



Federal Ministry
for Economic Affairs
and Energy



MITTELSTAND
GLOBAL
EXPORTINITIATIVE ENERGIE

Perspectives of the Solar- and Storage Market in Germany

Jan Knaack, BSW-Solar
Rio de Janeiro, 28. October 2019



Agenda

- **BSW-Solar**
- The global picture
- Latest trends in Germany's PV market
- C&I segment as market driver
- Digitizing grid-connected PV
- Outlook

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 40 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

Equipment

Materials

System
components

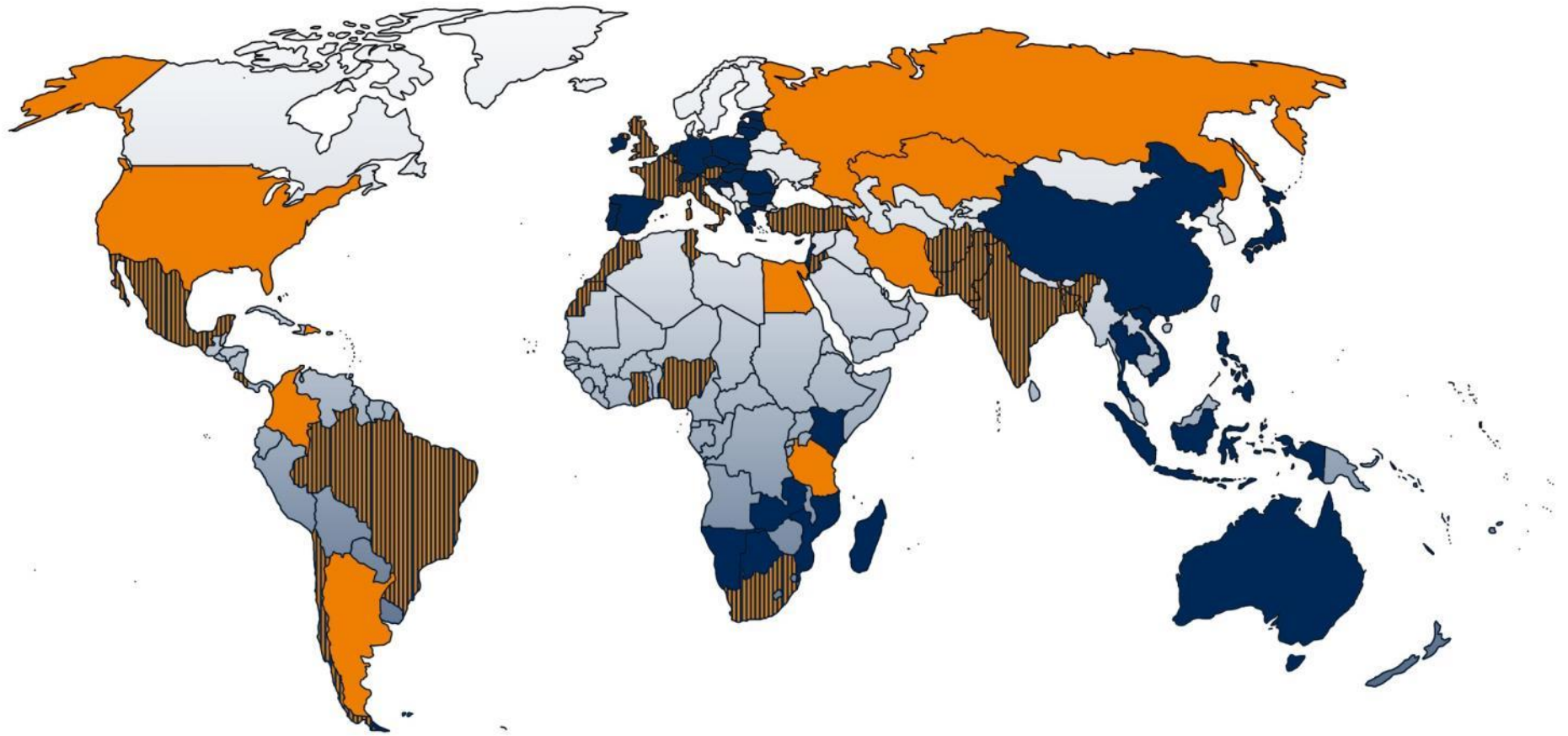
Wholesale
& Distri-
bution

Project
Develop-
ment

Con-
structi
on

O&M

With our partners, we work together to improve framework-conditions for solar energy world wide!



Partnerships,
business networks

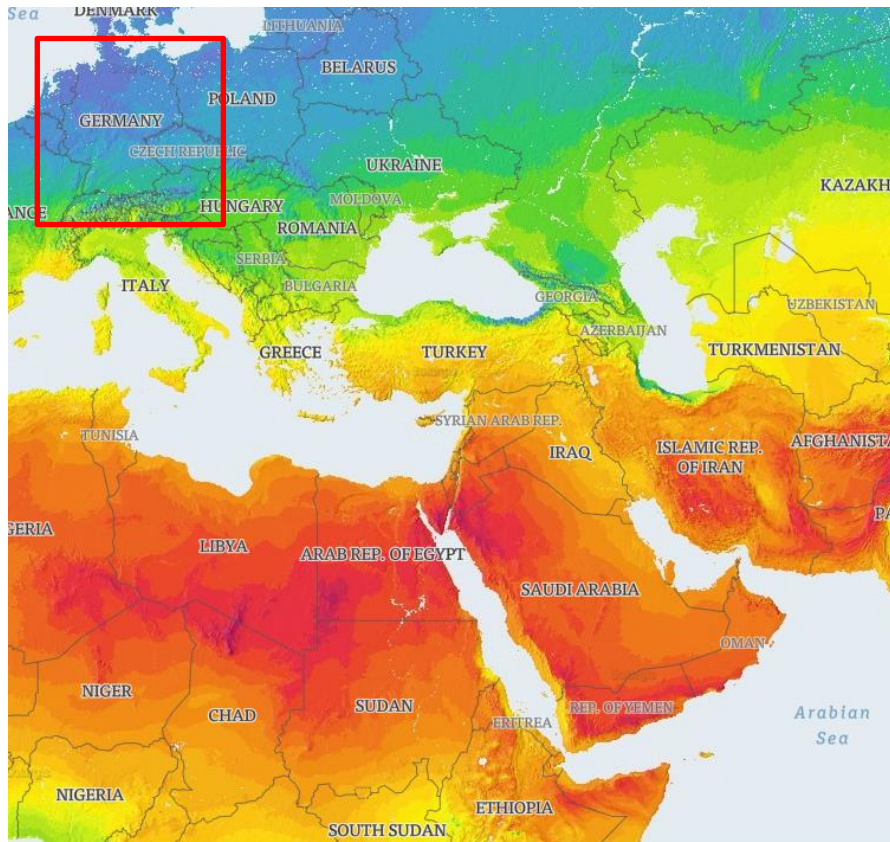
Projects, Market reports, esp.
"Enabling PV", Solar-Payback

both

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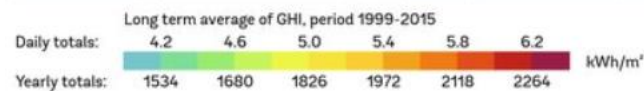
PV in Germany: 46 GW capacity, 2.96 GW in 2018
8 % of German power demand covered by PV



