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Part of THE smarter EUROPE

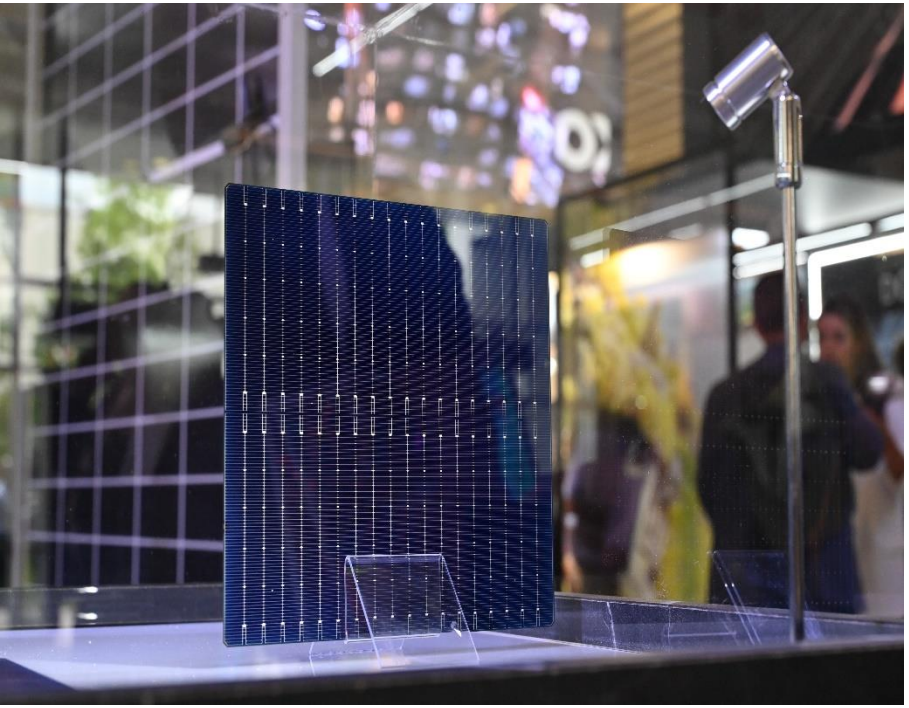
Market Study – The German PV and Battery Storage Market

Tuesday, July 30 2024

Welcome

Horst Dufner, Head of The smarter E Europe,

Solar Promotion GmbH

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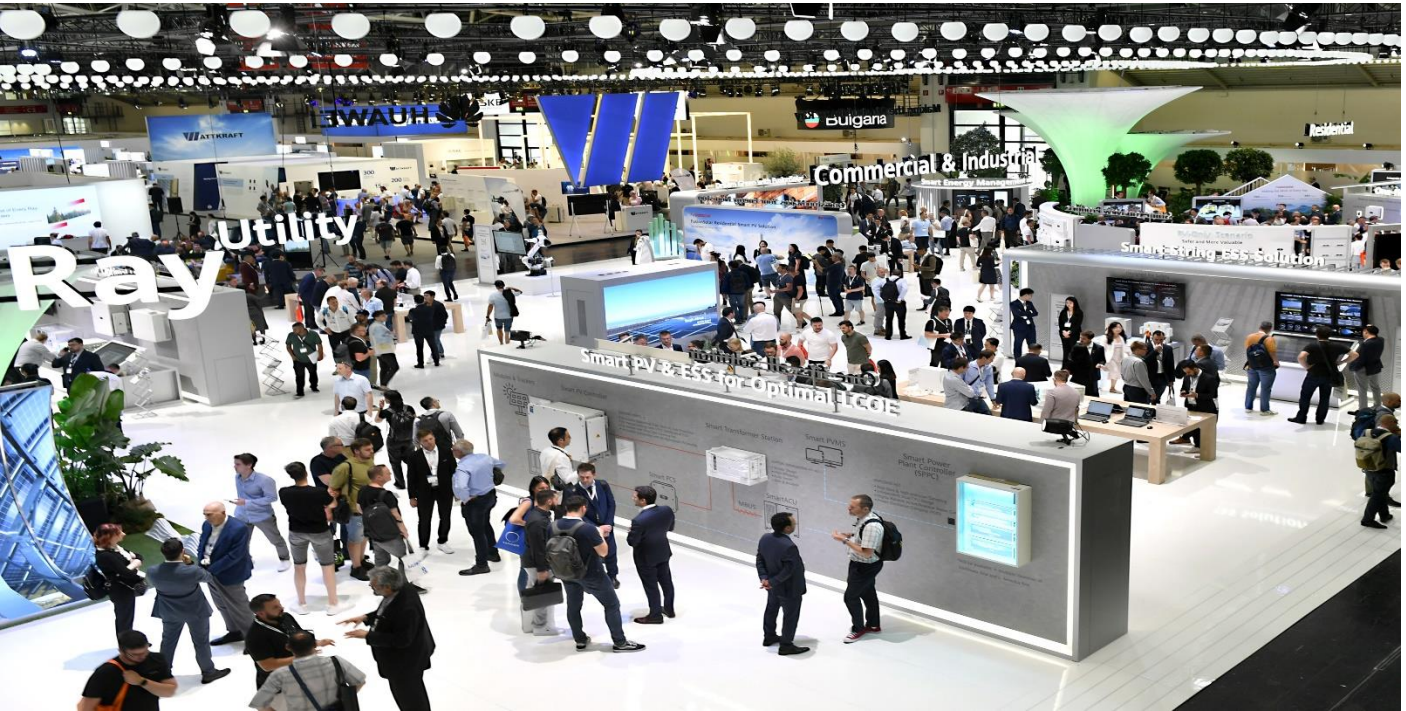
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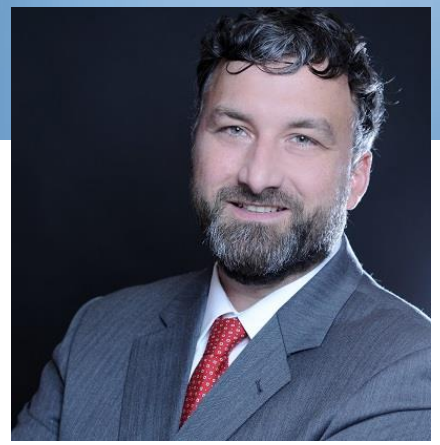


Speaker

David Wedepohl

Managing Director International Affairs, BSW-Solar

Speaker

Dr. Christoph Kost

Head of Group Energy Systems and Energy Economics, Fraunhofer ISE

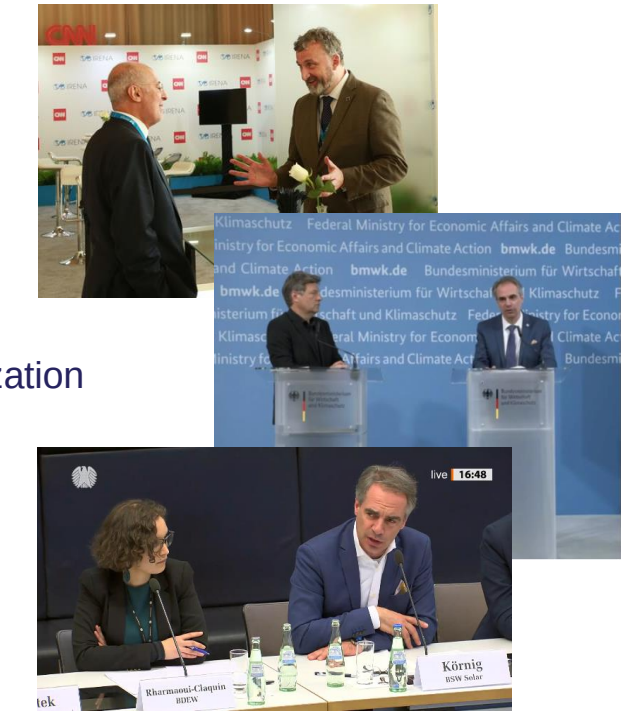
Solar Coaster Ride – Understanding the Continent's Most Ambitious Solar Market

2nd Quarter of 2024 - Market update from the German Solar Association (BSW-Solar)

www.solarwirtschaft.de

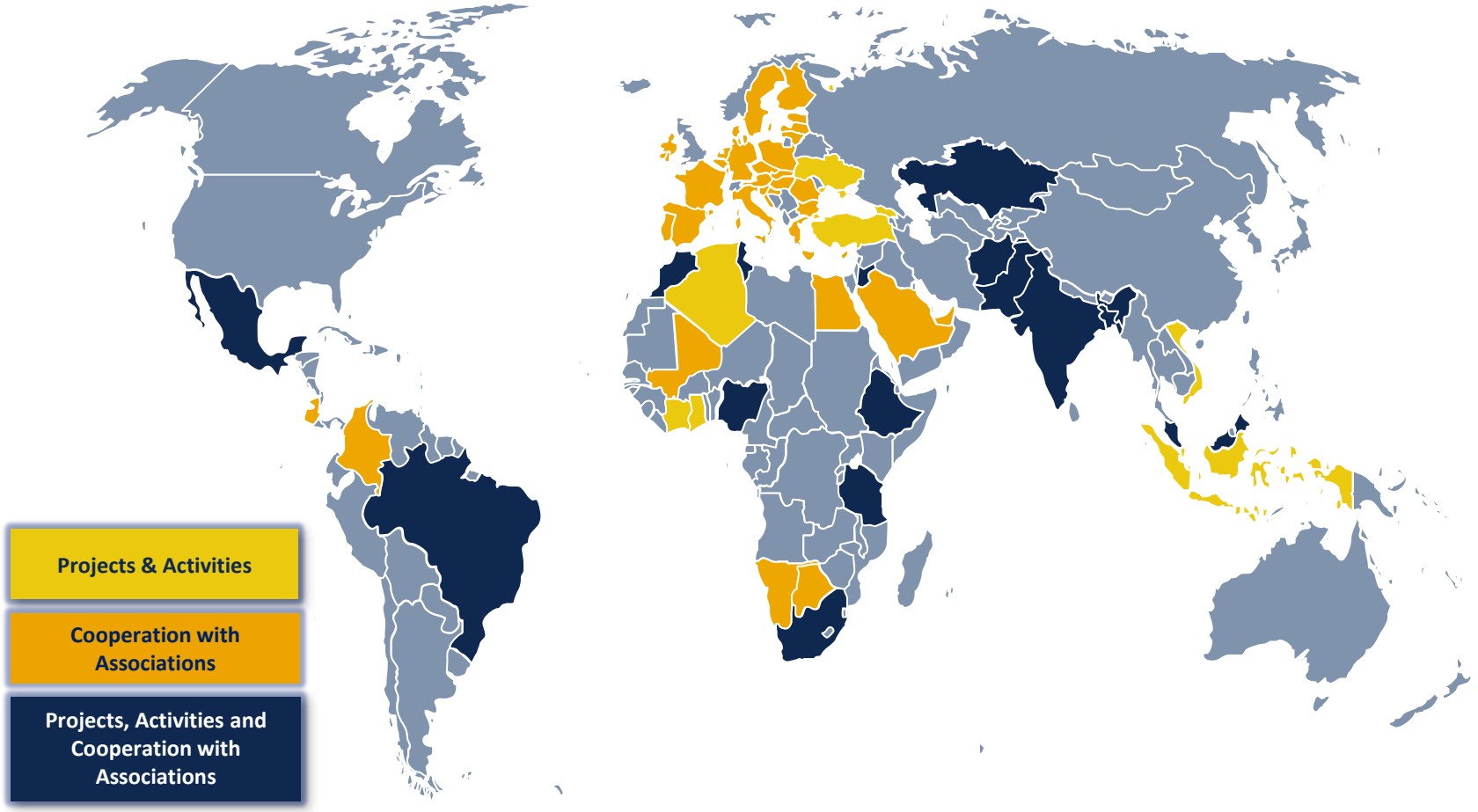
BSW = Bundesverband Solarwirtschaft e. V.
= German Solar Association

TASK	To represent the solar industry in Germany in the photovoltaic, thermal 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 43 years
REPRESENTS	Over 1,100 solar producers, suppliers, wholesalers, installers and other companies active in the solar business from all over the world
HEADQUARTER	Berlin



Equipment → Materials → System components → Wholesale & Distri-bution → Project Develop-ment → Con-structi on → O&M

BSW-Solar: Working worldwide to improve frameworks for the use of solar energy!



BSW represents around 1,100 member companies!

… as well as many installing companies!

Logos of selected BSW members

Flashback: Market Report and Deep Dive into the Solar Boom of 2023

This is what AI thinks a solar Deep Dive in Germany looks like

- **Annually added PV capacity doubled within one year** (2022: around 7.5 GWp, 2023: around 15 GWp) **and a ten-fold increase since 2016**
- **Annual number of newly commissioned** PV systems in residential segment increased more than ten-fold since 2018
- **All PV market segments significantly bolstered**
- **Annually added residential storage systems more than doubled** within one year
- **PV and storage as an economic driver in Germany** (around €30bn turnover and 118,000 jobs)

Bound for a Solar Coaster Ride? German Market Report through Q2 2024

This is what AI thinks a Solar Coaster looks like

- **Already 7.7 GWp at the end of June 2024**
  (more than the annual 7.5 GWp in 2022 and
  > half of the annual 15 GWp in 2023)

- **Overall, 8% growth** over the capacity installed in the first half of 2023 (without considering late registrations)
- When taking **late registrations** into account*:
  24% growth over the first half of 2023

- **But: PV market segments on diverging trends***
  -6% change in residential PV compensated by
  +55% growth in commercial and ground-mounted PV

- **Battery storage in Germany reaches 15.8 GWh in Q2 2024***
  +3% growth in residential storage over last year and
  +35% in commercial storage yield overall **+11% growth**

Data Source: BSW based on core energy market data register (Marktstammdatenregister) and commissioning date of PV unit; as of 24th of July 2024
* Comparison based on registered commissioned units within identical registration periods to eliminate the distorting effect of late registrations

Comparing Apples to Oranges! Wait, there is also a Pear..?

