Federal Ministry for Economic Affairs and Energy

Distributed PV-generation for C&I Developments in the lead market Germany

MITTELSTAND GLOBAL ENERGY SOLUTIONS MADE IN GERMANY

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Berlin / Delhi, 26 May 2020

Facilitator:

eclareon

Agenda

BSW-Solar

The global picture

Latest trends in Germany‘s PV market

- C&I segment as market driver

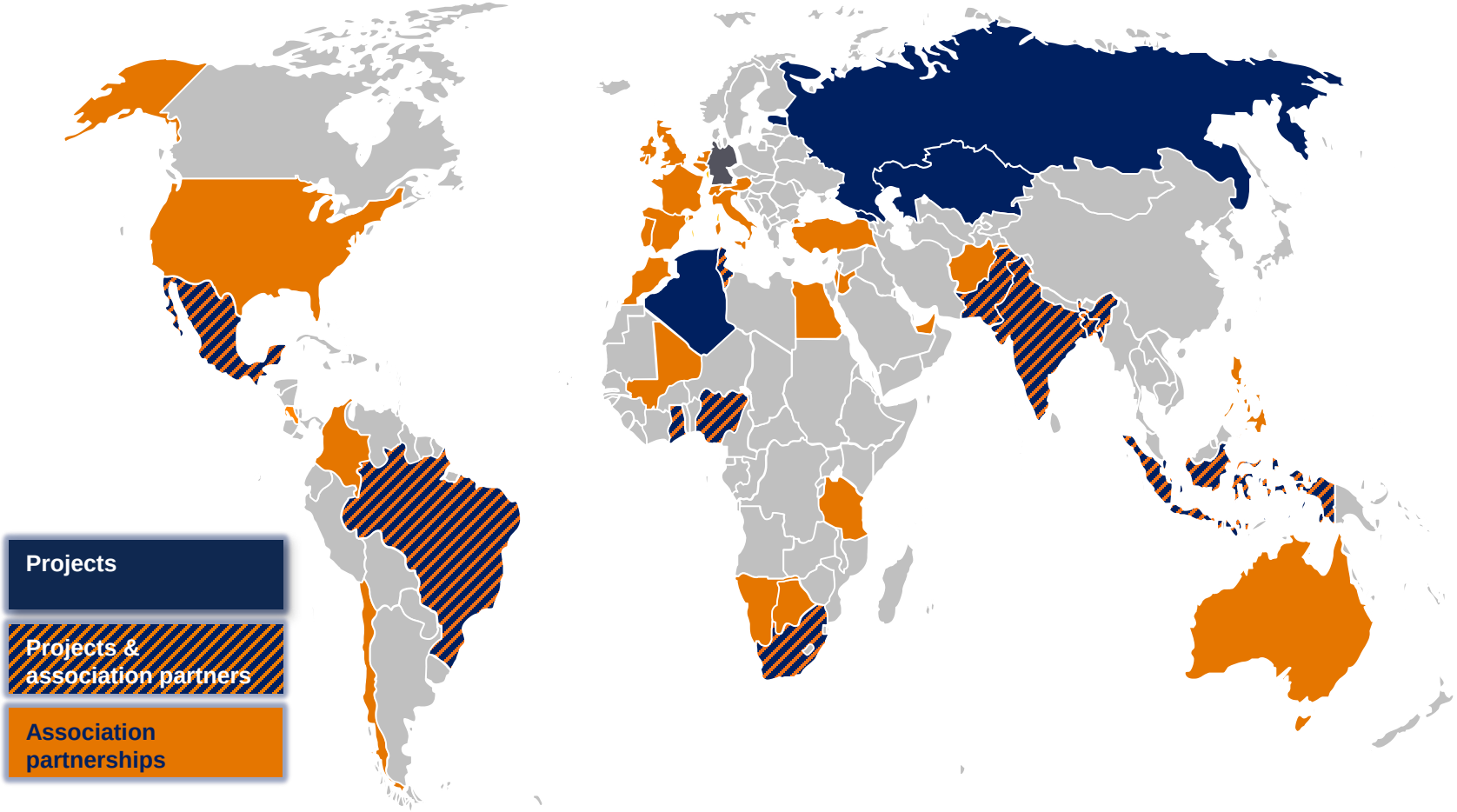
COVID 19 – effects on the market in Germany