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SOLAR RESOURCE MAP

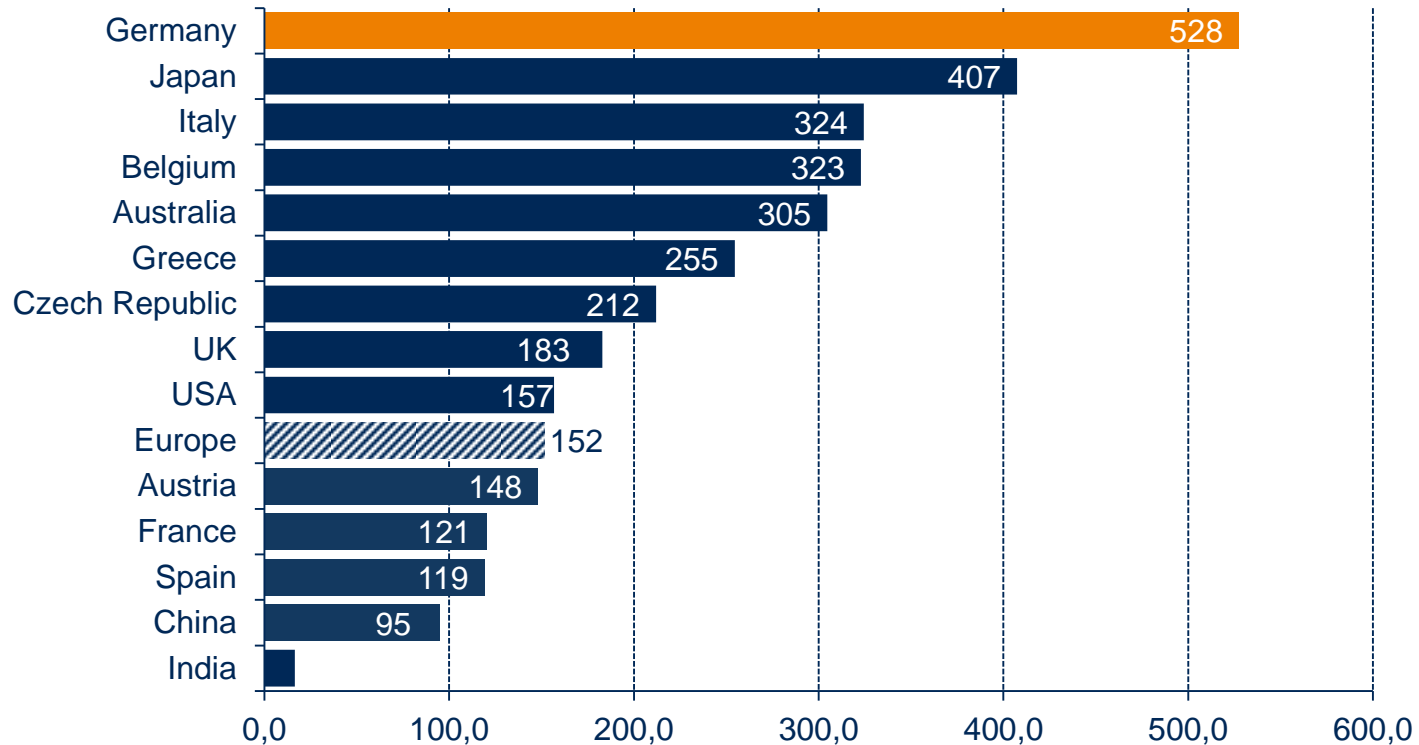
GLOBAL HORIZONTAL IRRADIATION BRAZIL



This map is published by the World Bank Group, funded by ESMAP, and prepared by Solargis. For more information and terms of use, please visit: <http://globalsolaratlas.info>

Germany leads the PV world in per capita capacity

2017 Solar Energy supplies power for 10 Million households



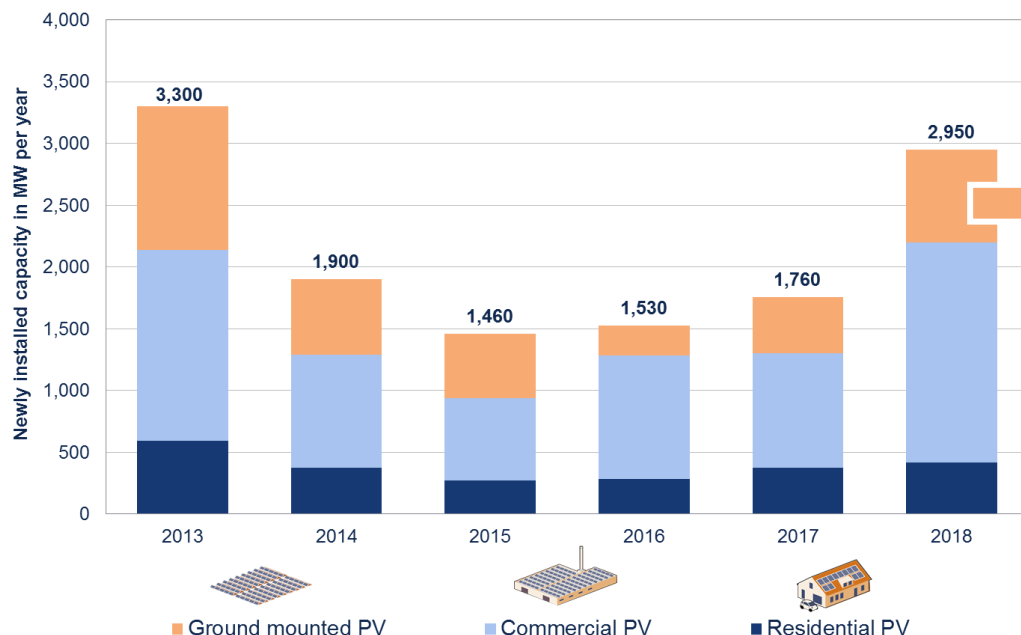
* preliminary figures subject to change

Source: BSW-Solar calculations, market information nat. solar associations, analyst reports