30 days after the end of a month, still roughly 30% of eventual registrations are missing

Careful data analysis shows

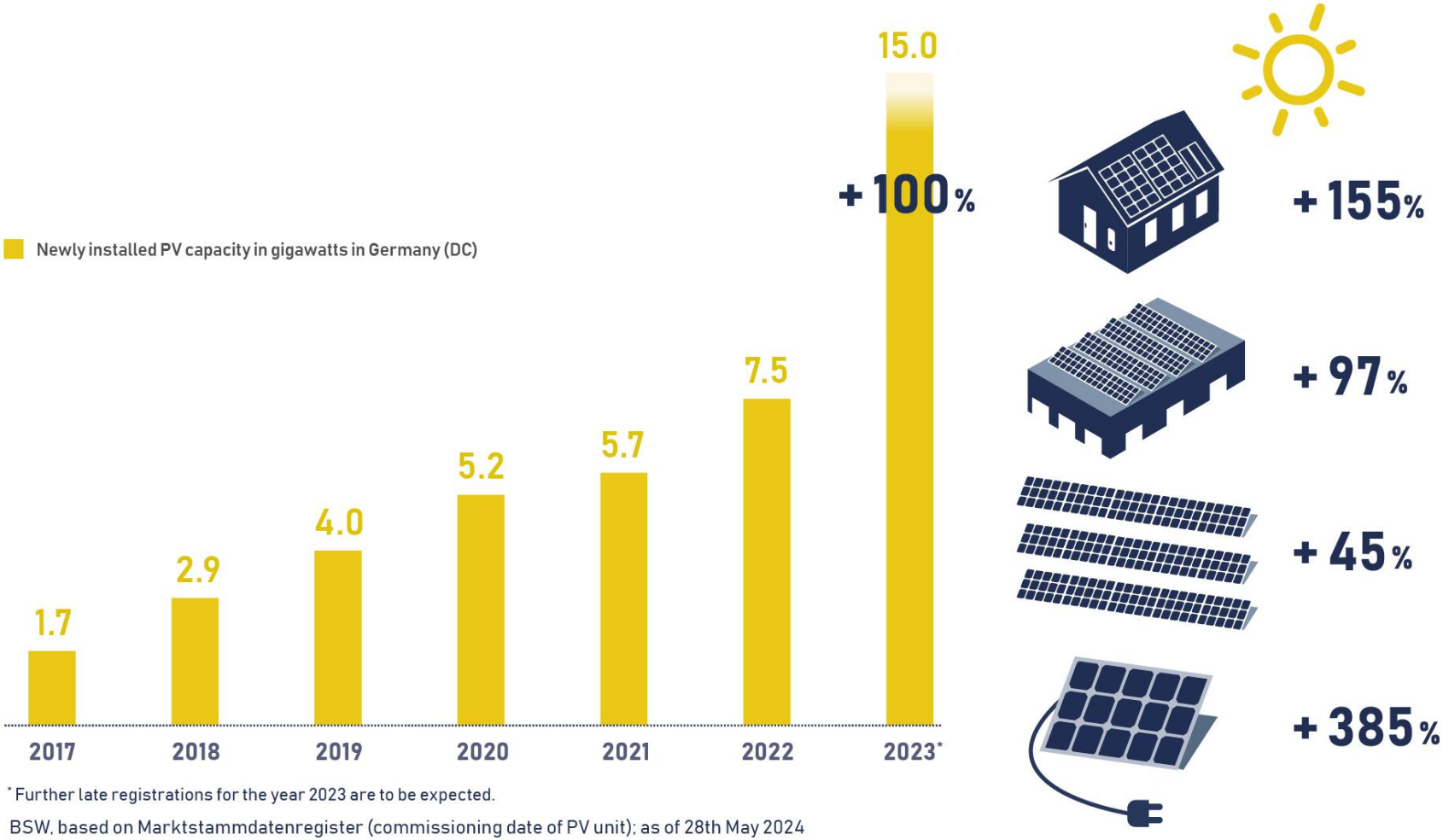
- **PV market growth** in the first half of 2024 (**+24%** over 2023*)
- **Ignoring late registrations** makes **current year always look bad**
- Commissioned PV systems ≠ **Newly ordered systems**

  → Observed order patterns are an important early alert signal
  → Installers know their order books → Signals to be taken serious!
- **Take away:** Do not just compare the

  # of currently commissioned PV systems 
  to
  # of incoming new orders 
  to
  # of historically commissioned PV systems 
- **Outcome: Overall market growth** but slow residential market & post-boom-competition → many firms **experience a Solar Coaster**
- **22 GW target** needs supportive **policy framework**

Sources: Abhijit Tembhekar (via Wikipedia), 3268zauber (Wikimedia, CC BY-SA 3.0), Wikimedia
Data Source: BSW based on core energy market data register (Marktstammdatenregister) and commissioning date of PV unit; as of 24th of July 2024
* Comparison based on registered commissioned units within identical registration periods to eliminate the distorting effect of late registrations

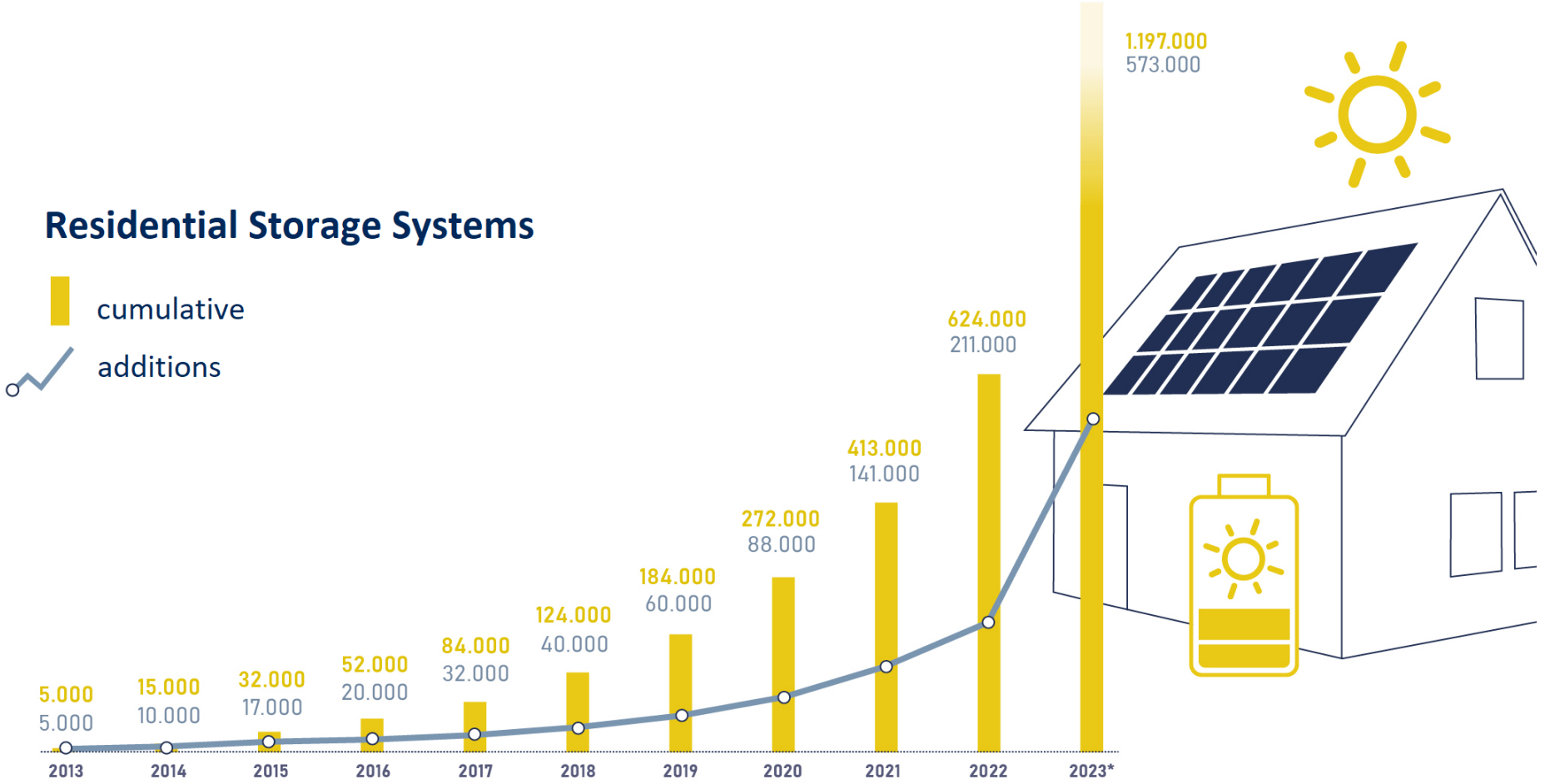
Flashback: Doubling of newly installed PV capacity in 2023 vs. previous year and > 1m new PV systems deployed



* Further late registrations for the year 2023 are to be expected.

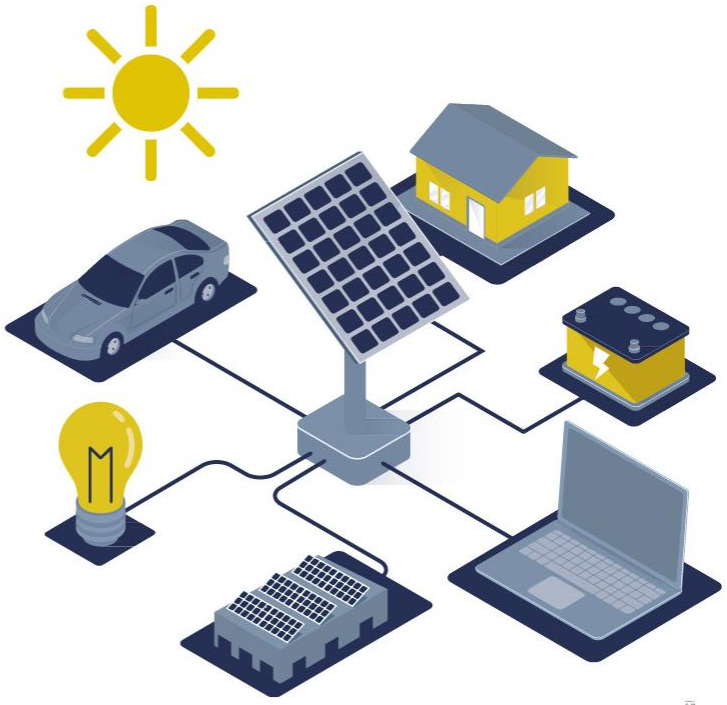
BSW, based on Marktstammdatenregister (commissioning date of PV unit); as of 28th May 2024

Flashback: 1.2 million Residential Storage Systems by end of 2023
Annually added systems more than doubled within one year



*Late registrations and revisions for 2023 to be expected, contains estimates of late registrations based on observations of previous years
Source: BSW, based on Marktstammdatenregister as of January 5th 2024

Photovoltaics an economic driver in Germany with approx. €30 billion turnover in 2023



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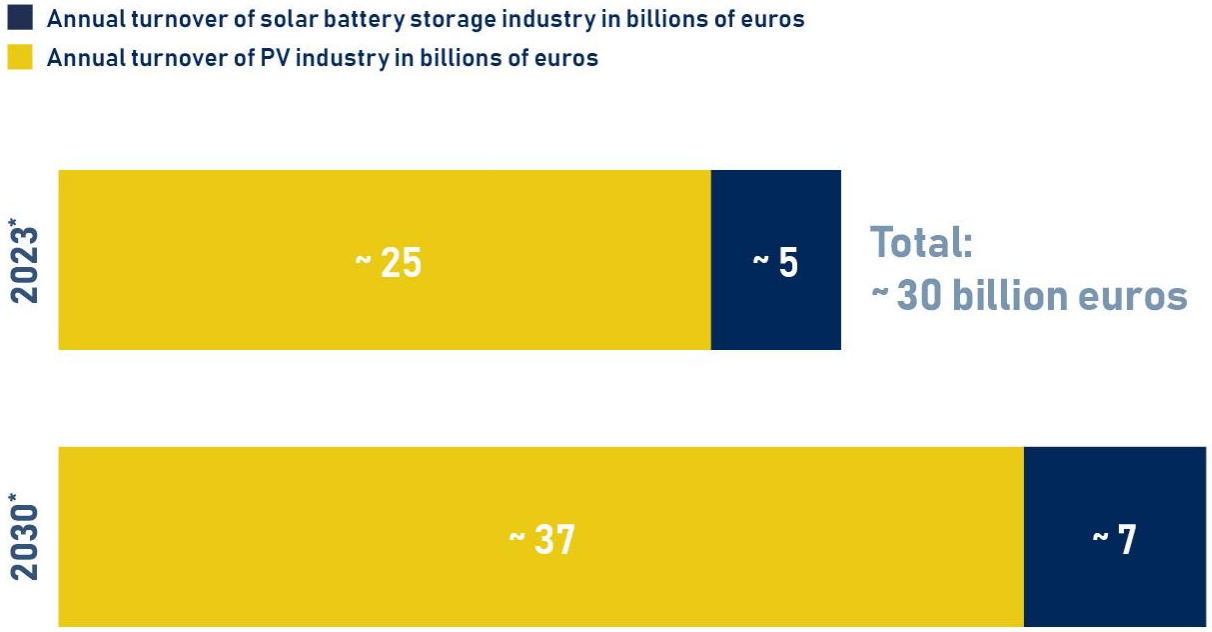
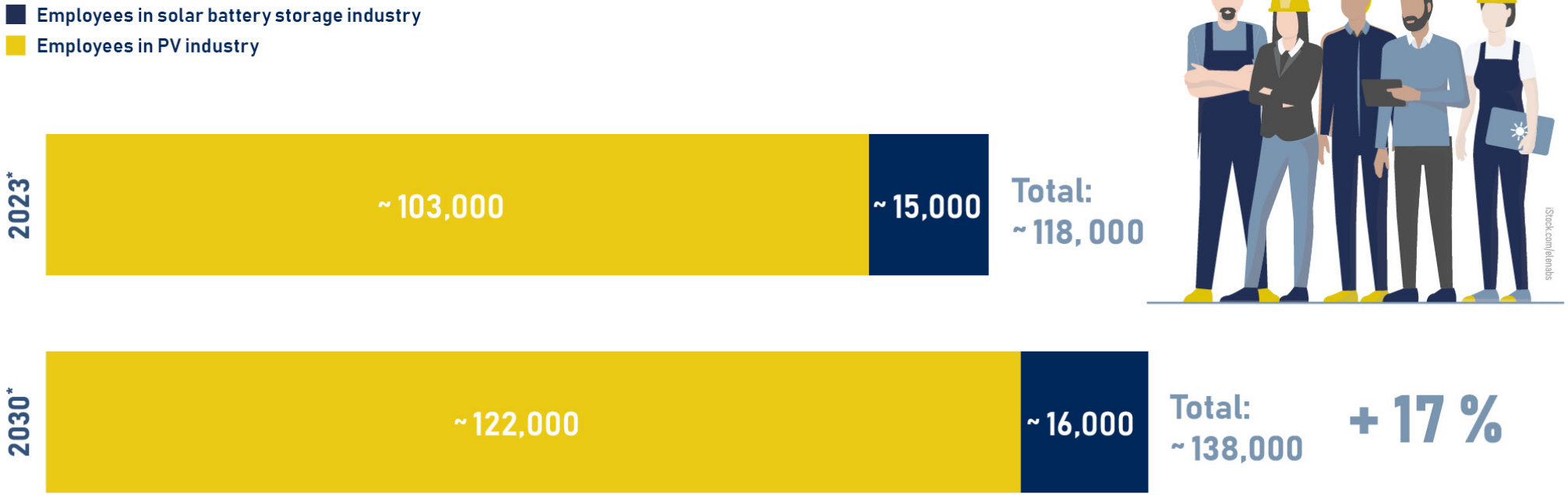