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

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



Agenda

BSW-Solar

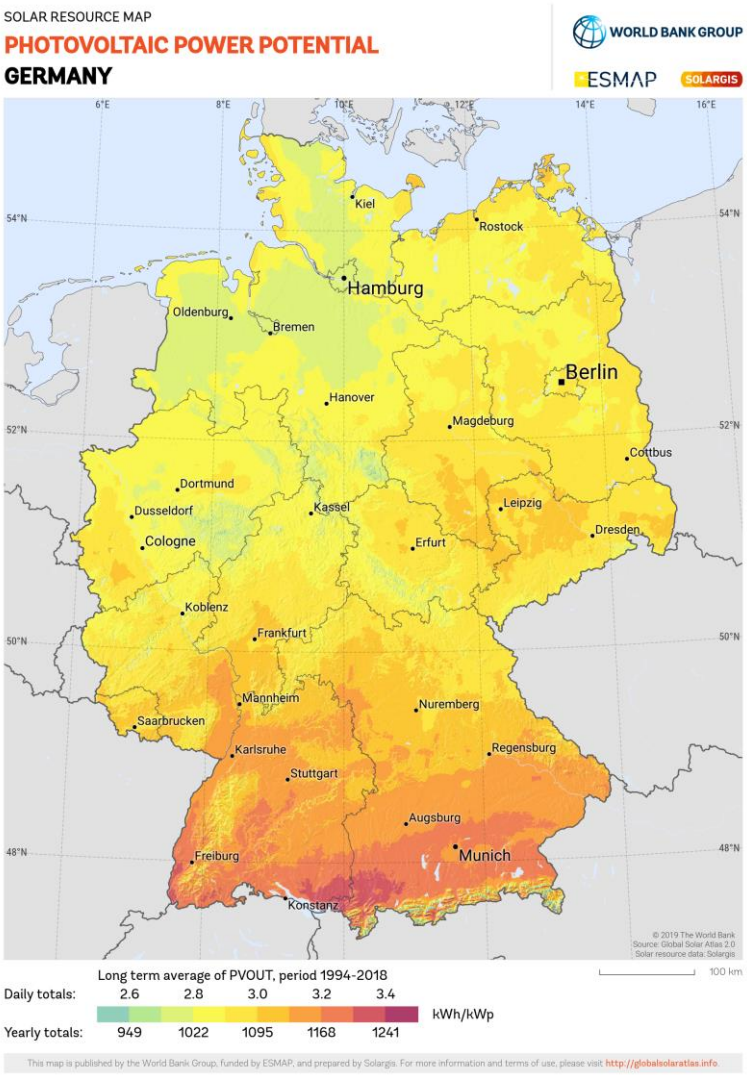
Latest trends in Germany‘s PV market

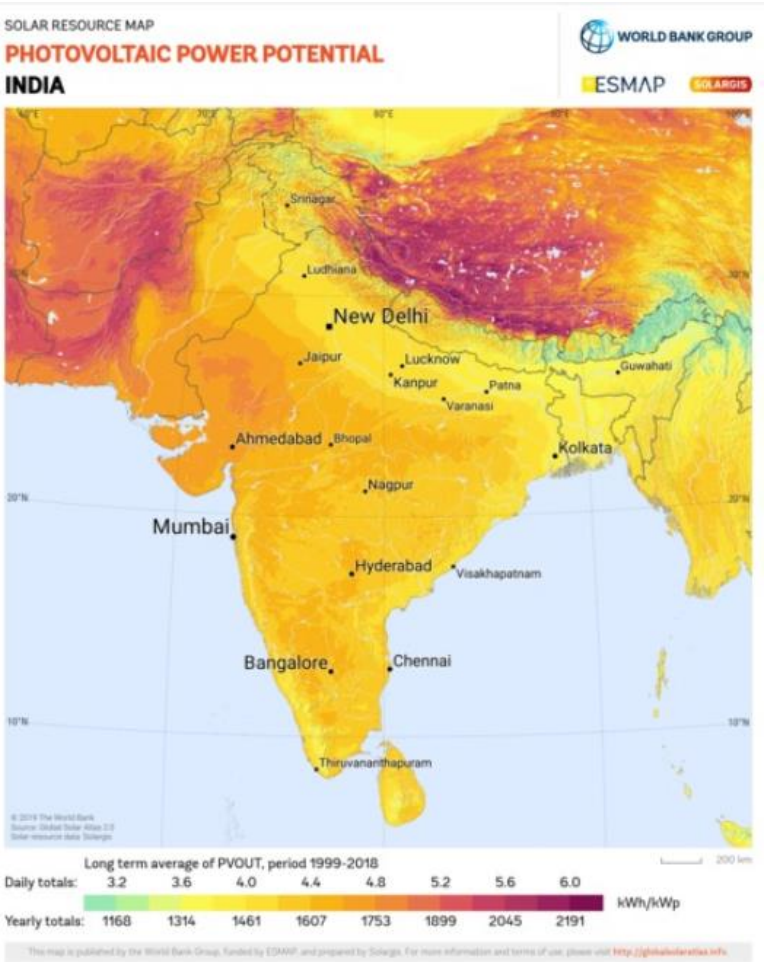
COVID-19 - impacts

Outlook

Germany: Now more than 50 GW PV capacity installed

Close to 4 GW added in 2019





…so why did it happen in Germany first?

- There was support for renewables across party lines on a national level
- There was a strong environmental movement paired with world-class engineering and business-minded entrepreneurs
- A permit for a PV installation was two pages
- There was high availability of skilled crafts and trade
- There was a priority for green energy connections to the grid

Image Credit: NASA, Iconshock

PV currently is economically viable in areas where this was unthinkable five years ago