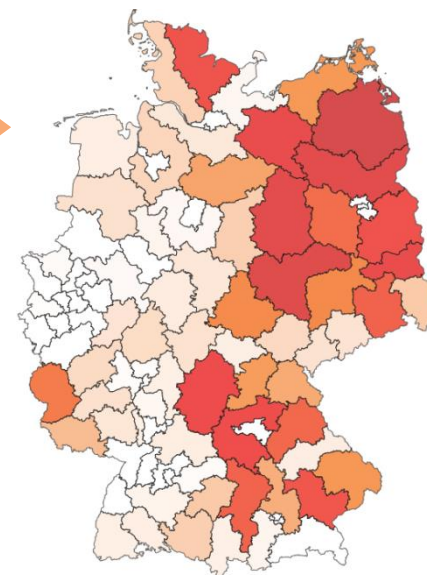
Recent Market Development (I) – the overall picture

- In 2018 German PV market grew for the third year in a row
- Commercial segment is the main market driver
- Installation of ground mounted PV is concentrated in eastern Germany

PV Market Segment Development in Germany



Regional spread of ground mounted PV projects since 2015 (1.7 GW in total)



Source: BNetzA, BSW-Solar, Dec 2018

160 MW


Important to know: Security for investors is the key! (Renewable Energy Sources Act)

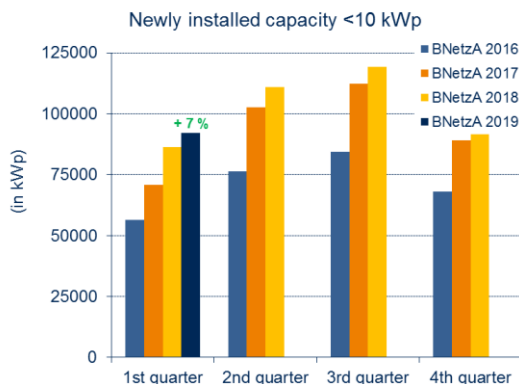


Statutory regulations for the operation of renewable energy systems:

- **Connection and purchase obligations of** grid operators to take up electricity from renewable energies
- **Feed-in tariffs in the** form of flexible market premiums, the amount of which depends on the current electricity price on the exchange, and fixed feed-in tariffs for smaller PV systems.
- **Feed priority** for renewable energy systems


Recent Market Development (II) – Market Segments

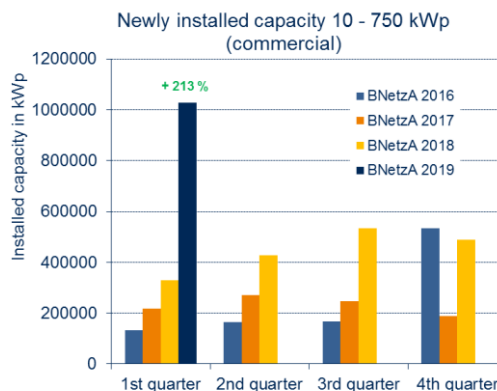
Market Share 2018: 14 %
Growth rate 2018: +12 % 



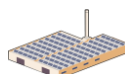
Source: BSW-Solar, BNetzA; 4/2019




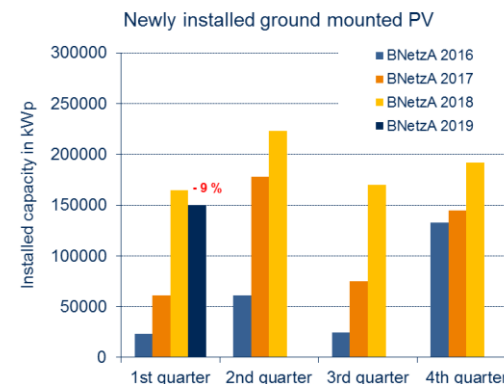
Market Share 2018: 60 %
Growth rate 2018: +92 % 



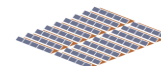
Source: BSW-Solar, BNetzA; as of 4/2019



Market Share 2018: 26 %
Growth rate 2018: +63 % 





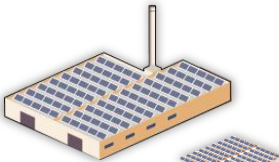
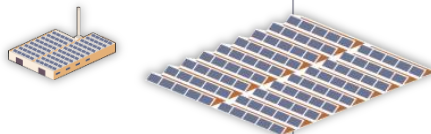
Quellen: BSW-Solar, BNetzA; Stand 4/2019



Basic photovoltaic structure - Typical building and area scenery



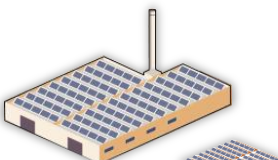
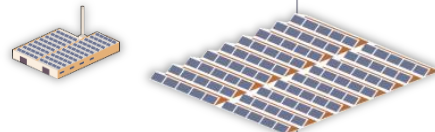
Building and area scenery

Market
share PV
extension
2017
1.700MW

	up to 10kW 22,0%  de minimis limit 0% (§ 61a EEG)	> 10kW to 100kW 21,3%  tenant flow (Section 21 (3) EEG)	> 100kW up to 750kW 30,3%  open space	> 750kW up to 10MW 26,4%  3x a 200MW p.a. (§28 EEG)	> 10MW
Buildings / Area scenery	<ul style="list-style-type: none"> • One and two-family houses • Small commercial roofs 	<ul style="list-style-type: none"> • MFH, • Barns/stables, • commercial operations • trade • administration • schools 	<ul style="list-style-type: none"> • Large agricultural holdings • Large supermarkets • factory buildings • open space • structural facilities 	<ul style="list-style-type: none"> • open space • Conversion areas • structural facilities • large roofs 	<ul style="list-style-type: none"> • Building site