Source: EUPD Research, 2024, * Estimate

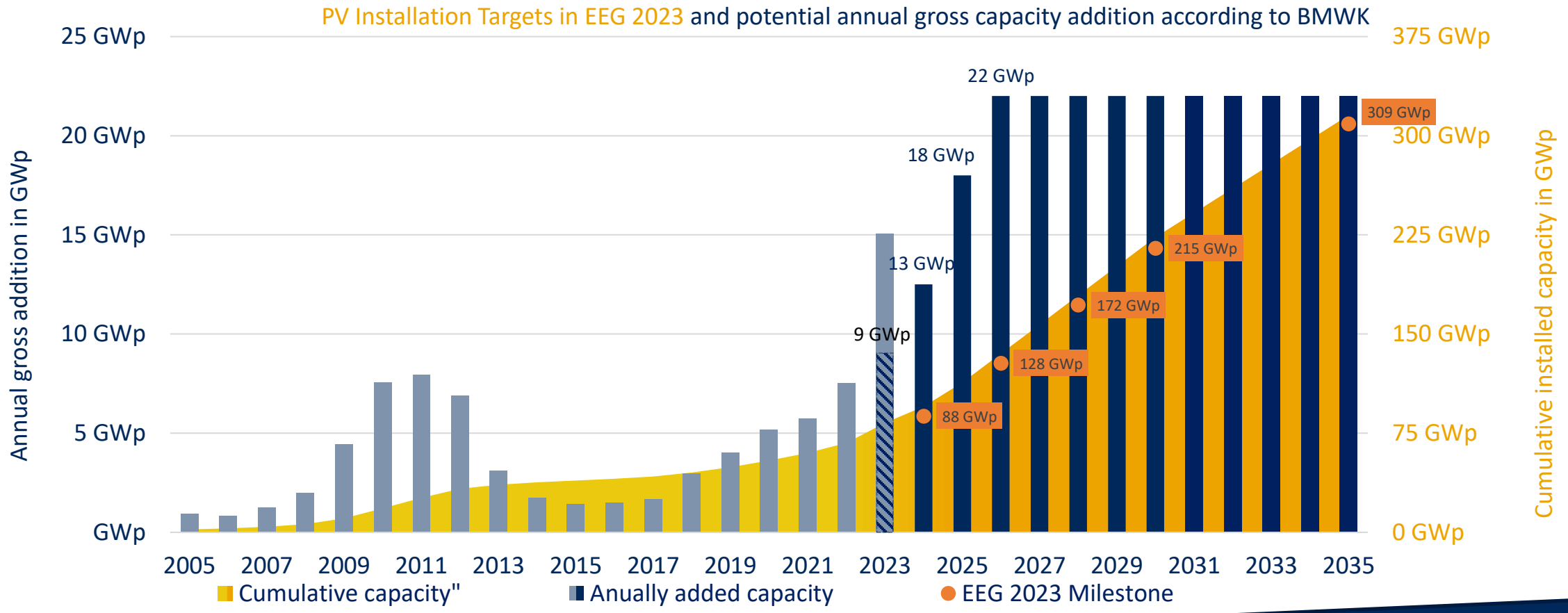
Solar power as a job creator in Germany
Already over 100,000 jobs in the solar sector in Germany



Source: EUPD Research, 2024, * Estimate

Photovoltaic expansion in Germany surpassed target in 2023 but reaching federal gov't target of 215 GWp by 2030 requires…

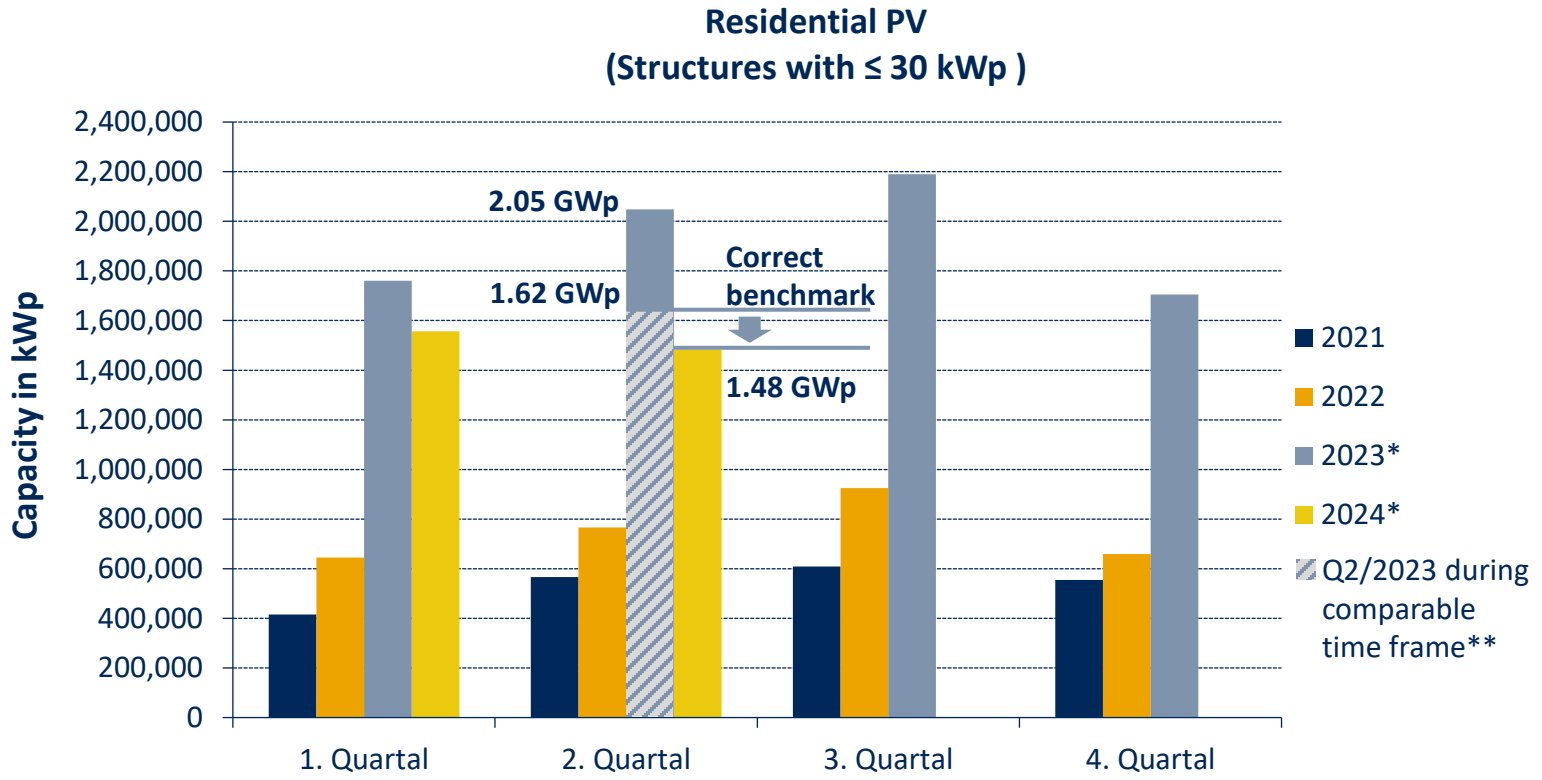
… 14% annual ⌀ increase in newly installed PV capacity required through 2026
… doubling of PV share of electricity consumption from 12% to around 25% within approximately 7 years



Sources: BSW-Solar, EEG 2023, BMWK (2022)

Residential PV capacity additions down by 9% in 2nd quarter 2024

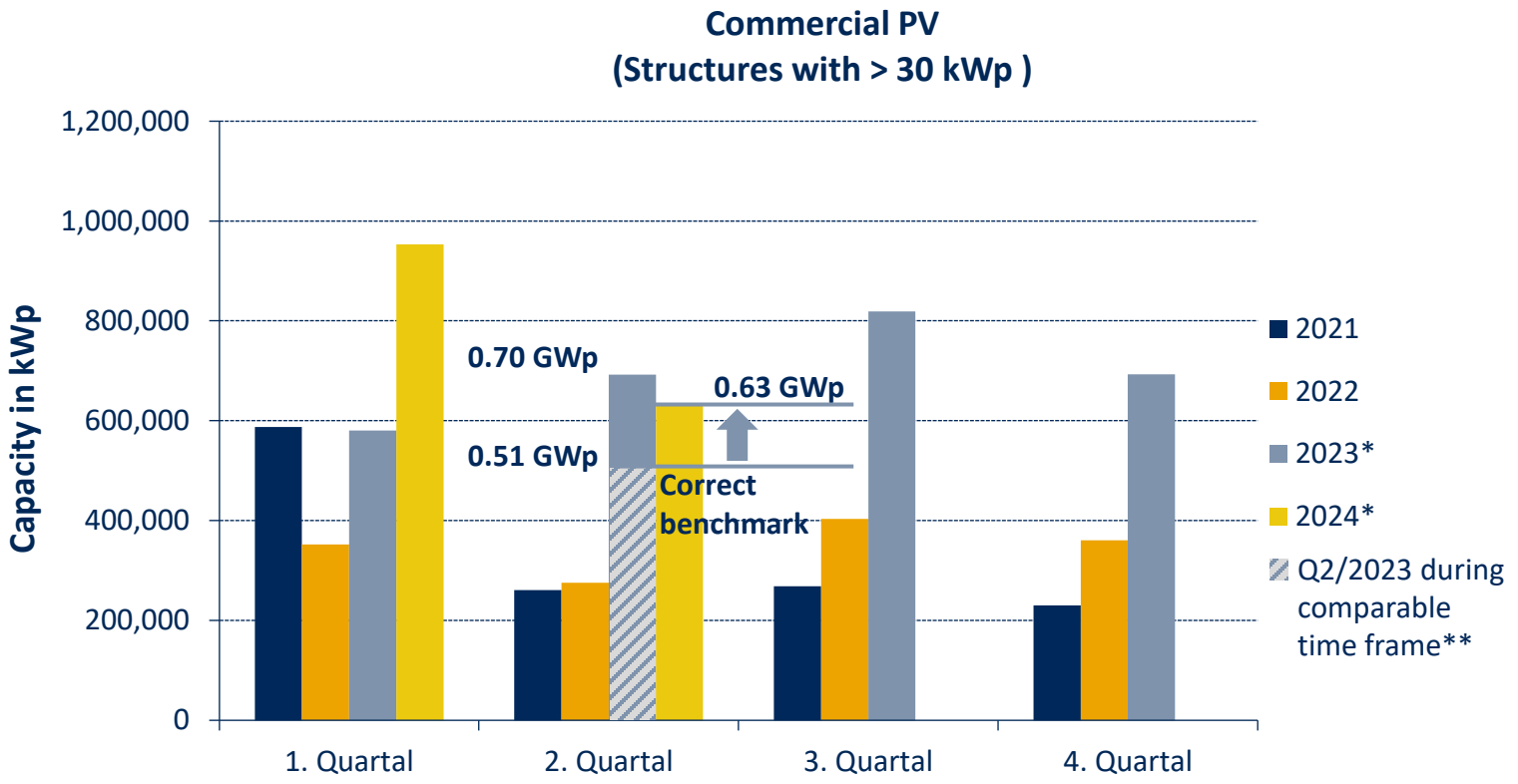
Correct comparison methodology puts market trend into perspective



Source: BSW based on MaStR (by date of commissioning of PV unit); as of 24 July 2024
* Capacity additions subject to revisions due to late registrations and corrections.
** Registrations within comparable time frame until 24 July 2023 added for comparative reasons.

Commercial PV compensates with +24% in 2nd quarter of 2024

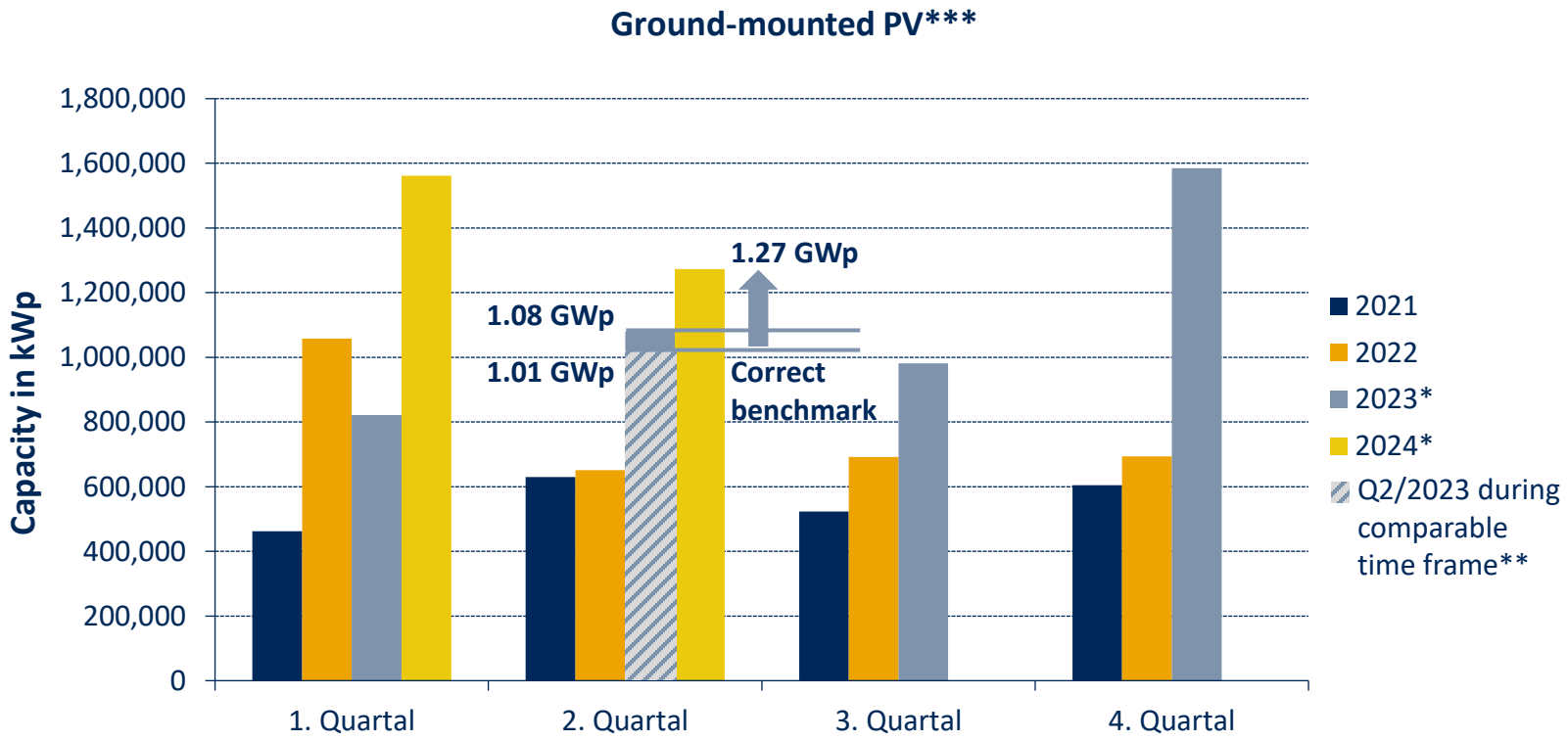
Significant growth expected once late registrations are in



Source: BSW based on MaStR (by date of commissioning of PV unit); as of 24 July 2024
* Capacity additions subject to revisions due to late registrations and corrections.
** Registrations within comparable time frame until 24 July 2023 added for comparative reasons.