Yakutia, Russia

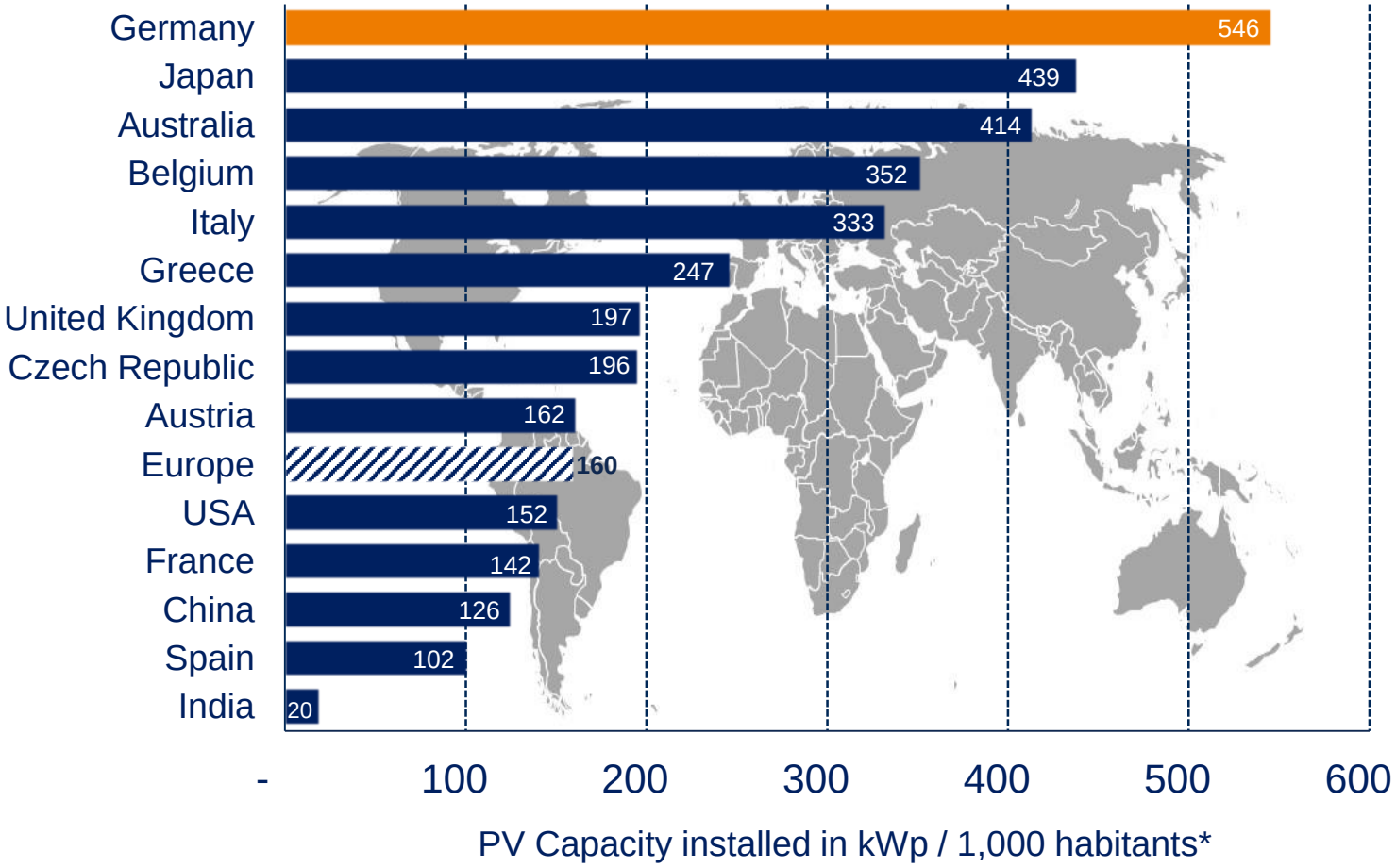
http://патриотам.рф/otkryta-krupnejshaya-v-zapolyare-solnechnaya-elektrostanciya/

Severny, Russia

http://www.es-ufa.ru/news/detail.php?ELEMENT_ID=2089

Germany leads the PV world in per capita capacity

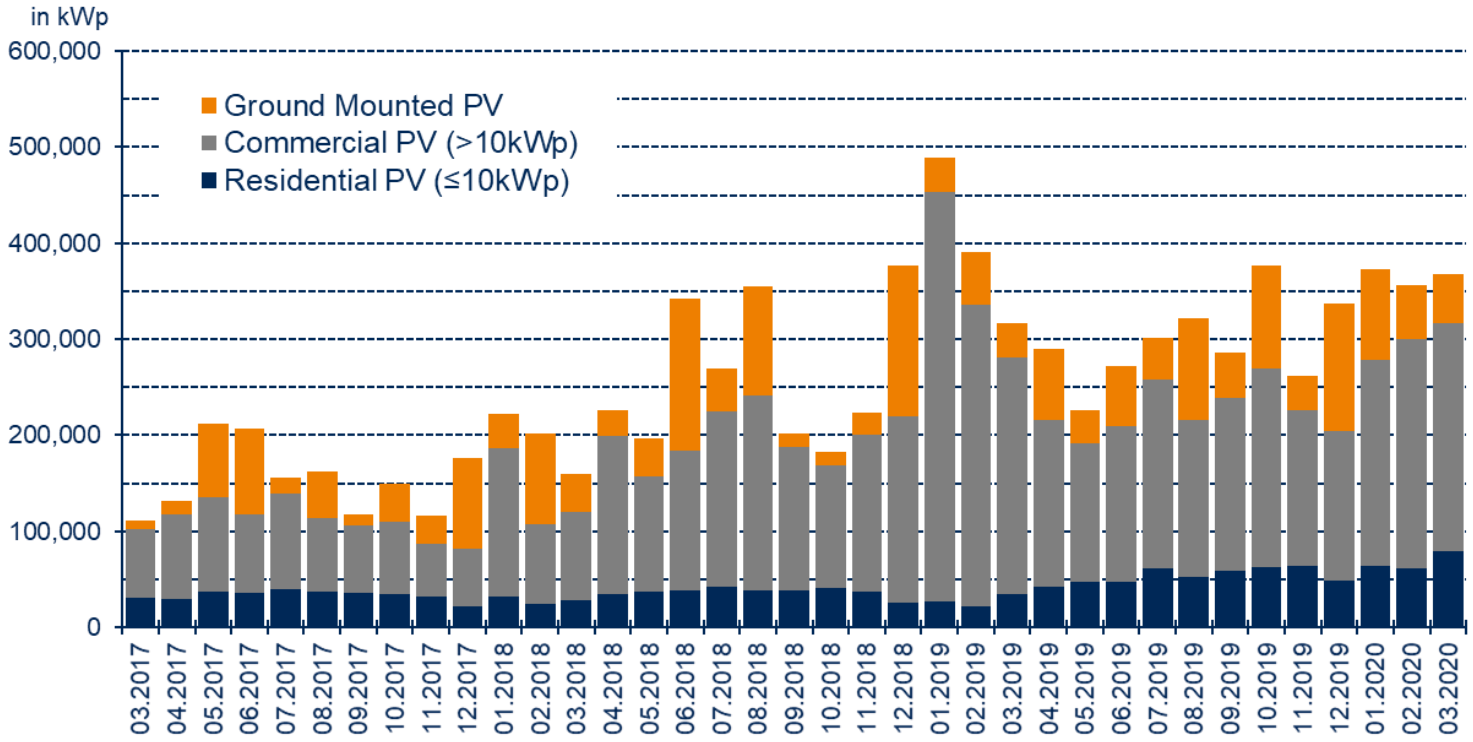
2018 Solar Energy supplies power for 11 Million households