Basic photovoltaic structure - Typical plant operators – 1.7 Mio PV systems

Actor structure

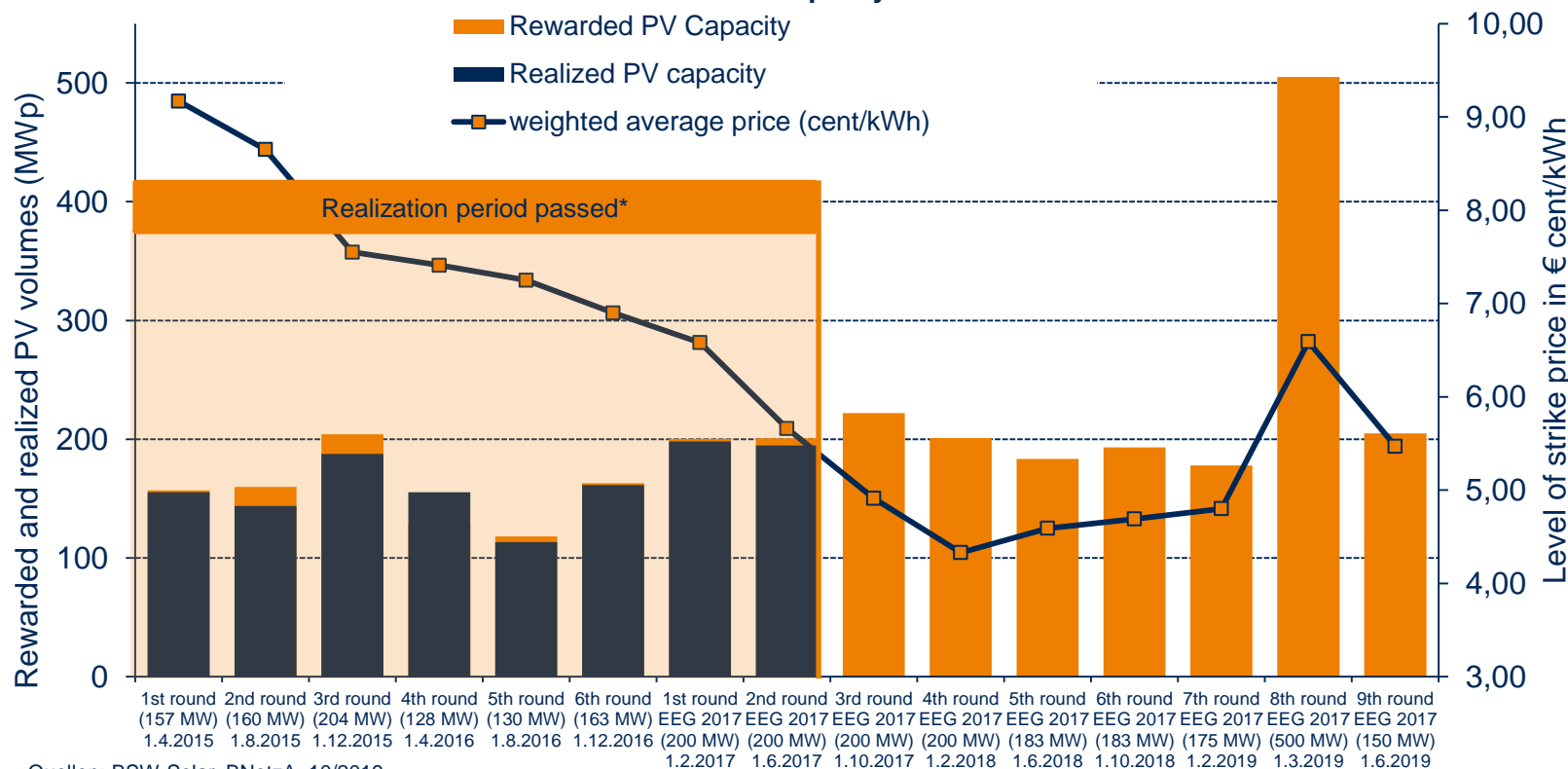
Market share PV extension 2017	up to 10kW	> 10kW to 100kW	> 100kW up to 750kW	> 750kW up to 10MW	> 10MW
	<p>22,0%</p>  <p>de minimis limit 0% (§ 61a EEG)</p>	<p>21,3%</p>  <p>tenant solar (Section 21 (3) EEG)</p>	<p>30,3%</p>  <p>open space</p>	<p>26,4%</p>  <p>3x a 200MW p.a. (§28 EEG)</p>	
Plant operator	<ul style="list-style-type: none"> • private individuals • building owner) • small trade 	<ul style="list-style-type: none"> • private individuals • farmers • small businesses, public sector 	<ul style="list-style-type: none"> • Farmers Farms • open. hand • fund • Project companies • ENERGY SUPPLY COMPANY 	<ul style="list-style-type: none"> • fund • Project and civil societies • ENERGY SUPPLY COMPANY 	<ul style="list-style-type: none"> • ENERGY SUPPLY COMPANY • Capital-gsl.

Trend I – Tenders drive the costs down (in the long run)

(Regular and Exceptional Tenders for Solar only)



- Since first round in April 2015 average prices nearly cut in half (with a slight recent increase)
- Intensity of competition has been constantly high
- So far more than 90% of rewarded projects were realized in time



Quellen: BSW-Solar, BNetzA, 10/2019

Political Background – Extra Tenders

- The recent governments coalition agreement demanded 4 GW extra capacity for each PV and Wind until 2020
- A **Coal Commission** was tasked with preparing a roadmap for phasing out coal. It has concluded its work, and according to the consensus found, Germany should complete its exit from coal **no later than 2038**
- The agreement also required that the **grid** has to be prepared for more RES
- A revision of the German renewable energy act (EEG) was adopted in late 2018
- The compromise included the agreed volumes of extra tenders for both PV and wind installations until 2021, also measures to improve **grid stability** and **system integration** and so called “innovation tenders” were introduced

Dates and volumes of extra tenders:

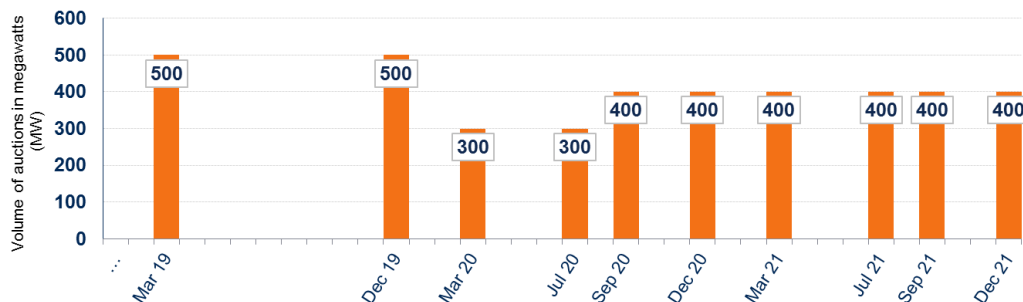
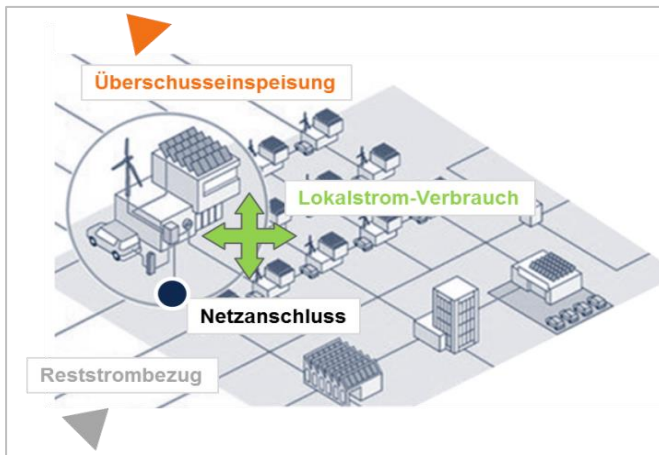