Ground-mounted PV with strong +26% growth in 2nd quarter 2024

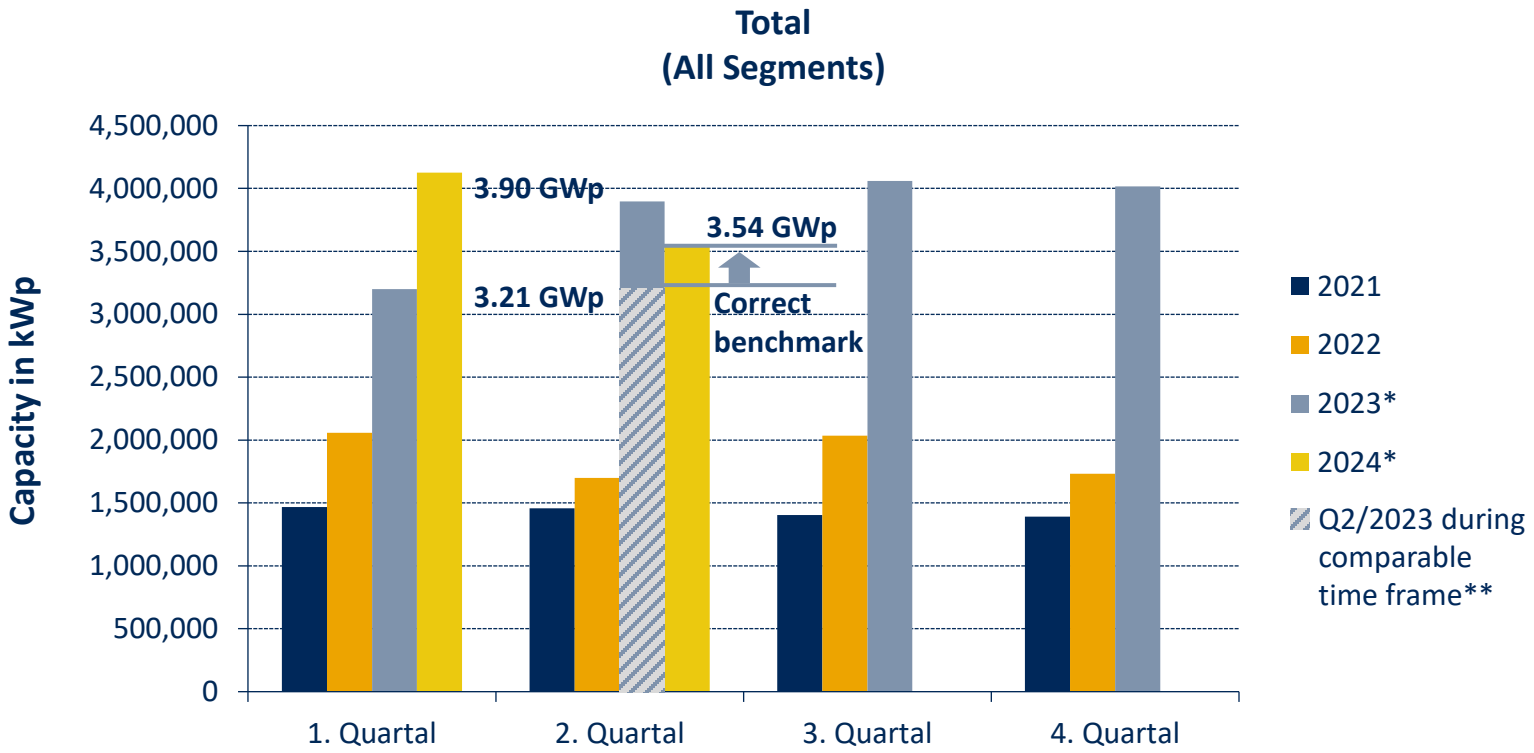
Over 3 GWp already registered in MaStR for the first half of 2024



Source: BSW based on MaStR (by date of commissioning of PV unit); as of 24 July 2024
* Capacity additions subject to revisions due to late registrations and corrections.
** Registrations within comparable time frame in 2023 added for comparative reasons.
***Ground-mounted PV includes various structures, agri- and floating-PV.

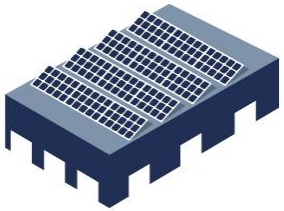
Total capacity additions average out at +10% growth for 2024 Q2

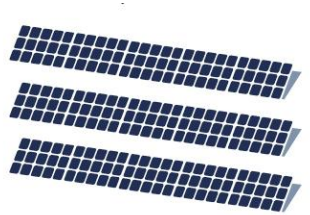
Overall growth and already registered 7.7 GWP in the first half should not obscure **residential sector challenges**



Source: BSW based on MaStR (by date of commissioning of PV unit); as of 24 July 2024
* Capacity additions subject to revisions due to late registrations and corrections.
** Registrations within comparable time frame until 24 July 2023 added for comparative reasons.

Summary: Added PV capacity January to June 2024
Approximately 7.7 GWp and +24% compared to same period in 2023*



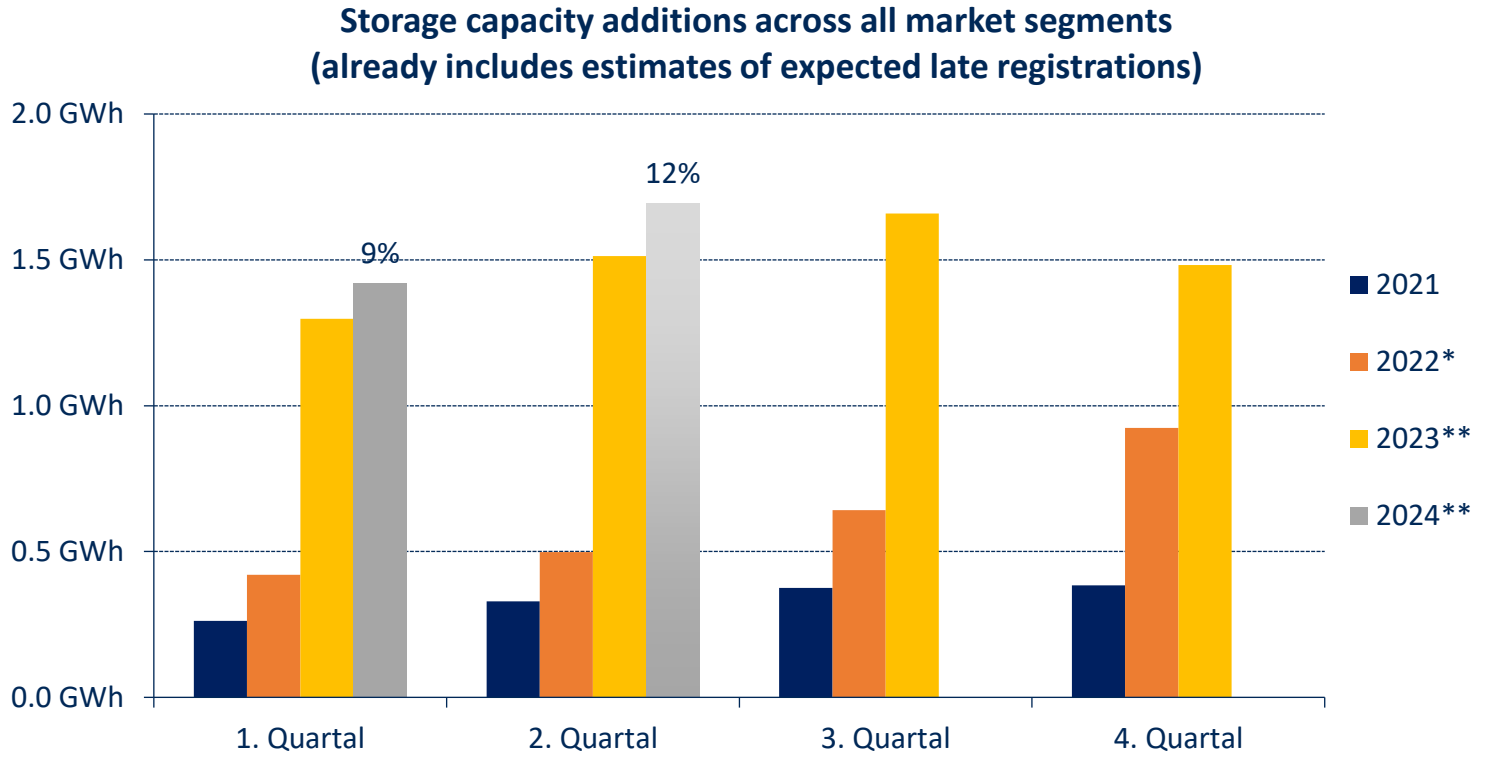


Added capacity	**Residential rooftop PV** ≤ 30 kWp	**C&I rooftop PV** > 30 kWp	**Ground-mounted PV** (incl. other structures, floating PV and agrivoltaics)	**Plug-in solar devices** ("Balcony PV")
Jan. to June 2023* *as of registration date* ***24 July 2023***	**approx. 3.22 GWp**	**approx. 1.02 GWp**	**approx. 1.83 GWp**	**approx. 0.1 GWp**
Jan. to June 2024 *as of registration date* ***24 July 2024***	**approx. 3.04 GWp** *-6%*	**approx. 1.59 GWp** *+56%*	**approx. 2.84 GWp** *+55%*	**approx. 0.2 GWp** *+96%*

Source: BSW based on core energy market data register (Marktstammdatenregister), commissioning date of PV unit; as of 24 July 2024
* Comparison based on registered commissioned units within identical registration periods to eliminate the distorting effect of late registrations

Total storage capacity additions show +12% growth for 2024 Q2

After a slow start to the year especially in the residential sector, slight acceleration in the 2nd quarter → **3.1 GWh in the first half**



Source: BSW based on MaStR (by date of commissioning of PV unit); as of 24 July 2024
* Capacity additions subject to revisions due to late registrations and corrections.
** Revisions and changes to be expected due to late registrations. Contains estimates of late registrations to be expected until the end of July 2025 based on observed registration patterns in previous years.

Solar Package I
Acceleration of grid connection and storage expansion

- **Introduction of access rights** for the grid connection cable associated with ground-mounted PV on publicly owned property
- Acceleration of **PV system certificates for middle-sized PV systems on commercial roof-tops**
- **Simplified grid connection procedures** for systems up to 30 kWp and registration of small installations, shorter deadline for the grid operator to replace the meter
- Initial steps towards **exit from exclusivity principle** for storage systems
- **Access rights for the grid connection cable also for battery storage systems** and priority grid connection for storage possible

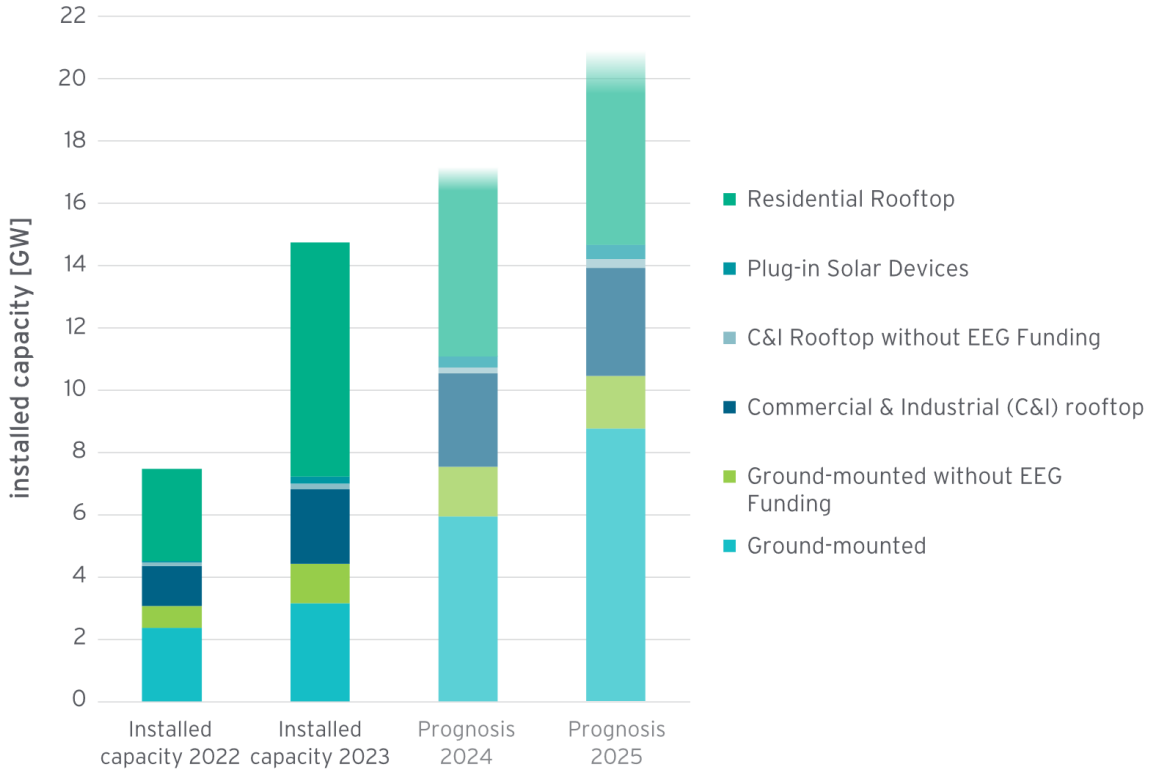
Source: Adobe Stock

Solar Package I
Remuneration rates and bureaucratic streamlining

- **Increase in remuneration rates** by 1.5ct/kWh for commercial rooftop PV systems between 40 and 1,000 kWp
- Gradual **increase of annual tender volumes** for PV rooftop systems from 1,400 MW in 2024 to 2,300 MW as of 2026, accompanied by simultaneous lowering of tendering threshold from 1,000 kWp to 750 kWp PV system size
- Introduction of energy sharing behind the meter
- Simplification for repowering of roof-top PV systems
- **Reducing of bureaucracy**, incl. elimination of annual registration for two parallel-operated systems (full and partial feed-in)
- Simplifications for **plug-in solar systems**, incl. elimination for double registration requirements, use of type F electric plug, increase of threshold to 800W, temporary net metering until meter switch

Source: Adobe Stock

Fraunhofer ISE projected in Spring that overall capacity additions for Germany could reach up to 17 GW in 2024