Sources: BSW, IRENA, IMF, The World Bank; 10/2019
*Cumulative PV capacity installed as of December 2018 in kWp
Note: Ranking of countries remains unchanged with June 2019 population numbers

Recent Market Development (I) – the overall picture

- In 2019 German PV market grew for the fourth year in a row
- Commercial segment remains the main market driver (Peak in early 2019 due to announced reduction in feed-in tariffs)
- Lower installed capacities of ground mounted PV in 2020 so far, as numerous projects from earlier auctions are not being build



Source: BNetzA, BSW-Solar; 05/2020

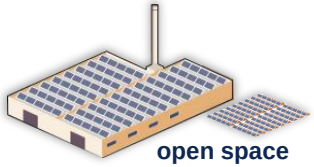
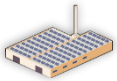
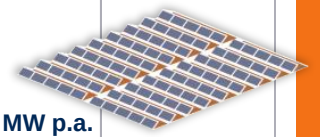
Important lesson: Security for investors is the key!

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

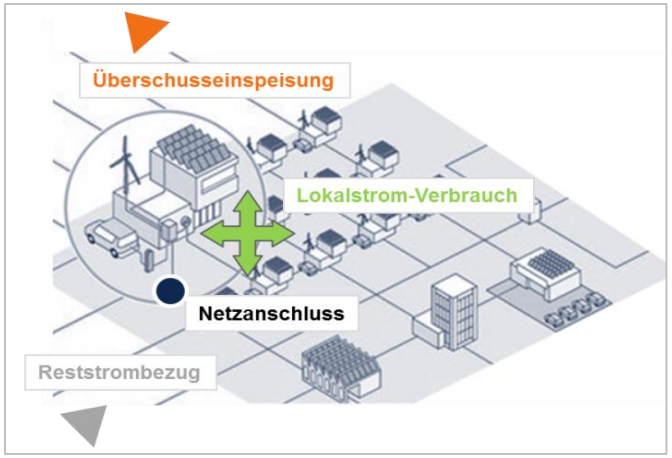
Basic market structure:

Buildings and open field installations

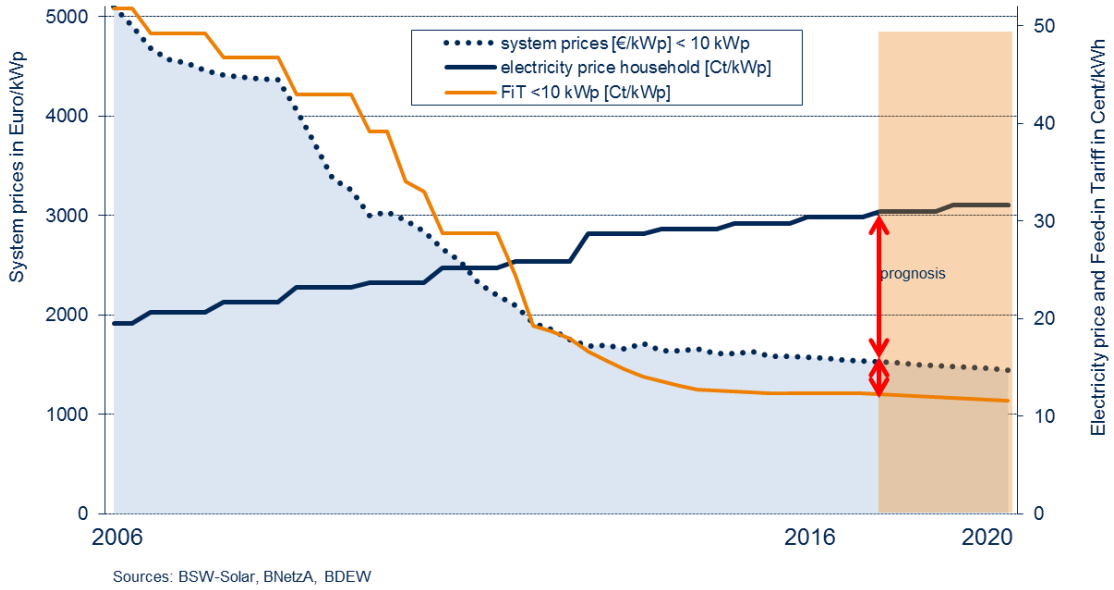
	up to 10kW	> 10kW to 100kW	> 100kW up to 750kW	> 750kW up to 10MW	> 10MW
Newly installed capacity and Market share PV in 2019	**570 MW 15%**  de minimis limit 0% (§ 61a EEG)	**717 MW 19%**  **tenant solar** (Section 21 (3) EEG)	**2.020 MW 52%**  **open space**	 **3x 300 MW p.a.** (§28 EEG)	**558 MW 14%** 
Buildings / Area scenery	• One and two-family houses • Small commercial roofs	• MFH, • Barns/stables, • commercial operations • trade • administration • schools	• Large agricultural holdings • Large supermarkets • factory buildings • open space • structural facilities	• open space • Conversion areas • structural facilities • large roofs	• Buildin g site
Plant operator	• private individuals • building owner) • small trade	• private individuals • farmers • small businesses, public sector	• Farmers Farms • open. hand • fund • Project companies • ENERGY SUPPLY COMPANY	• fund • Project and civil societies • ENERGY SUPPLY COMPANY	• ENERGY SUPPLY COMPAN Y • Capital-comp