Foto: Elsdorf-blog.de

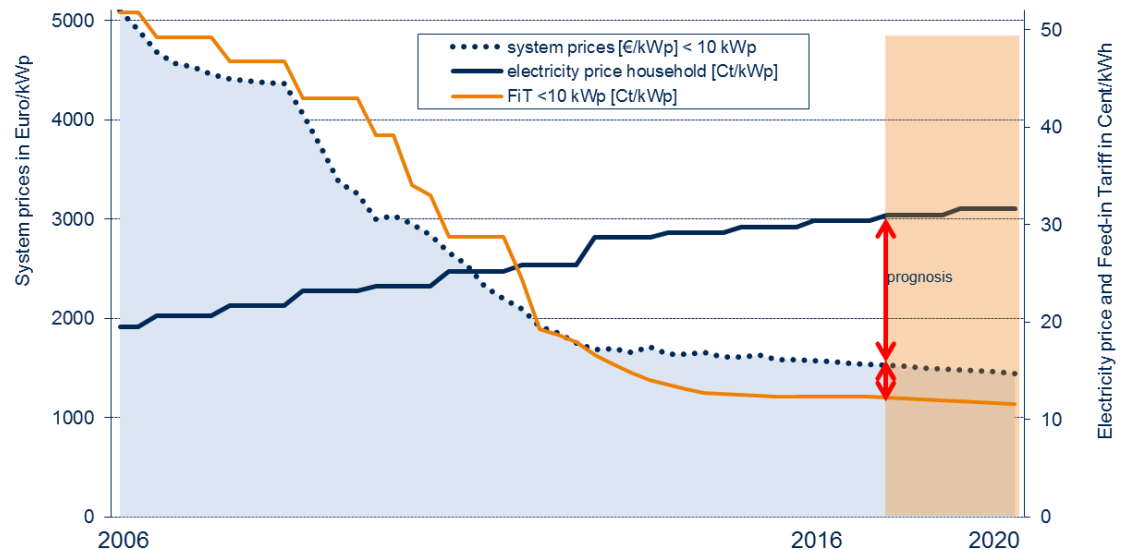
Trend (II)

Self-consumption / Prosuming

- Decreasing PV system prices reduce electricity cost; as a driver of the majority of PV installations
- In many cases solar energy is cheaper than electricity from the utility

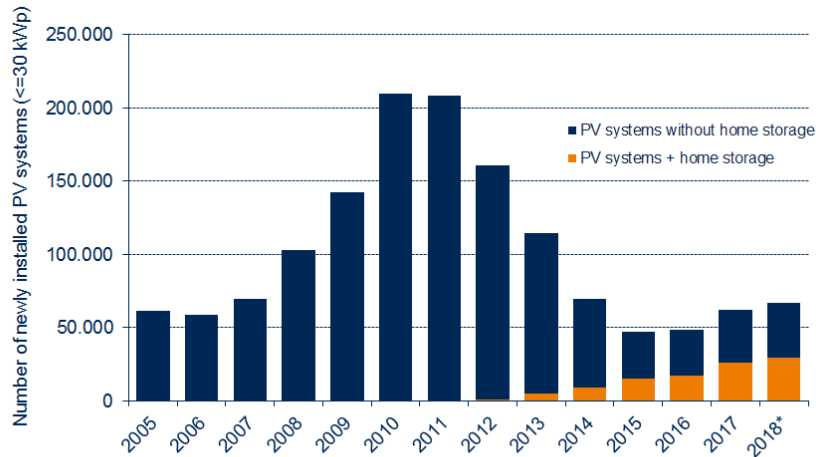


Particularly attractive in
the commercial /
industrial sector



Sources: BSW-Solar, BNetzA, BDEW

Trend (III) Storage

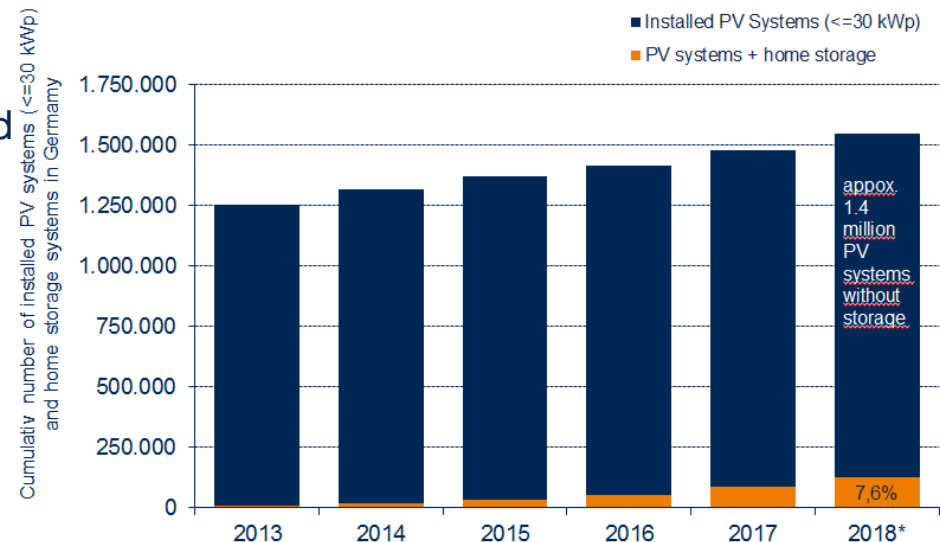


Source: BSW-Solar 2/2019, Bundesnetzagentur, 2018* estimated

- ~ 40,000 new stationary battery storage systems in 2017 (~**125,000 batteries** installed at the end of 2018)
- **Average annual growth rate: around 50 % since 2013**
- More than 50% of the newly installed PV plants (up to 30 kWp) are installed in combination with a storage system
- **AND...**

...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 2019
- Combination with EV expected to drive the market further



Source: BSW-Solar 2/2019, Bundesnetzagentur, 2018* estimated

- ~ **cumulative 125,000 batteries** installed at the end of 2018.