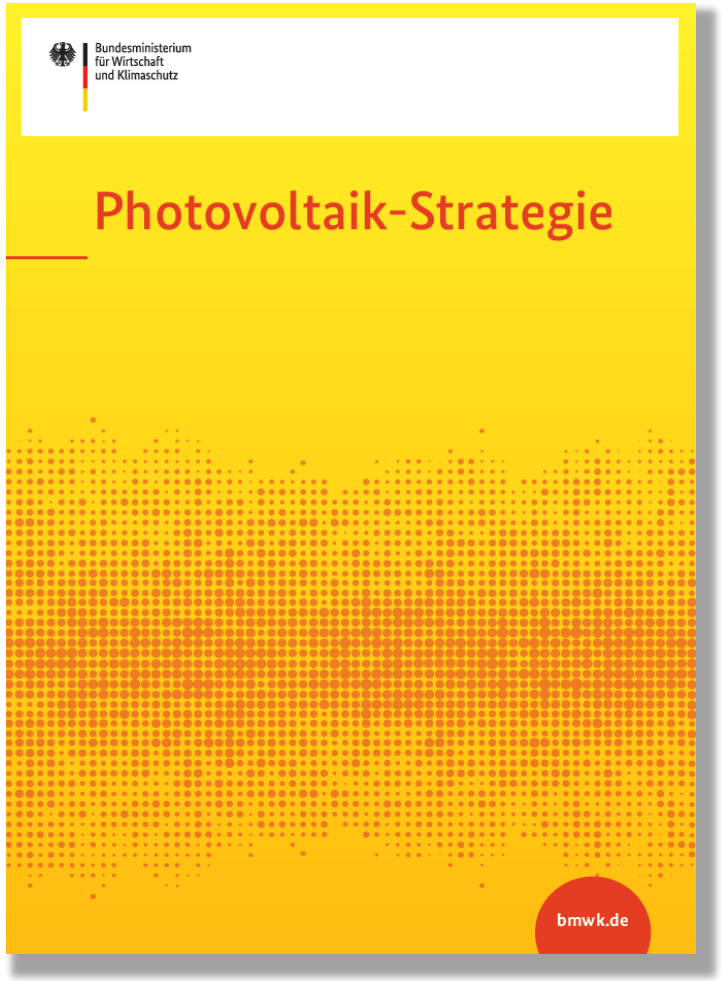
→ Political support necessary for market growth
→ Gap in KTF funding puts pressure on EEG schemes
→ Prognosis difficult due to political uncertainty

Source: Adobe Stock

Compared to 2 GWp in 2017 and 7.5 in 2022
→ **It's a good time to be in solar in Germany**

Solar Package I only implements 1st part of PV strategy – Intensive policy consulting (AKA lobbying)

11 areas of action for reducing PV market barriers

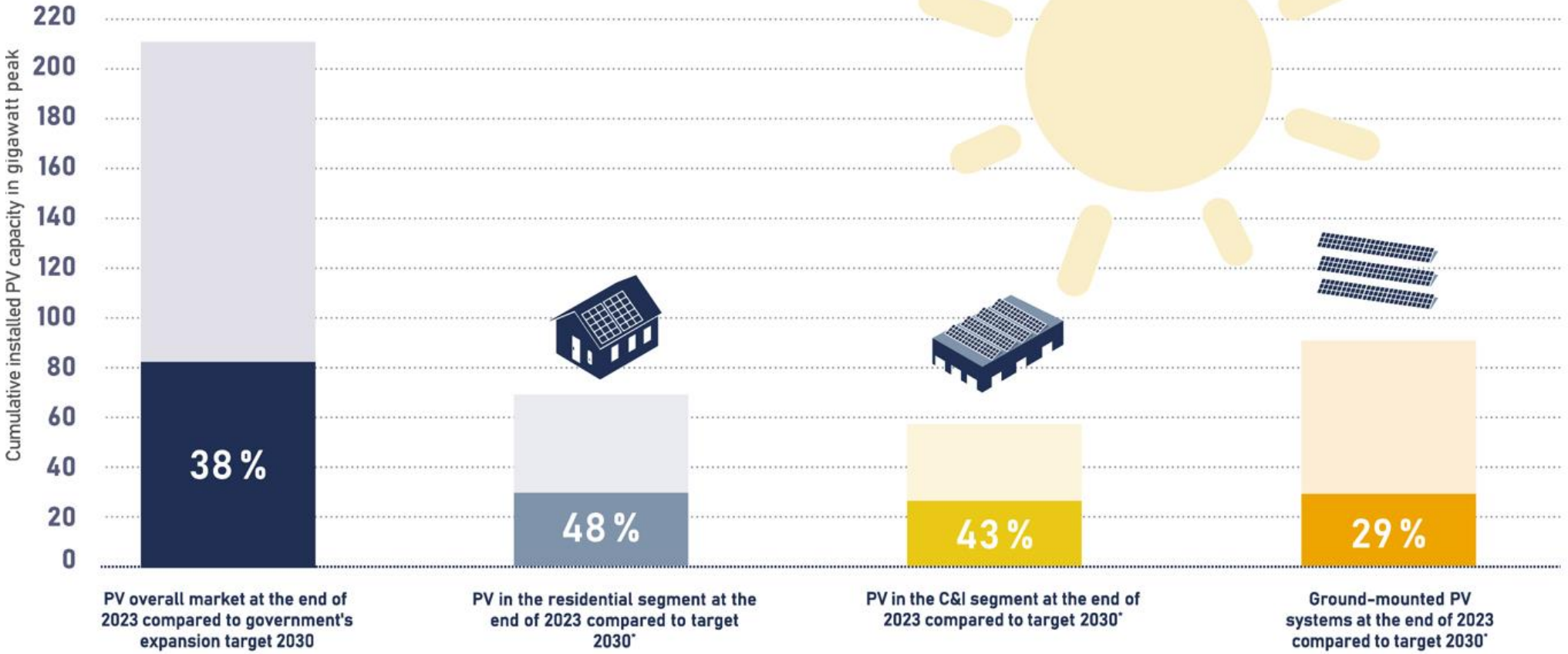


✓	1.	Greater expansion of **ground-mounted systems**
✓	**2.**	Facilitate **rooftop PV**
✓	3.	Simplify **landlord-tenant electricity models** and **shared PV on buildings**
✓	4.	Facilitate use of **plug-in solar**
✓	5.	Accelerate **grid connections**
✓	6.	Build **acceptance for PV**
✗	7.	Effective interlinkage of **tax law** with energy law
✗	8.	Incentivize **supply chains** and **competitive European** production
✗	9.	Secure **skilled worker** capacities
✗	10.	Advance **technological development**
✗	11.	Utilize **European instruments** for more rapid PV expansion

Solar Package I

Solar Package II and sector-specific laws?

Photovoltaics target for 2030 – approx. 40% achieved



Source: BSW based on core energy market data register (commissioning date of PV unit), as of 28.05.2024, EEG 2023
*Necessary contribution of individual market segments according to own estimate based on EEG 2023

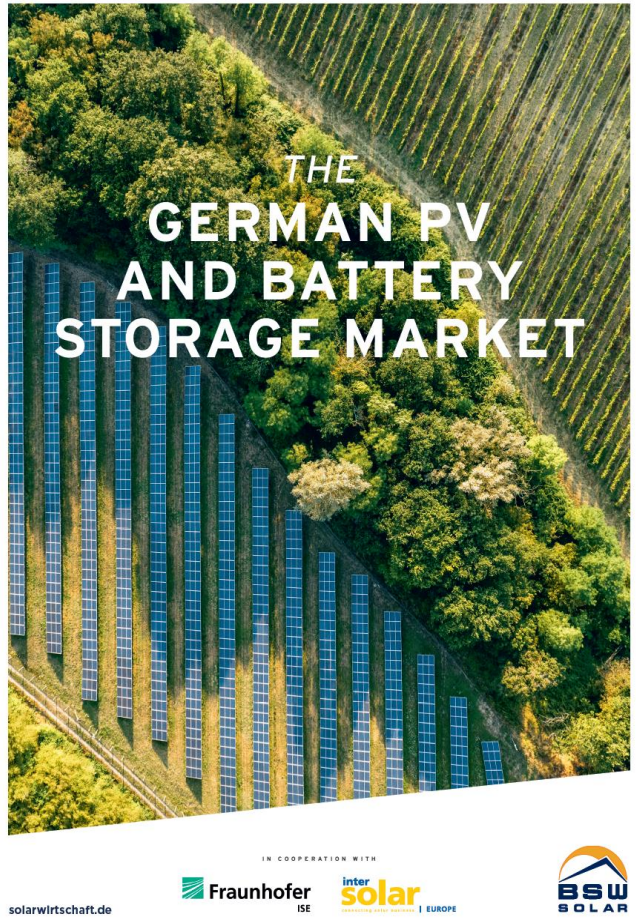
Download: The German PV and Battery Storage Market

Extensive study on the latest statistics of the PV and battery storage market, along with an examination of current funding mechanisms in Germany.

From market outlook to anticipated growth in the PV market and the evolving role of battery systems, this study outlines both present state and future prospects.

BSW-Solar in cooperation with Fraunhofer ISE and Intersolar Europe

https://bsw.li/4b8xm7f



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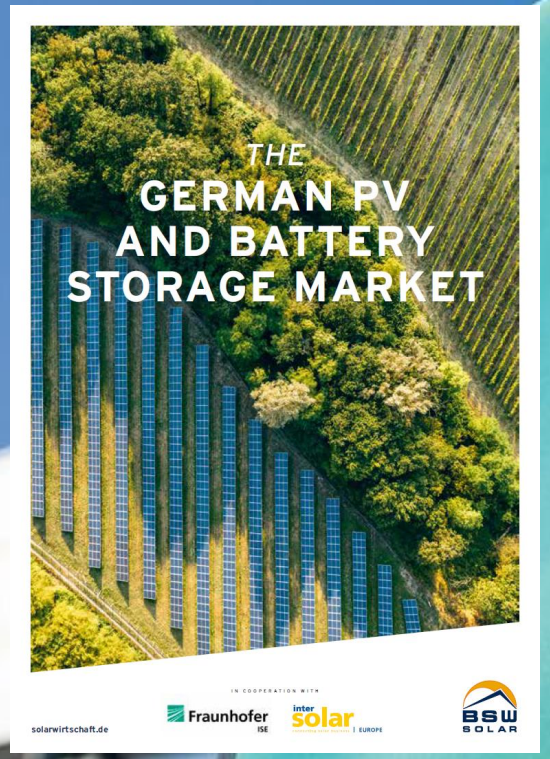

The German PV and Battery Storage Market

Regional Market Development of Solar PV in Germany

Dr. Christoph Kost
Fraunhofer ISE
Webinar July 30, 2024

PV systems in Germany

Study download under www.solarwirtschaft.de/en/the-german-pv-and-battery-storage-market/

Fraunhofer ISE

German PV and Battery Storage Market

Study prepared by Fraunhofer ISE for BSW

In addition to a general view, regional insights are provided.

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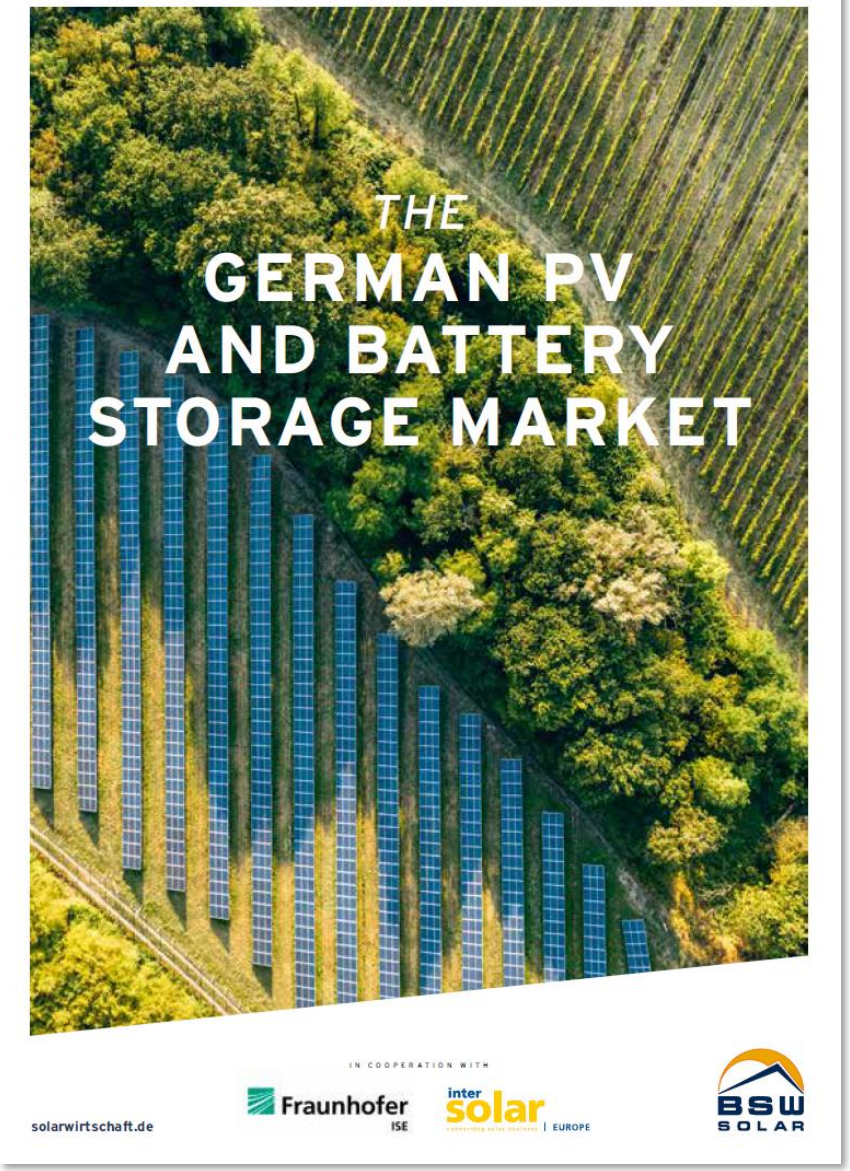
Insights and facts for the regional market development



Study download under www.solarwirtschaft.de/en/the-german-pv-and-battery-storage-market/

Fraunhofer ISE

Capacity additions Germany in the last 5 years

- >14 GW and >1 Mio PV systems added in 2023
- Strong market increase in 2023
- Increase of PPA PV systems and >300.000 Plug-in solar devices
- But growth in all segments
- Battery: 12.3 GWh installed, 5.5 GWh in 2023