Trend (I)
Self-consumption / Prosuming

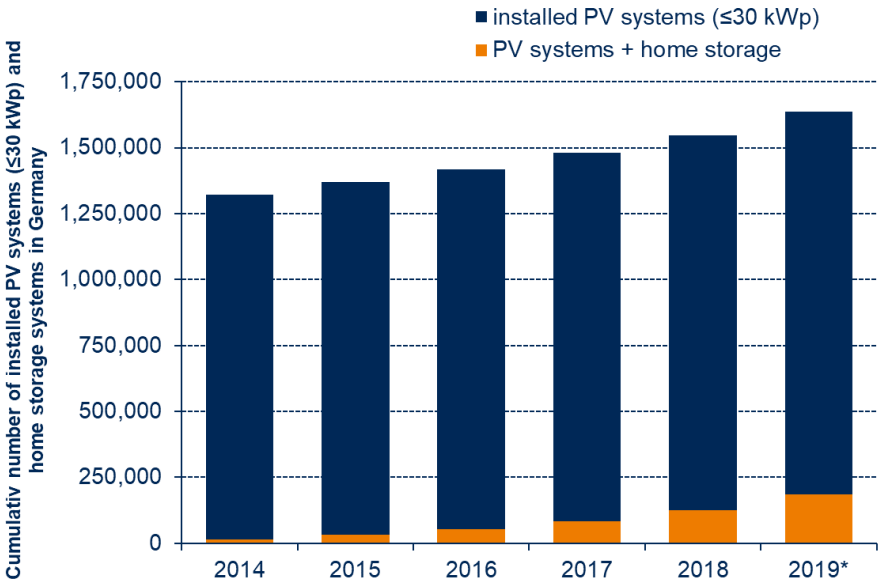
- Decreasing PV system prices reduce electricity cost; as a driver of the majority of PV installations
- In many cases solar energy is cheaper than electricity from the utility
- Almost 100,000 new „Prosumenten“ in Germany between February 2019 und January 2020



Particularly attractive in the commercial / industrial sector



Trend (II)
Storage



* estimated
Source: BNetzA, BSW-Solar; 05/2020

- ~ 60,000 new stationary battery storage systems in 2019 **(~180,000 batteries** for the end of 2019)
- **Average annual growth rate: around 50 % since 2016**
- 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 (< 30 kWp) without home storage systems
- Retrofit potential is growing by declining storage prices
- Reached storage parity in 2019
- Combination with EV expected to drive the market further

Trend (III)
Growing commercial and industrial segment

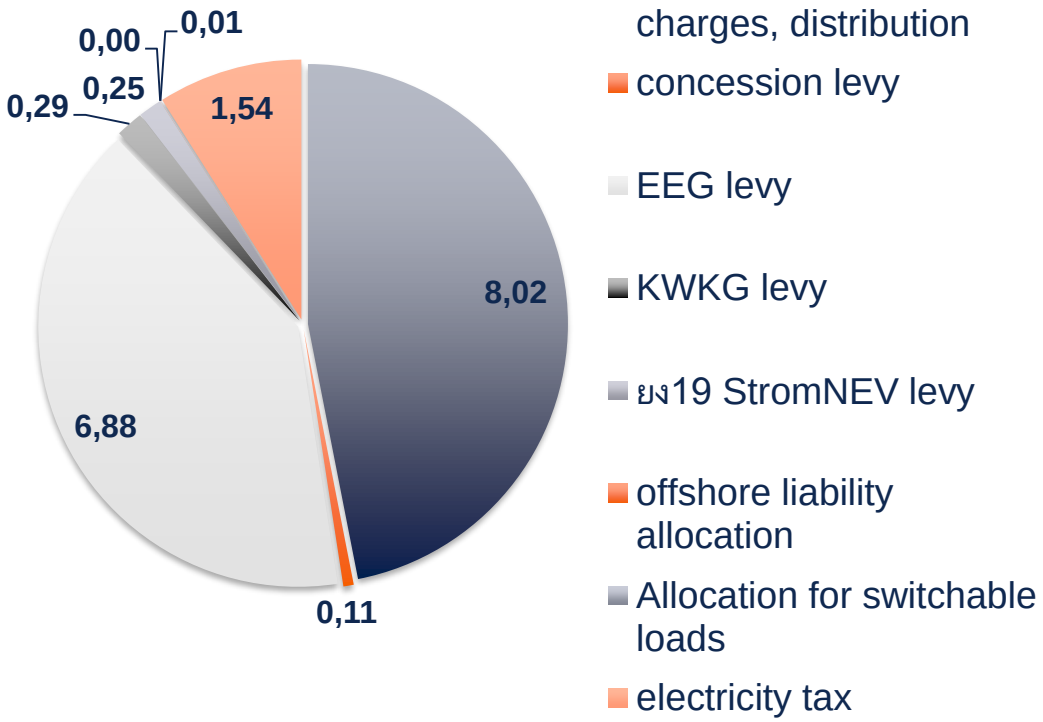
- Rooftop systems **up to 750kWp;** no special building permit required
- Best with **east / west orientation** to produce more electricity throughout the day - **increases self-consumption**!
- Self-consumption possible, but there is a EEG surcharge of approx. 2.7 €ct / kWh
- **PV electricity production costs (all in) <10 € ct / kWh**
- **Feed-in-Tariff up to 100kWp: currently ~ 7,50 €ct/kWh** (20 years)
- > 100kWp: mandatory direct marketing (**Compensation = Feed-in-Tariff** *minus* **market price**)