Trend (IV)

Growing commercial and 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 there is a EEG surcharge of approx. 2.7 €ct / kWh
- **PV electricity production costs (all in) <10 € ct / kWh**
- **Feed-in-Tariff up to 100kWp: currently ~ 8 €ct/kWh (20 years)**
- > 100kWp: mandatory direct marketing (**Compensation = Feed-in-Tariff *minus* market price**)



Foto © Christian Meyer, Hermann Meyer, Germany

Trend (V)

Power Purchase Agreements (PPAs)

Trends

- First projects in Germany are being realized after lengthy discussion
- Customers are often utilities
- Problems: lack of practical experience, models partly unknown
- BSW Survey: Potential of 1 GW per year

Investors Perspective

- PV systems >20 years (post EEG) of greater interest
- Tender (sometimes) unattractive because of penalties, restrictions regarding the location → PPAs: free choice of locations, no limitation regarding plant size (>10 MW) hence lower installation costs and falling LCOEs

Customers Perspective

- Stable power prices (customers)
- Marketing tool → regional focus; clean power from RES



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Self-consumption model – what makes PV so attractive

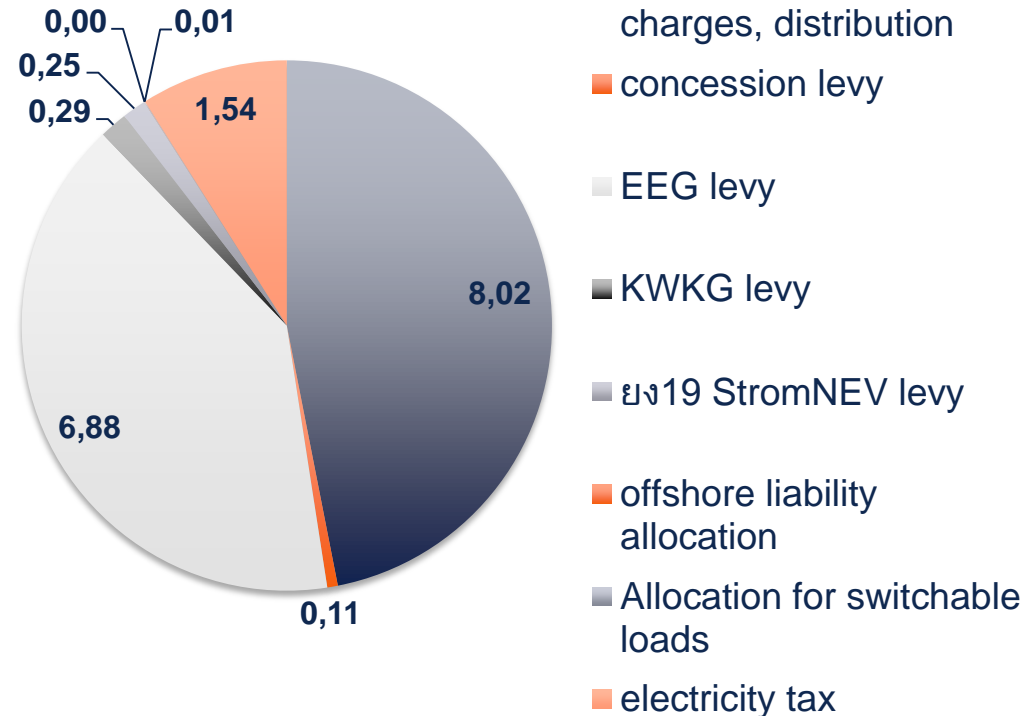
Reduction of electricity price components possible (industrial plant)



Price components electricity bill*

- ~~1. The EEG levy~~
- ~~2. The electricity tax~~
- ~~3. concession fees~~
- ~~4. network charges~~
- ~~5. The CHP levy~~
- ~~6. § 19 Allocation~~
- ~~7. The offshore liability allocation~~
- ~~8. The switchable load allocation~~

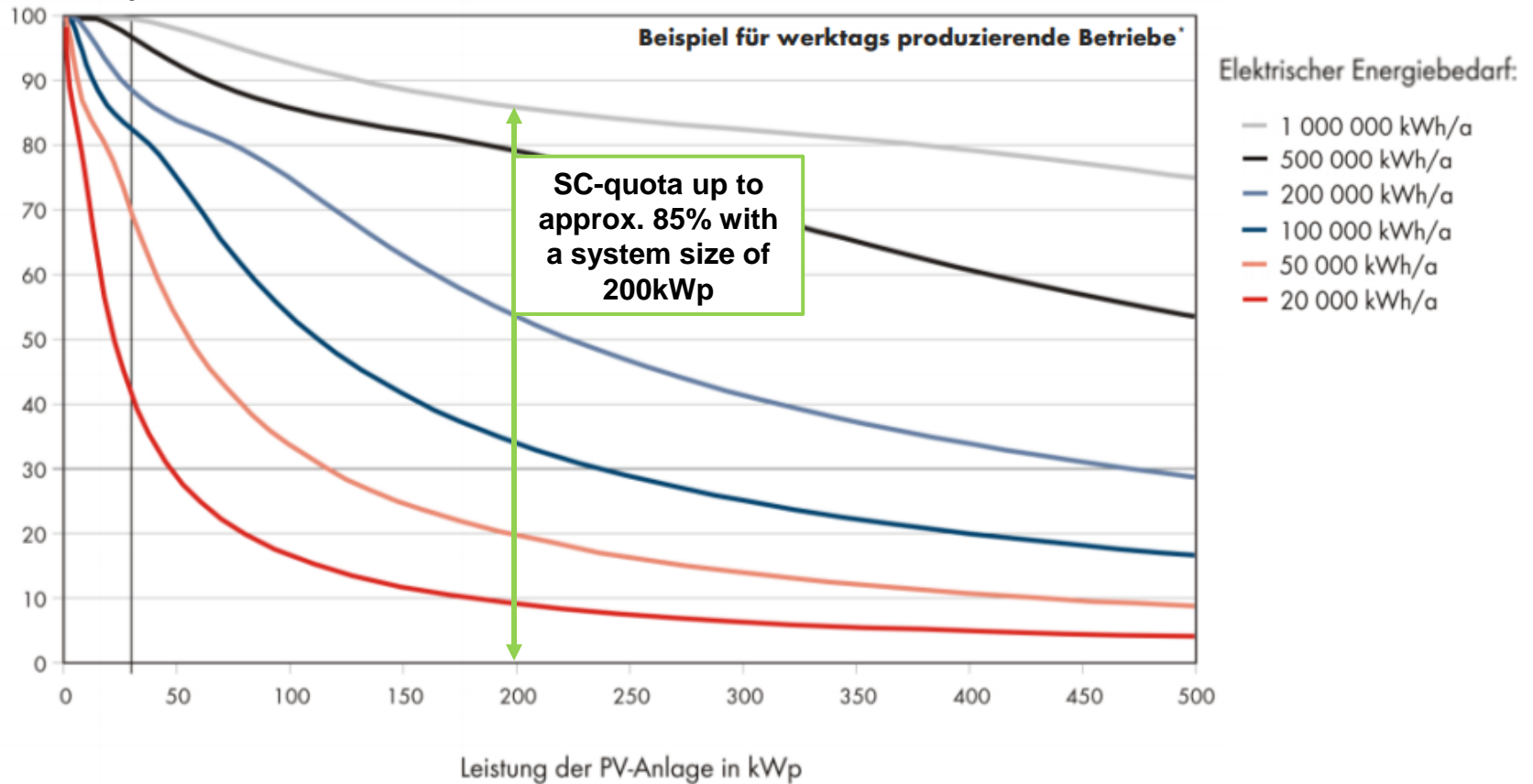
0 or 40% of the total



*Average electricity prices for industry in ct/kWh (incl. electricity tax)
Annual consumption 160,000 to 20 million kWh (medium-voltage supply;
100kW/1,600h to 4,000kW/5,000h consumption)