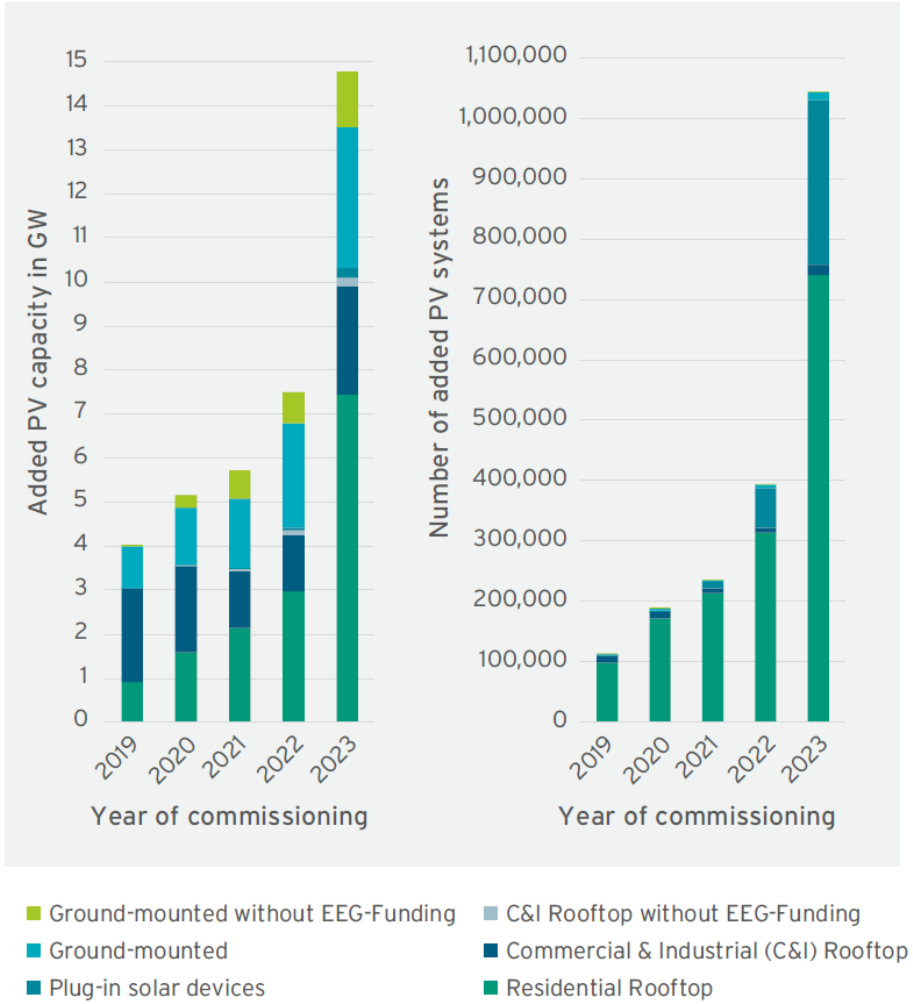


Figure 5

Number of added PV systems and new PV capacity in Germany by year of commissioning [7]

Comparison of Federal States

Number and Capacity of PV Systems

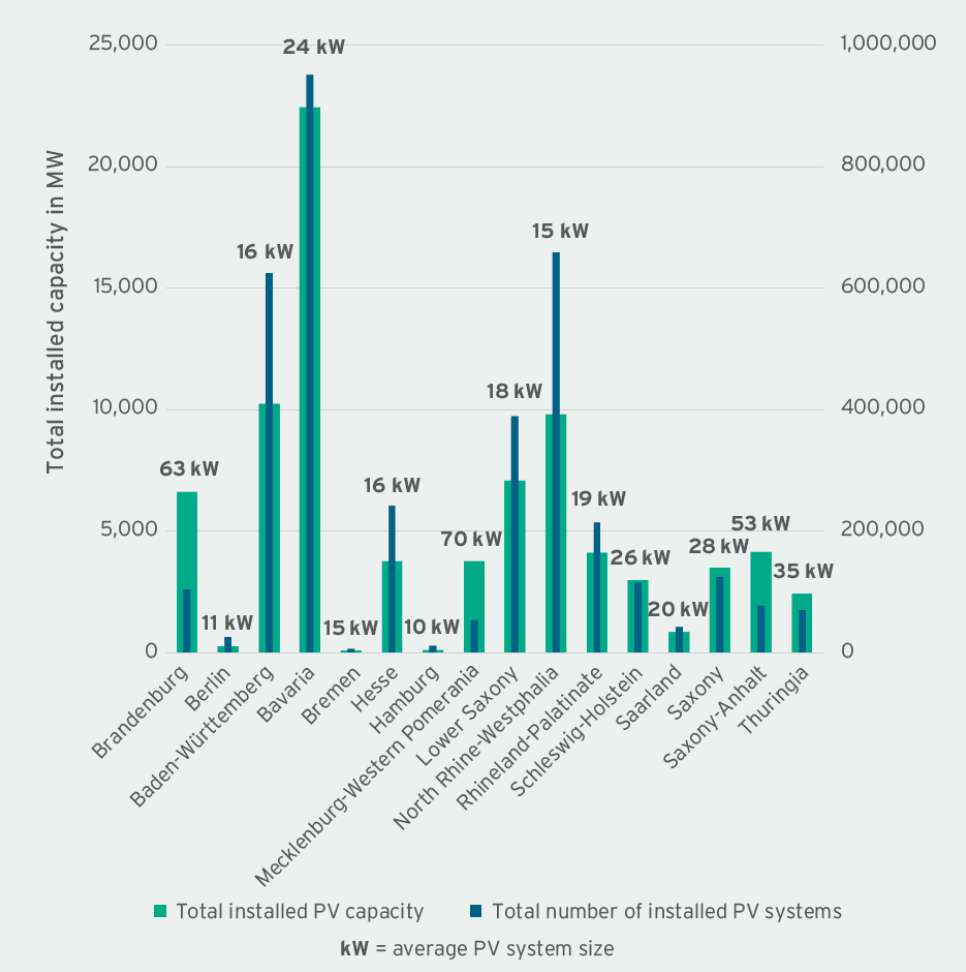
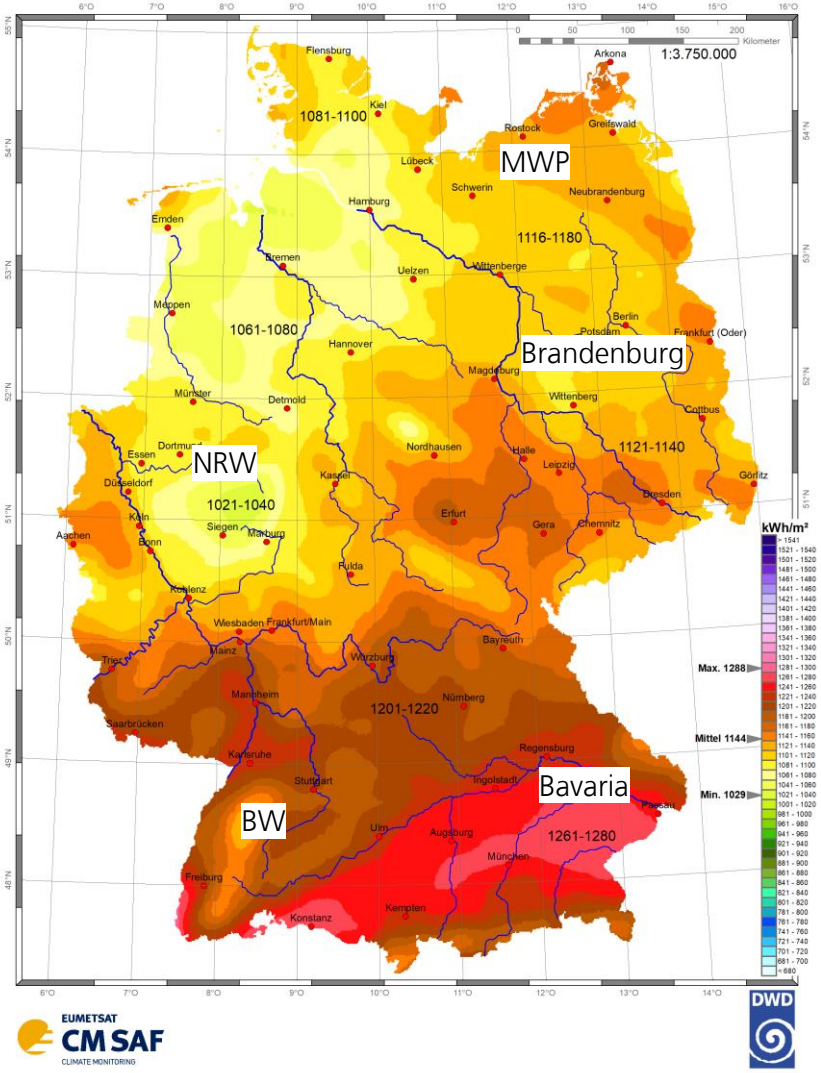


Figure 17

Total number of installed PV systems, total installed PV capacity and average PV system size by federalstate by the end of 2023 [7]



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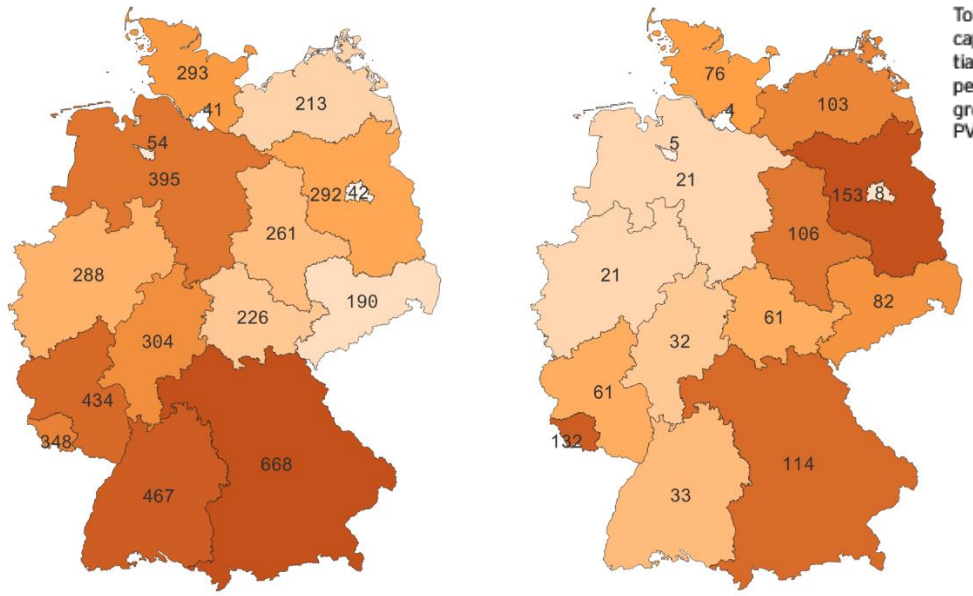
Key parameters on installed capacity per Federal State

Total Installed PV Capacities (end of 2023)

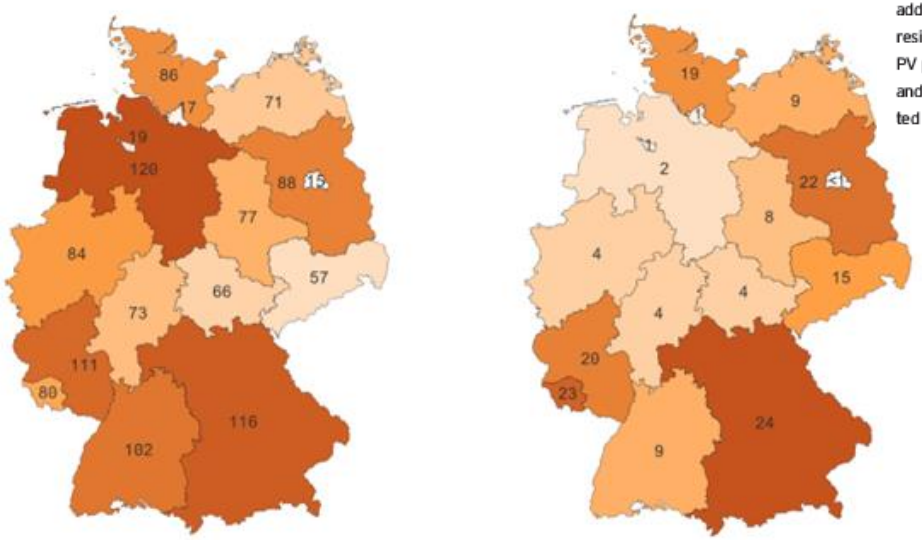


Specific PV capacity (residential rooftop) in W/inhabitant

Specific PV capacity (ground-mounted) in kW/km²

Figure 19
Total installed PV capacity: residential rooftop PV per inhabitant and ground-mounted PV per area [7]

PV Capacity additions in 2023



Specific PV capacity (residential rooftop) in W/inhabitant

Specific PV capacity (ground-mounted) in kW/km²

Figure 20
PV capacity additions in 2023: residential rooftop PV per inhabitant and ground-mounted PV per area [7]

Evaluation also available for battery storage

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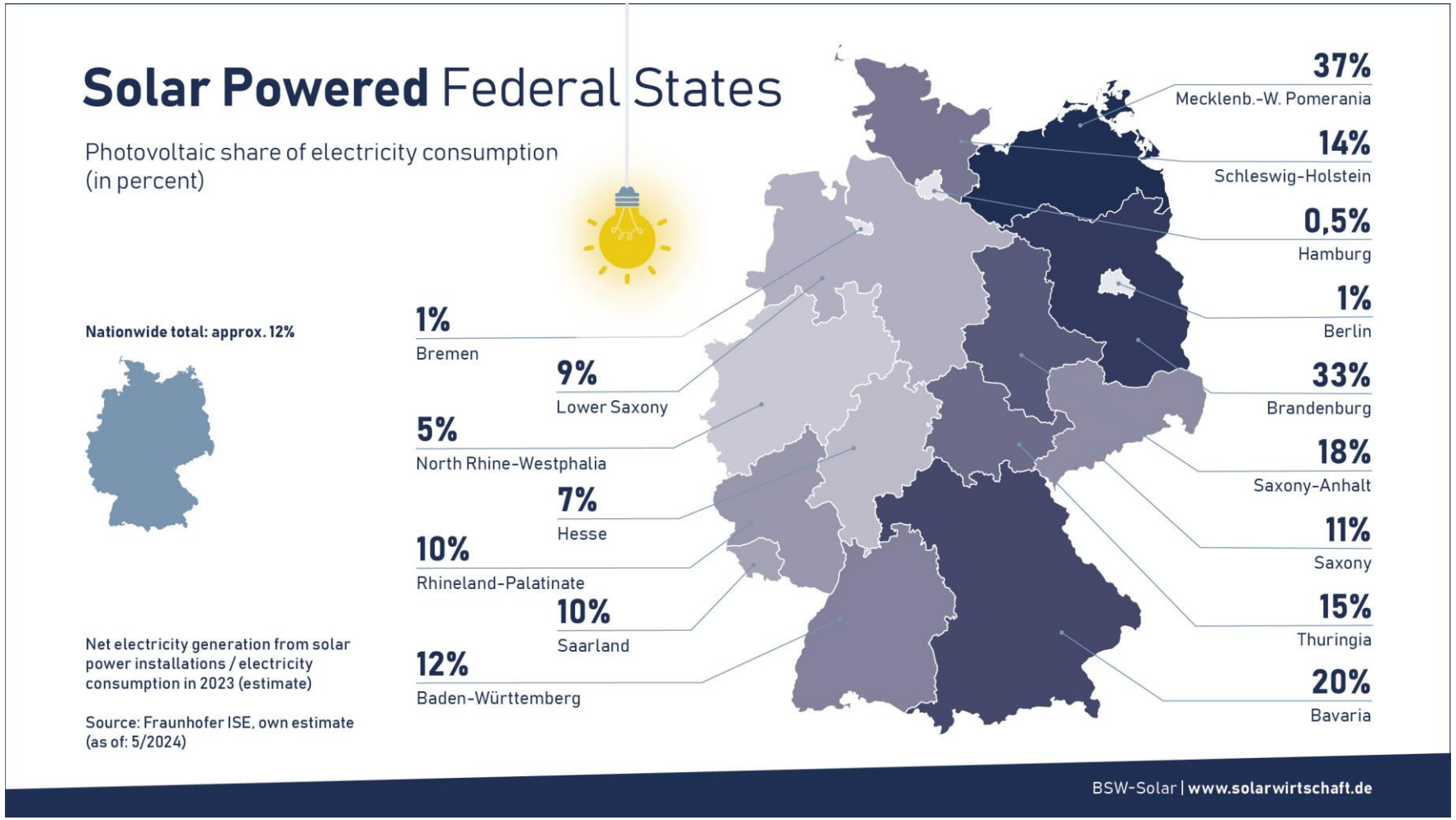
Electricity generation for Solar PV in Germany