Foto © Christian Meyer, Hermann Meyer, Germany

Self-consumption model – what makes PV so attractive
Reduction of electricity price components possible (industrial plants)

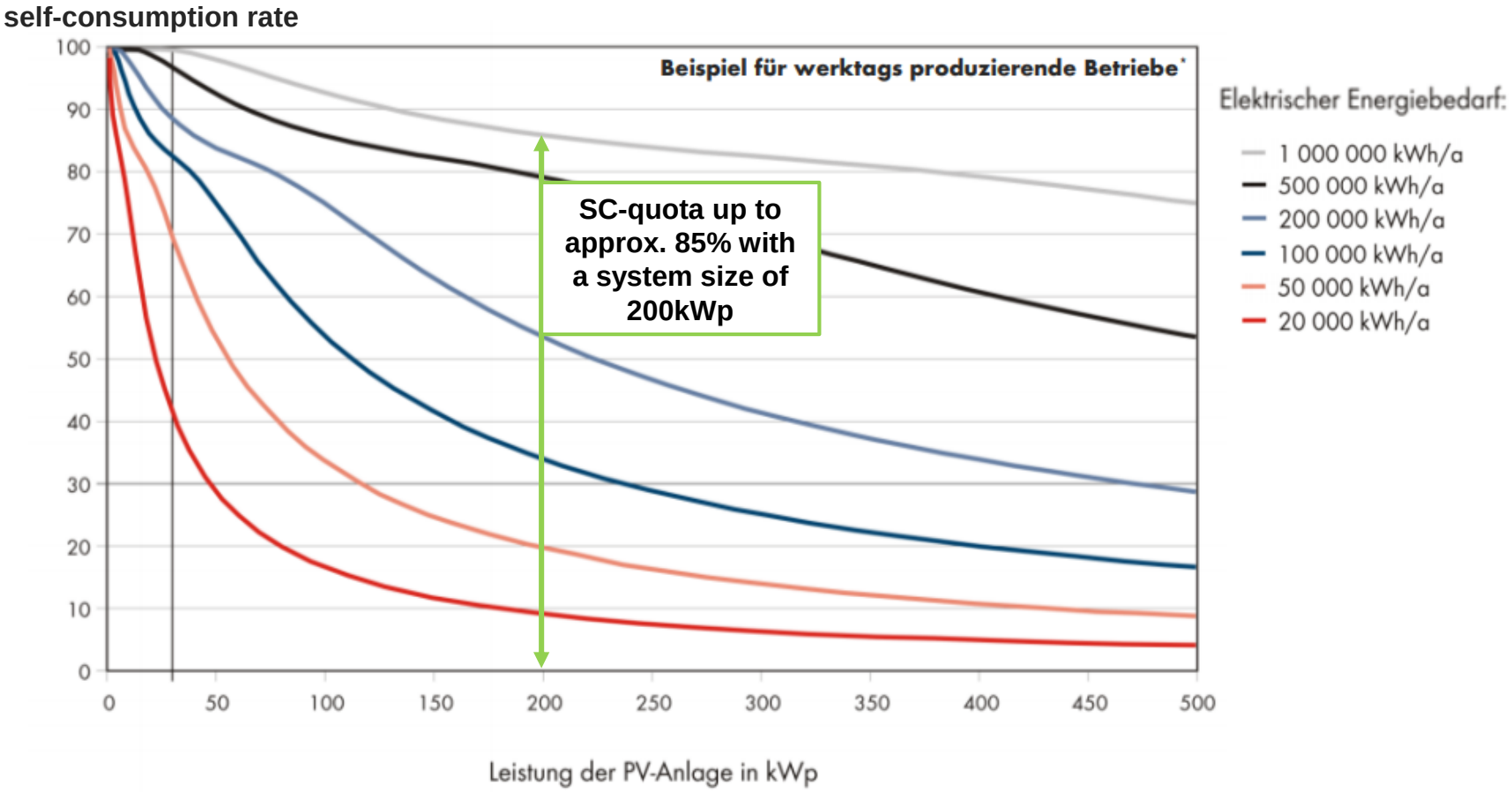
1. ~~The EEG levy~~ **0 or 40% of the total**
2. ~~The electricity tax~~
3. ~~concession fees~~
4. ~~network charges~~
5. ~~The CHP levy~~
6. ~~§ 19 Allocation~~
7. ~~The offshore liability allocation~~
8. ~~The switchable load allocation~~