Basic information - Own consumption rate: Percentage of self-consumed PV electricity

self-consumption rate



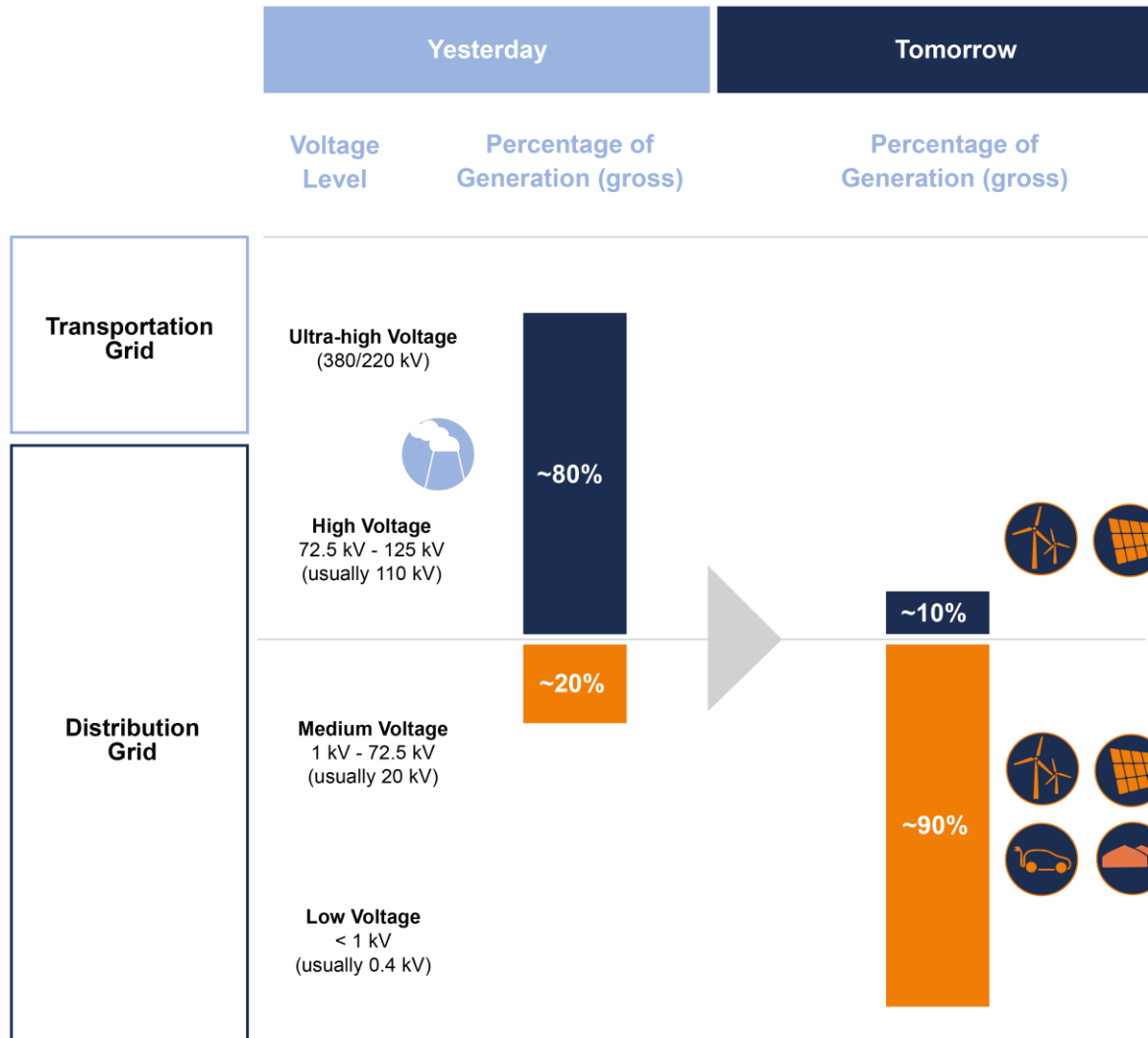
➡ Power requirement and system size determine SC rate

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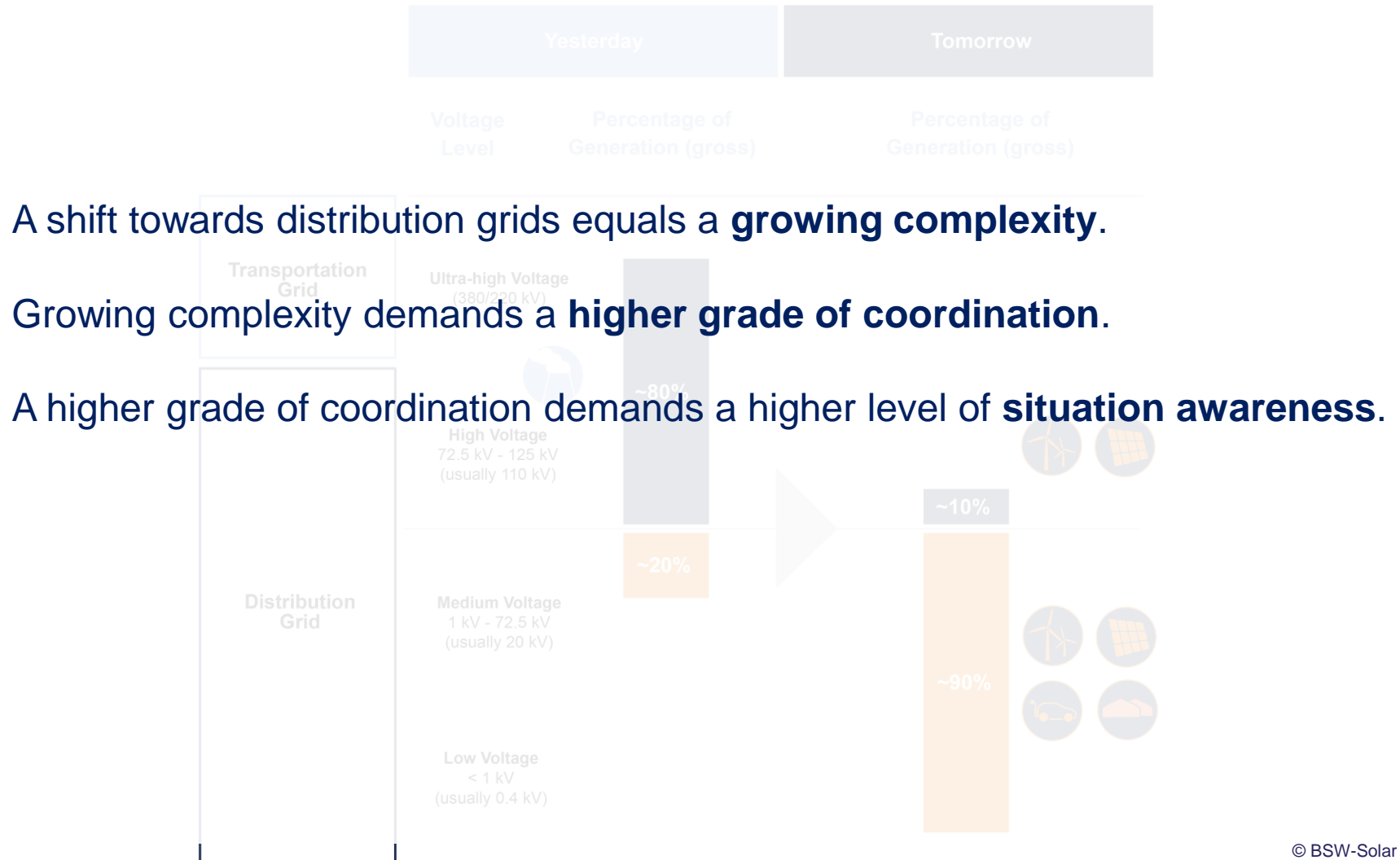
Renewables