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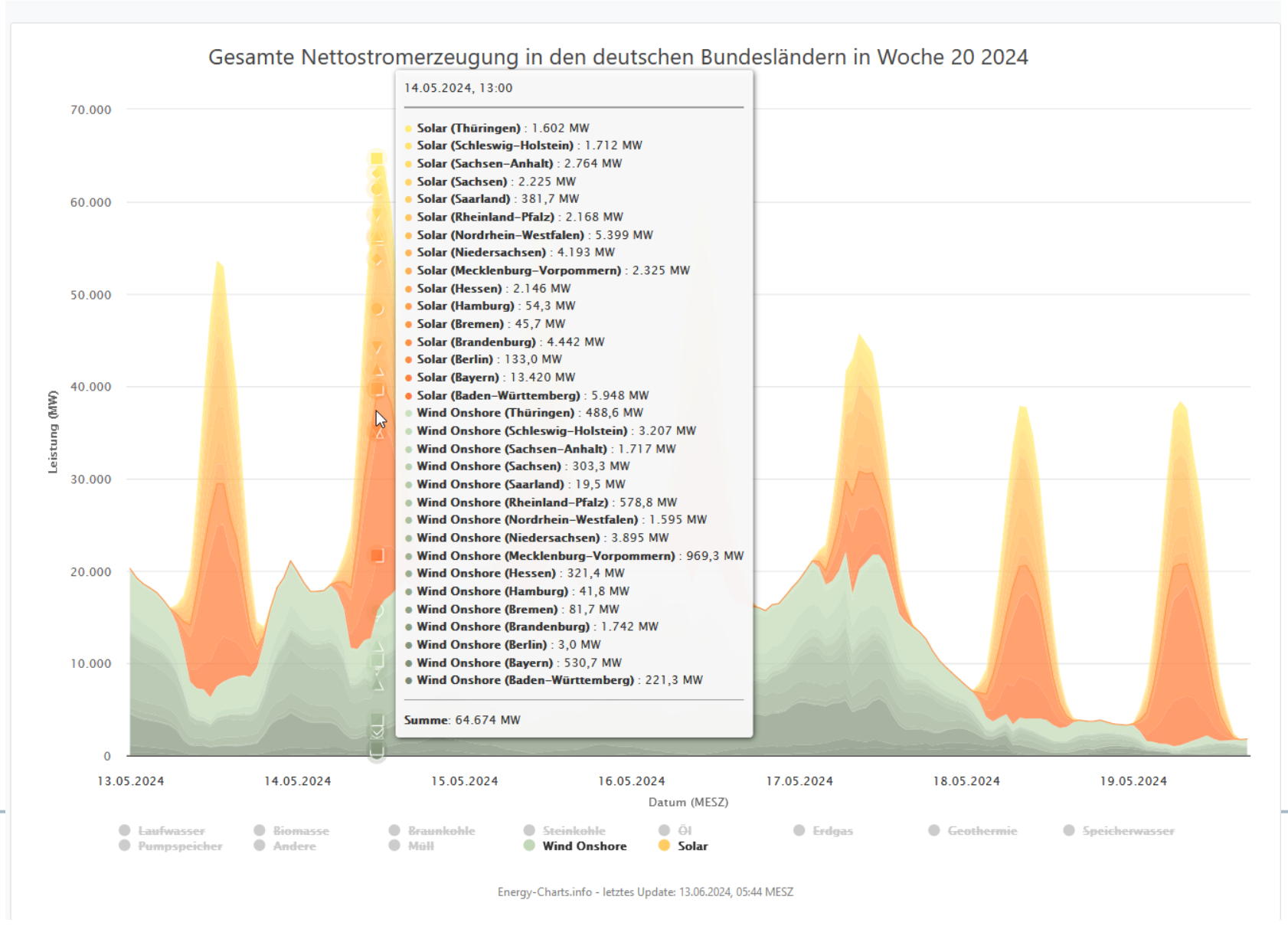
Electricity generation for Solar PV in Germany (on www.energy-charts.info)



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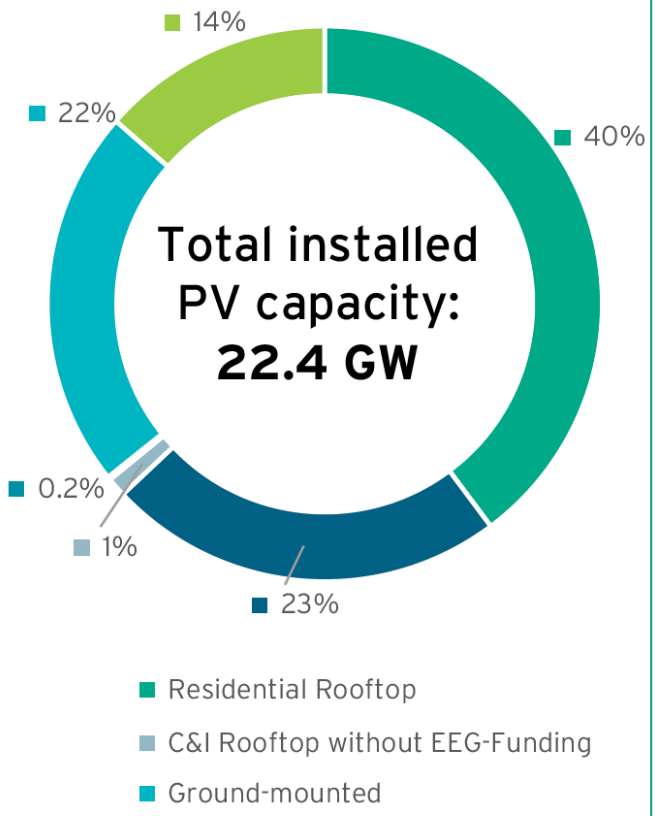
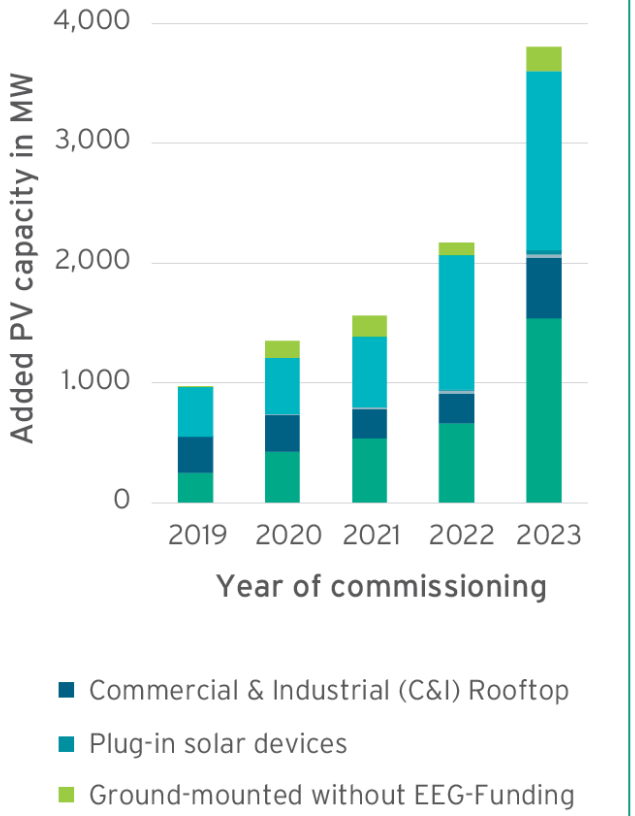
Bavaria: largest installed PV capacity in GER

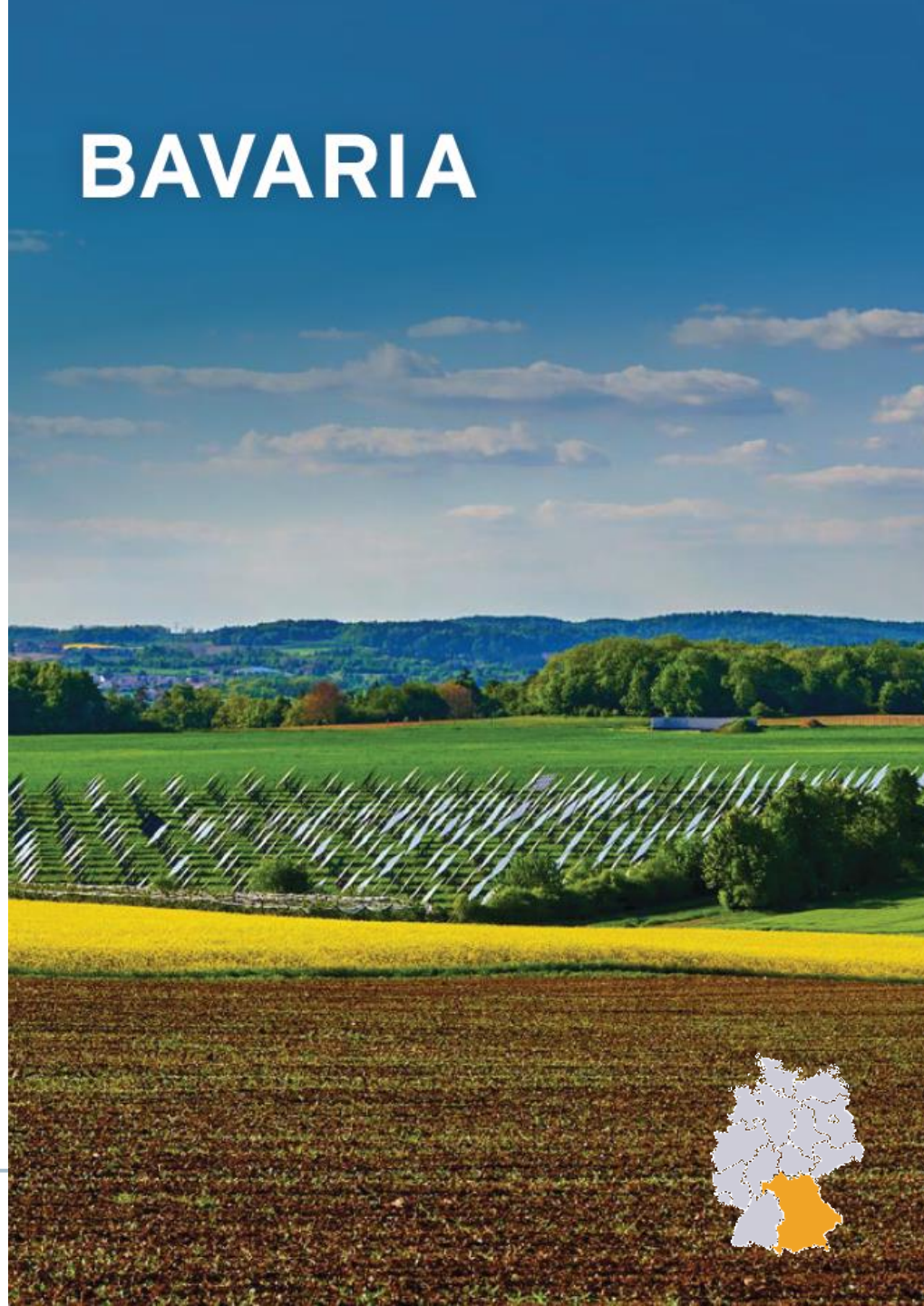
22.4 GW in 2023

Installed PV capacity



Added PV capacity in MW





Development of Battery Storage Market

Bavaria

Total installed battery capacity

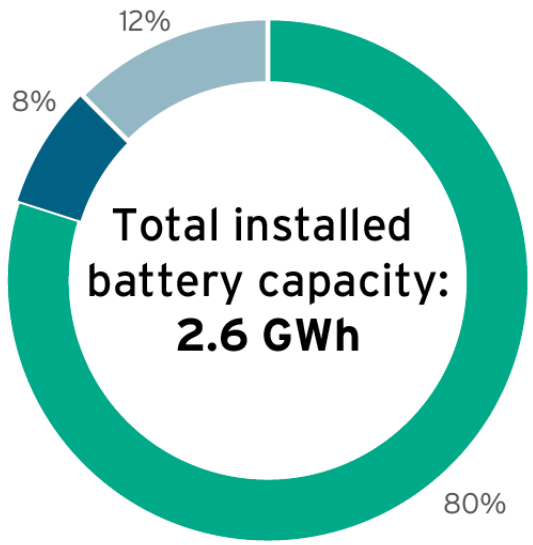
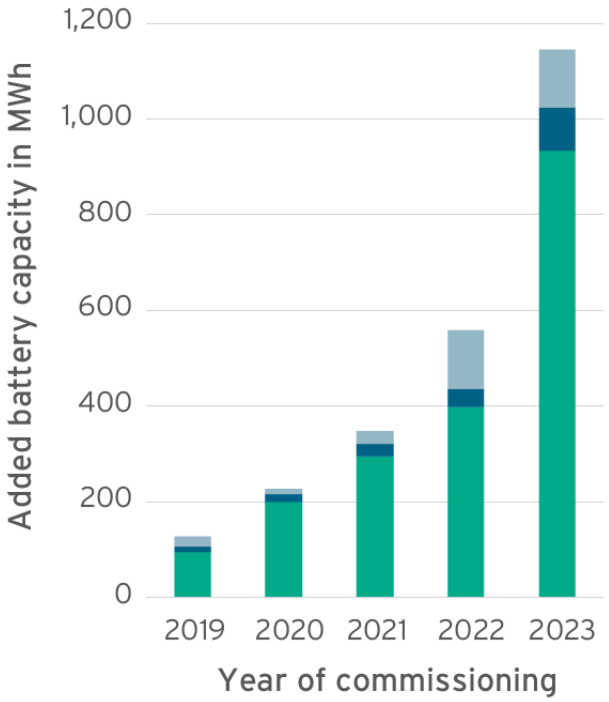
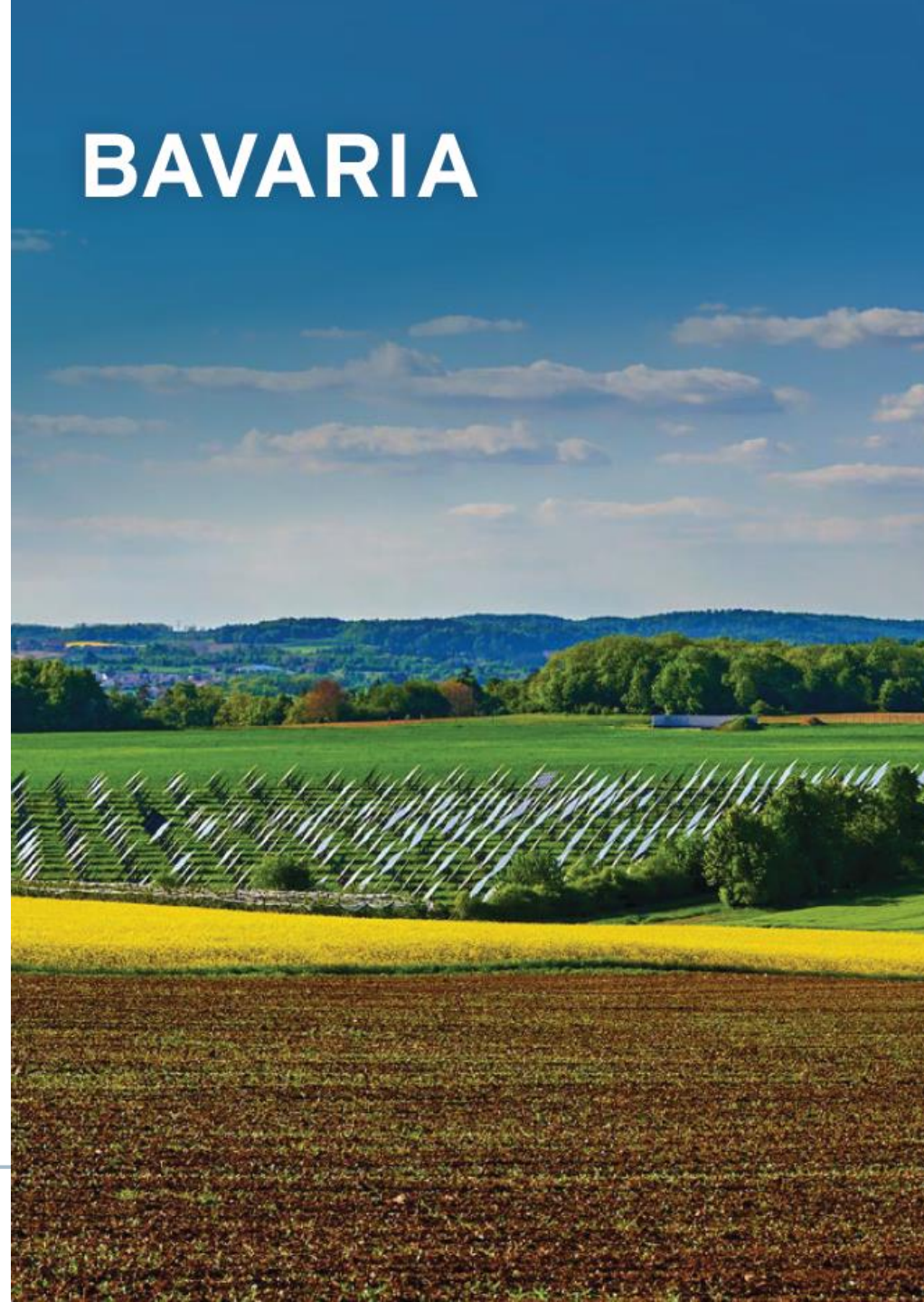