Price components electricity bill*



*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)

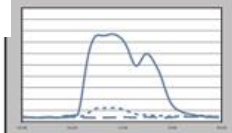
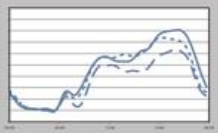
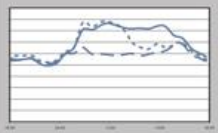
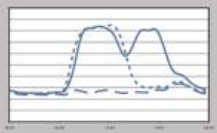
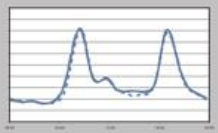
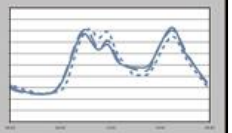
Basic information - Self consumption rate: Percentage of self-consumed PV electricity



Power requirement and system size determine SC rate

Source: SMA

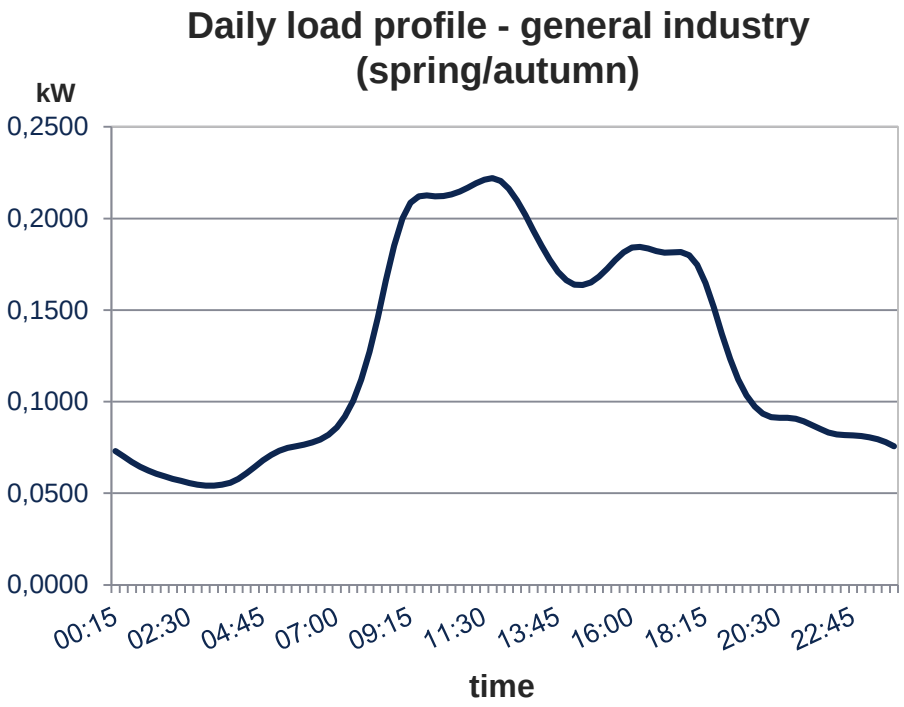
Basic information - SC rates as a function of the specific load profile of commercial enterprises

	Commercial daytime 8-18 h	Commercial afternoon / evening	Commercial contious	Commercial shop hours	Agriculture – dairy production	Agriculture – others
	G1	G2	G3	G4	L1	L2
Typical load profile						
Self consumption ratio	10 - 90 %	10 - 100 %	10 - 100 %	10 - 90 %	20 - 70 %	10 - 100 %
Use case examples	Office buildings Education Canteens Hospitals Amdinistaration Public Agencies Banks Service providers Medical institutes **C & I** Construction Crafts facilities, Auttomobile Sales offices	Hotels Restaurants Cafes Service stations Cultural, sports, leisure business Lighting	Shops with cooling Cooling / ventilation facilities Parking buildings IT-infracture Sewage cleaning facilities	Shops Department stores Cleaning Services	Dairy process plants (milking (2 day) & cooling	Agricultural companies with production and linving area Animal raising

Source: SMA

Basic information - Optimization possibilities Solar power generation

- Solar power generation should be dimensioned as optimally as possible for the daily consumption of the company, e.g. with regard to:
  - running production machines
  - air conditioners
  - Emergency lighting etc.
- Yield increases possible through sector coupling (e-mobility, storage)
- Introduction of a controlled load management if necessary sensible
- Prerequisite for this are common energy management systems (EMS)