A shift towards distribution grids



Renewables

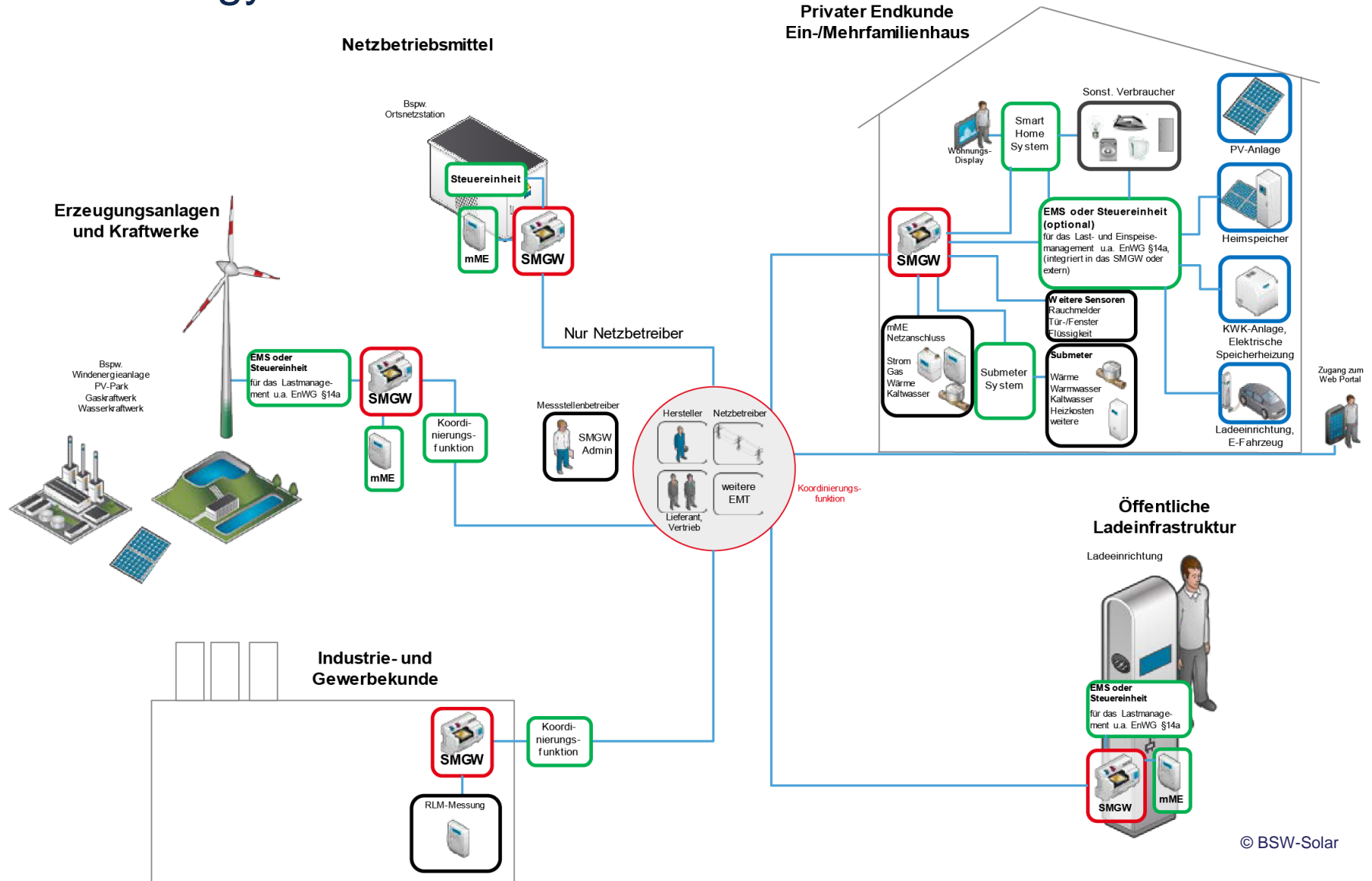
A shift towards distribution grids – consequences



Solution: the digitalization of the energy transition

How can we coordinate the **growing complexity** of the **energy system** due to the **integration of renewables**?

The Smart Meter Gateway – the German solution to digitize the energy transition



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Outlook & Summary

After a few years of relatively weak market development, **we now see increasing installation rates** as the simultaneous nuclear and coal phase-out drives demand.

For Germany in 2019, we expect

- Residential PV: 450 – 500 MW in 2019 (*2018: 420 MW*)
- Commercial PV: 2,100 – 2,400 MW in 2019 (*2018: 1,780 MW*)
- Ground mounted PV: 900 – 1,100 MW in 2019 (*2018: 750 MW*)

Total market (expected): **3,500 – 4,000 GW** in 2019 (*2018: 2,950 MW*)

Market drivers Tender; Regular-, Extra-, Joint- and Innovation-Tenders; Tender-Volume: 2019 ~ 2.0 GW; 2020 ~ 2.5 GW; 2021 ~ 2.8 GW

Main business models / without tenders: Commercial/Industrial PV, Prosuming, PPAs, Storage - **All segments hedge electricity costs!**

Estimations show an **additional investment volume of about 3.5 to 4.5 billion Euros** in the German PV market due to the extra tenders

We also expect a rising PV share in **German gross power consumption**;
In 2018 about **8 percent**; 2020 up to **10 percent** feasible

**Thank you very much
for your attention!**



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