Djigma Fondation from Burkina Faso
- KEREA (Kenya Renewable Energy Association) from Kenya
- MESIA (Middle East Solar Industry Association) from United Arabian Emirates
- METI (Indonesian Renewable Energy Society) from Indonesia
- NSEFI (National Solar Energy Federation of India) from India
- PSPA (Philippine Solar Power Alliance Inc.) from the Philippines
- REAG (Renewable Energy Association Ghana) from Ghana
- REAK (Association of Renewable Energy) from Khasakhstan
- REAN (Renewable Energy Association Nigeria) from Nigeria
- REIAoN (Renewable Energy Association of Namibia) from Namibia
- SAPVIA (South African PV Industry Association) from South Africa
- SASIA (Saudi Arabia Solar Industries Association) from Saudi Arabia
- SEDA (Solar Energy Development Association) from Egypt
- SEDA-E (Solar Energy Development Association) from Ethiopia
- SER Colombia (Renewable Energy Association of Colombia) from Colombia
- SIAB (Solar Industry Association of Botswana) from Botswana
- SQF (Solar Quality Foundation) from Pakistan
- SSSES (Sudanese Solar Energy Society) from Sudan
- TAREA (Tanzania Renewable Energy Association) from Tanzania
- USEA (Uganda Solar Energy Association) from Uganda
German Solar Market
Recent trends & outlook
Global PV market reaches 100 GW
Average market growth of about 30% per year (2010-2017)
Global PV market doubled in only three years

IRENA: 3,4 M PV jobs globally (+ 300,000 compared to prev. year; total RE: 10,3 M jobs)

PV and wind will be main pillars of global energy supply

Bloomberg expects PV investment potential of about 3,4 trillion Dollar until 2040

cost: ~0.2 T; gas: ~0.9, nuclear: 0.1 T Dollar
Renewables at the heart of Germany’s energy future: 33.1% in 2017 power mix

Source: AGEB

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German solar market - Strong decline after boom years, signs of growth since 2017

Growing market expected in 2018; 2.5 GW possible
PV Market Segments

Market shares of on-grid PV systems (all installations)

- **Tenant solar (Start 2017)**
  - 14%

- **Large Scale / Ground Mounted (> 1.000 kWp):**
  - ~12 GW installed capacity;
  - 3,700 systems

- **Residential (up to 10 kWp):**
  - ~6 GW installed capacity;
  - 970,000 systems

- **Commercial (10 - 1.000 kWp):**
  - ~24 GW installed capacity;
  - 660,000 systems

- **Ground mounted >1.000 kWp**

Allocation / market shares (cumulative)
Off-Grid PV Systems

Source: SolarWaterWorld
PV System Prices keep tumbling

PV system prices decreased by 70 percent since Q2/2006

Average end-customer prices (system prices, index) for installed roof-mounted systems of up to 10 kilowatt peak per kilowatt peak without tax

Source: BSW-Solar  PV Price Index 8/2016
Module Prices keep tumbling

Global PV Module trends 2009-2016

Prices for small lithium storage systems have fallen by nearly 44% since 2013.
Storage market in Germany
Increasing demand

More than 100,000 PV storage systems installed (summer 2018)
> 35,000 newly installed home battery storage systems expected in 2018

* Increase scenarios BSW-Solar
Quellen: KfW, EuPD, estimations BSW-Solar
Market Trends
Trends for the German Market

- Decreasing system prices
- Attractive self consumption
- New business models with tenant solar
- New market actors (real estate companies, municipalities)
- Trend towards E-mobility
- Falling prices for solar batteries
Trend I
Self-consumption as a driver of the majority of installations

Main driver: Decreasing PV system prices

- Decreasing PV system prices **reduce electricity cost**
- In many cases solar energy is **cheaper** than electricity from the utility
Trend II
Growing **residential** segment

- Stable market segment partially due to interest in solar home storage
- Main driver: **self-consumption and autarky**
- This segment represents **21 percent** of the market volume **2017**

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Trend III
Growing **commercial & industrial** segment

- Rooftop systems **up to 750kWp**; no special building permit required
- Best with **east / west orientation** to produce more electricity throughout the day - **increases self-consumption**!
- Self-consumption possible, but plus EEG surcharge of approx. 2.7 €ct / kWh
- **PV electricity production costs (all in) <10 € ct / kWh**
- **Feed-in-Tariff up to 100kWp: 8.44 €ct/kWh (20 years)**
- >100kWp: mandatory direct marketing (**Compensation = Feed-in-Tariff minus market price**)
Trend IV
Solar Power Storage Systems

...a huge potential for further growth

- More than 1.4 m rooftop PV systems without home storage systems
- Retrofit potential is growing by declining storage prices
- Expected storage parity in 2018/2019

> 30,000 new stationary battery storage systems in 2017 (~85,000 batteries installed at the end of 2017)
- Average annual growth rate: around 60 %
- More than 40% of the newly installed PV plants (up to 30 kWp) are installed in combination with a storage system
- AND...

Source: BNetzA, BSW-Solar; as of 4/2018
Trend V
Ground mounted PV / Tender

- Applies to large scale PV systems (roof top and ground mounted >750 kWp)
- Applied from: January 1st 2017 (pilot phase since April 2015)
- Volume of auctions: 600 MW (200 MW per round) for PV systems per year (February 1st, June 1st and October 1st)
- Auction mode: pay-as-bid
- Duration of payment: 20 years
- Weighted average auction price
  - 1st auction round 2017: 6.58 Cent/kWh
  - 2nd auction round 2017: 5.66 Cent/kWh
  - 3rd auction round 2017: 4.91 Cent/kWh
  - 4th auction round 2018: 4.33 Cent/kWh

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Trend V: Tenders for ground-mounted systems PV below price level of wind onshore in Germany

Source: BSW-Solar, BNetzA; as of 6/2018
What can German companies offer?

- **All Solar solutions** needed for utility-scale and residential PV: modules, inverters, components, batteries, EPC-services, O&M services
- **Quality products** that are designed for a long life time at very low maintenance costs that undergo some of the strictest testing requirements in the world.
- **Knowledge** and a lot of experience around marketing, sales, installation, maintenance and in qualifying and training your staff.
- Not only **state-of-the art** but also **innovative** and **reliable** technology with long warranties.
- Often 20 or more years of **experience** with **grid connected** or **off-grid** solar applications!
Thank you for your attention...

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