Quarter-hour output values for annual consumption of 1,000 kWh/a

Trend (IV)
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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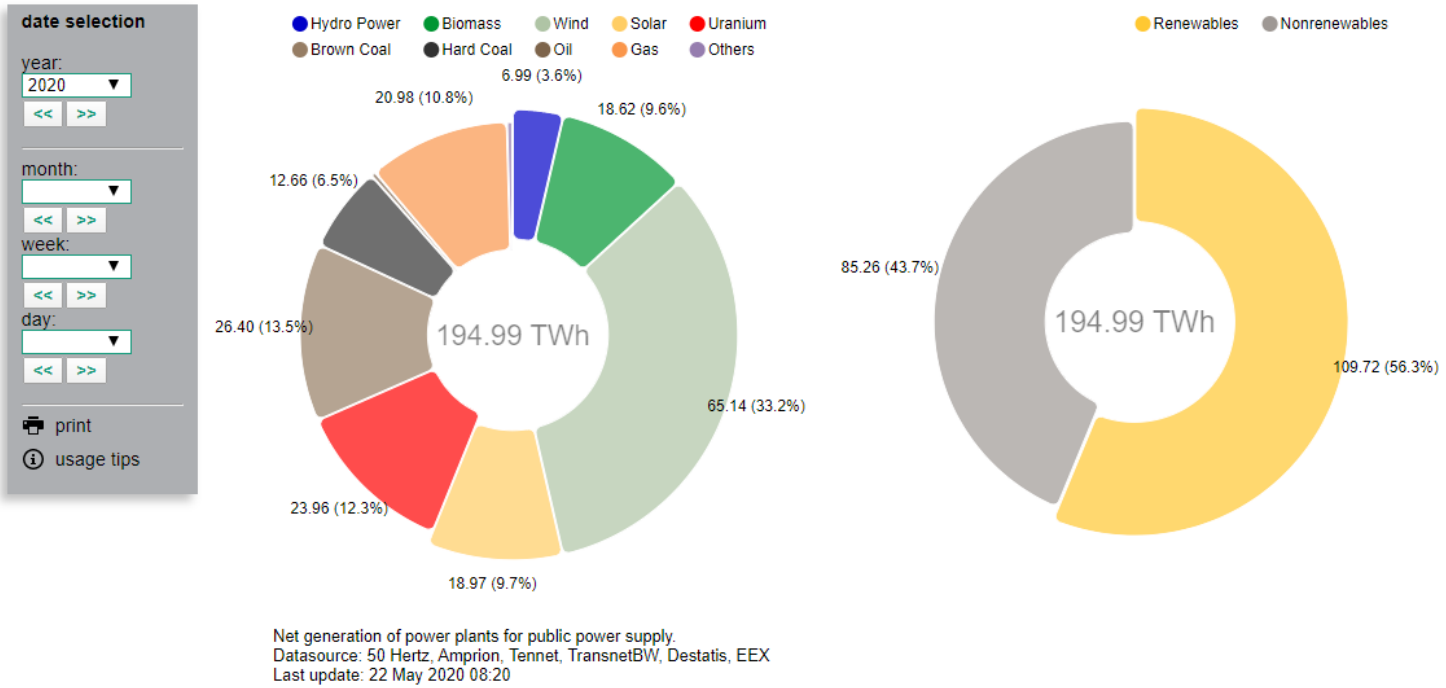
COVID 19 – effects on the market in Germany

Outlook

Impacts of COVID 19 + 52 GW PV cap for EEG-scheme

Increase in the generations of Renewable Electrictiy in 2020 >55 % (due to wind and solar) and reduced electricity consumption

Net public electricity generation in Germany in 2020



Net generation of power plants for public power supply.
Datasource: 50 Hertz, Amprion, Tennet, TransnetBW, Destatis, EEX
Last update: 22 May 2020 08:20

Impacts of COVID 19 + 52 GW PV cap for EEG-scheme

But delays ……..

1. . …… in the supply chain in February – April 2020 – especially with goods purchased in China
2. ……in the completion of solar projects / large ground mounted fields (in Germany) due to restriction in work processes – extension of deadlines by the Federal grid agency (+6 months)
3. …… and rejection info financing facilities for new projects by banks (due to 52 GW cap)
4. …… and abstention in investments in new projects, especially with residential customers due to (economic) insecurities + difficulties of project financing

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.

Germany remains the lead market for many applications with around 4 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
- **Commercial/Industrial PV, Prosuming, PPAs, Storage** - all segments hedge electricity costs!

- We also expect a rising PV share in **German gross power consumption**; In 2020 up to **10 percent** or even more due to reduced electricity consumption

COVID 19

COVID 19 has impacts on supply + for PV systems (short run) as well as investments for residential systems – nevertheless, the insecurity for the 52 GW cap has had more impacts on the total market in 2020 in Germany – nevertheless recover in Europe will take more time then expected

EU – Green Deal + Corona Recovery Activities might lead to further incentives for Green Technologies

Contact us

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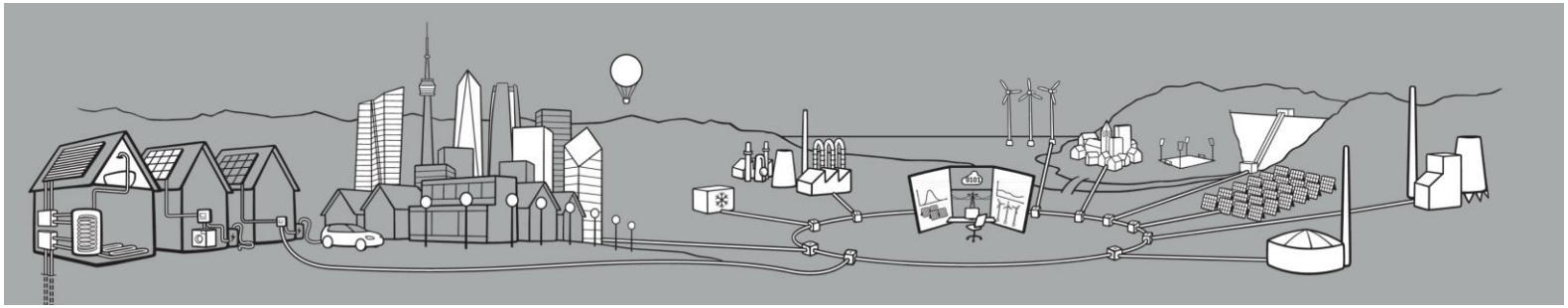

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Thank you very much for your attention!

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Source: Solarmarkt