Figure 28:
Installed battery capacity in Bavaria [7]

- Residential storage systems
- Commercial storage systems
- Mass storage systems

Added battery capacity





Key figures for PV in Bavaria

Table 5: Key figures for PV and battery installations in Bavaria [7]

	Residential	C&I	Ground-mounted	Plug-in solar devices	Total
Installed PV capacity in MW	8,928	5,453	8,017	41	22,439
Specific PV capacity in kW/km²	127	77	114	1	318
Specific PV capacity in W/inhabitant	668	408	-	3.1	1,678
	Residential	**Commercial**	**Mass storage**		**Total**
Installed battery capacity in MWh	2,072	196	325		2,592
Installed battery capacity in Wh/inhabitant	155	15	24		194
	Rooftop		**Ground-mounted**		**Total**
PV potential in GW	77.4 [13]		182.0 [27]		259.4
					By the year 2030
PV expansion target in GW					36.20[21]

Bavaria: 36 GW target in 2030

Market outlook

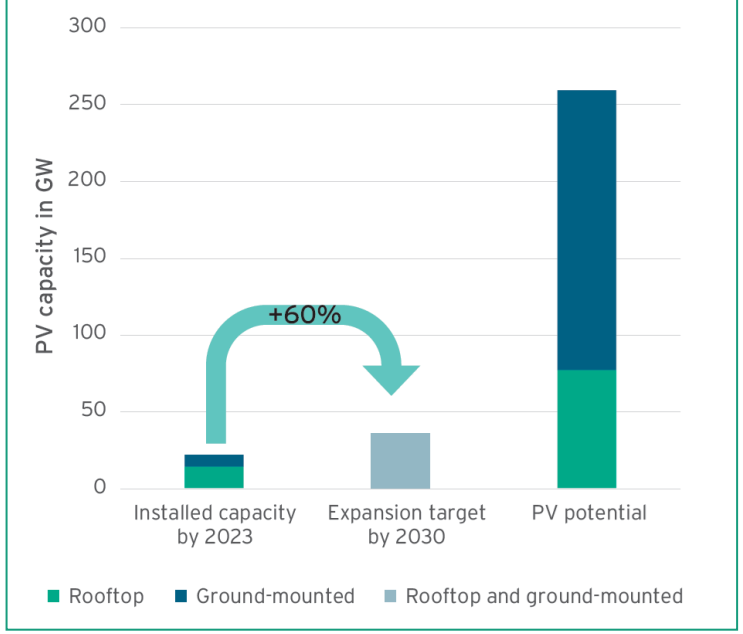


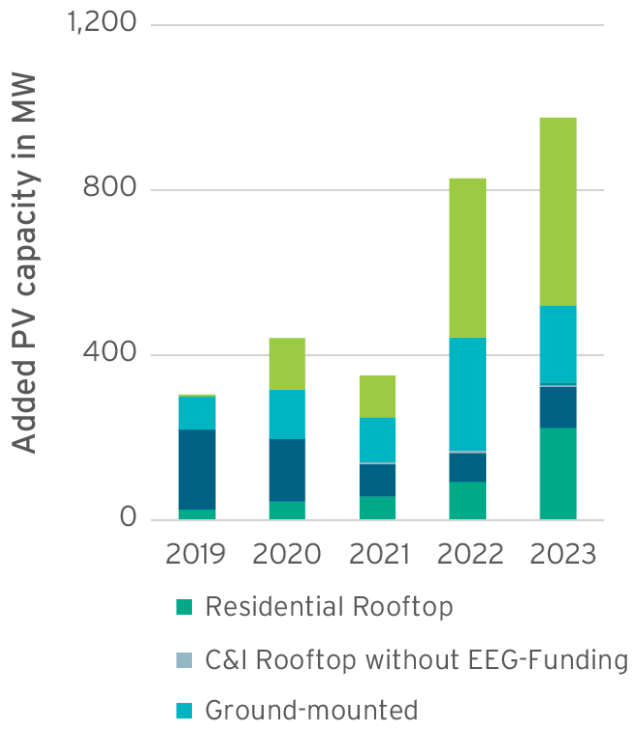
Table 6: Solar obligations in Bavaria [32]

	New construction	Fundamental refurbishment	Already constructed
Residential buildings	Jan. 2025	Jan. 2025	
Non-residential buildings	Since March 2023	Jan. 2025	
Public buildings	Since Aug. 2023	Since Aug. 2023	Since Aug. 2023

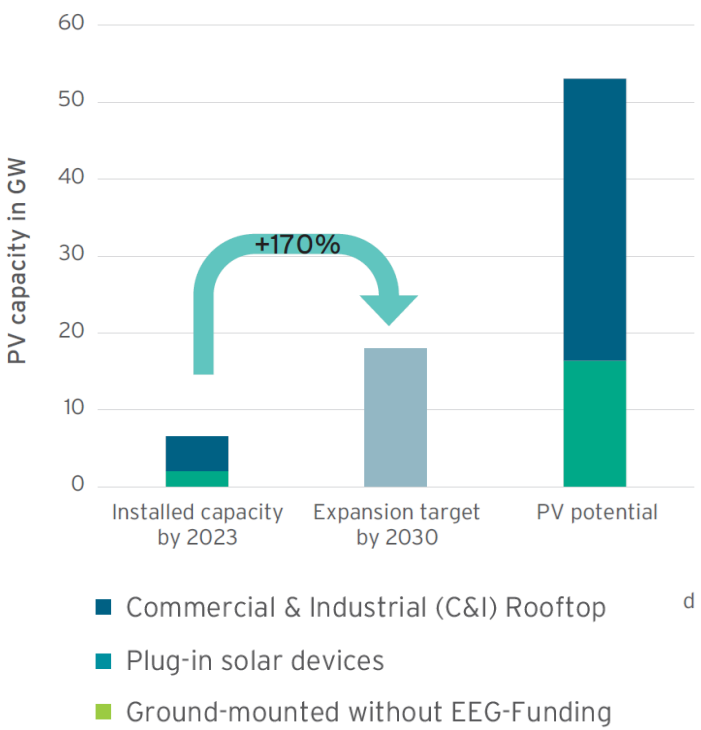
Regional subsidy programs:
Bavaria supports companies and independent contractors in financing renewable energy generation technologies and storage systems. Funding can be received for investment in new projects and modernization measures in electricity generation and storage systems from renewable energy sources. Funding is granted in the form of a reduced-interest loan. [33]

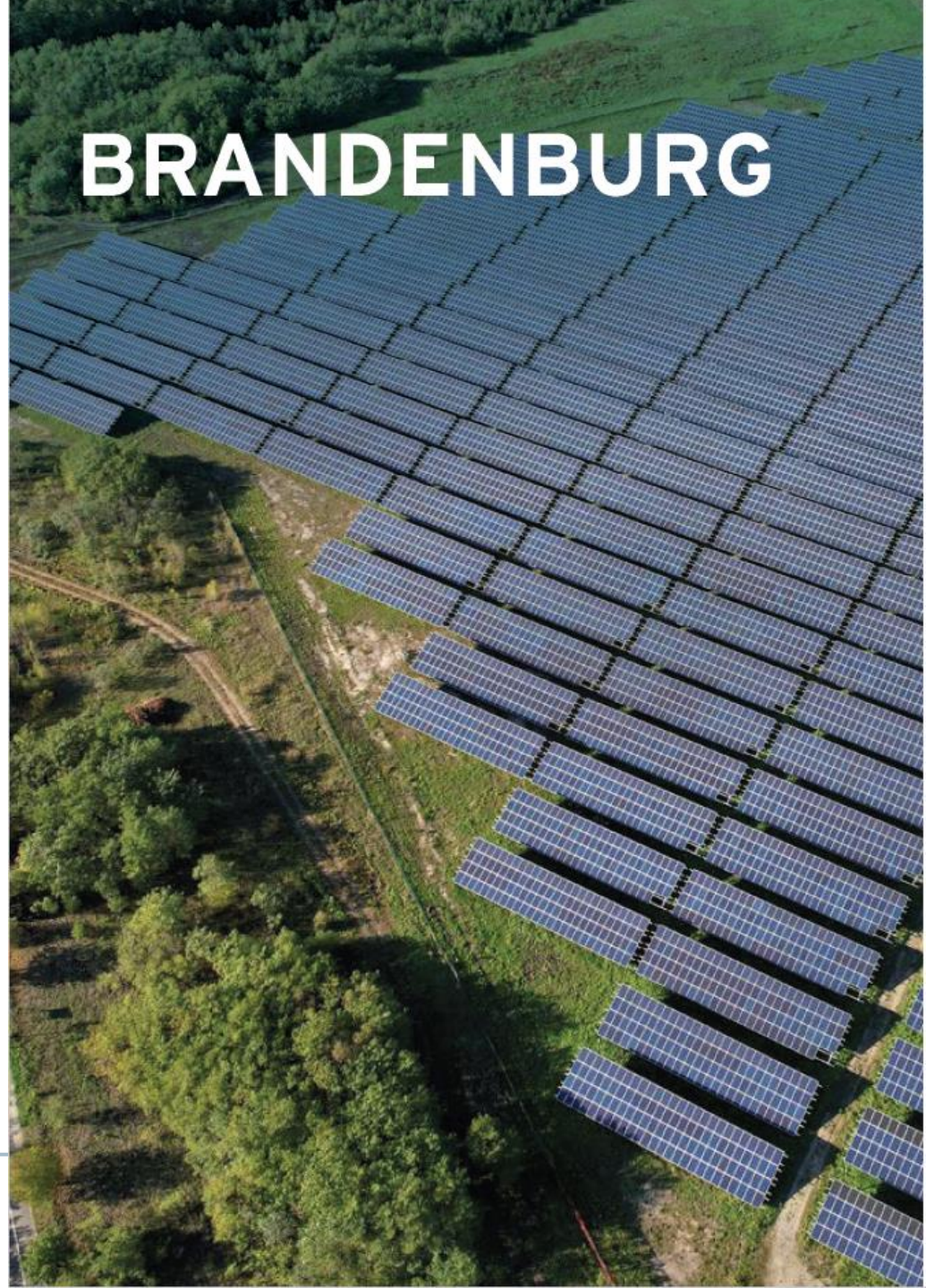
Focus: Large ground-mounted PV

Added PV capacity in MW



Market outlook





Detailed information can be found for all of the Federal States

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Market Outlook for PV in Germany

Long-Term Targets for PV in Germany

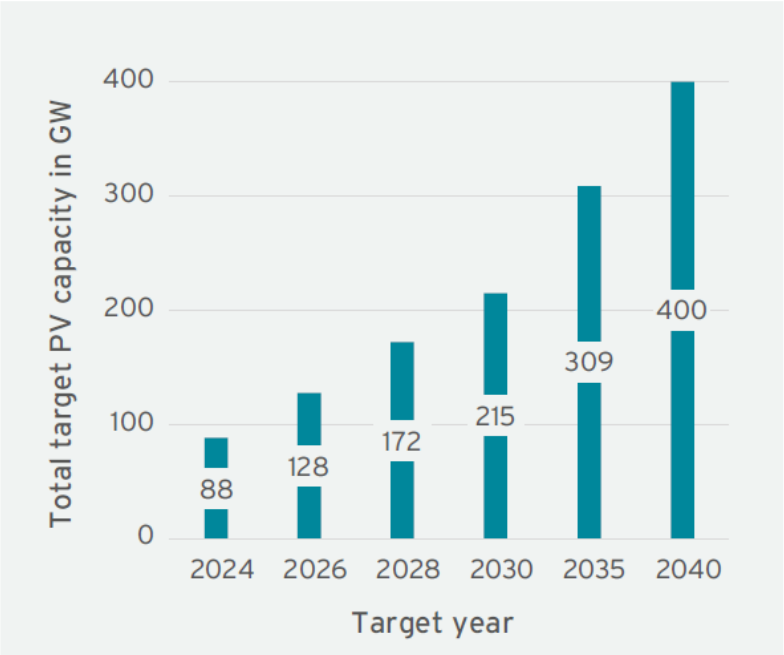

Figure 6

Total installed PV capacity targets in GW according to EEG 2023 [9]

Near-term Market Outlook for PV in Germany

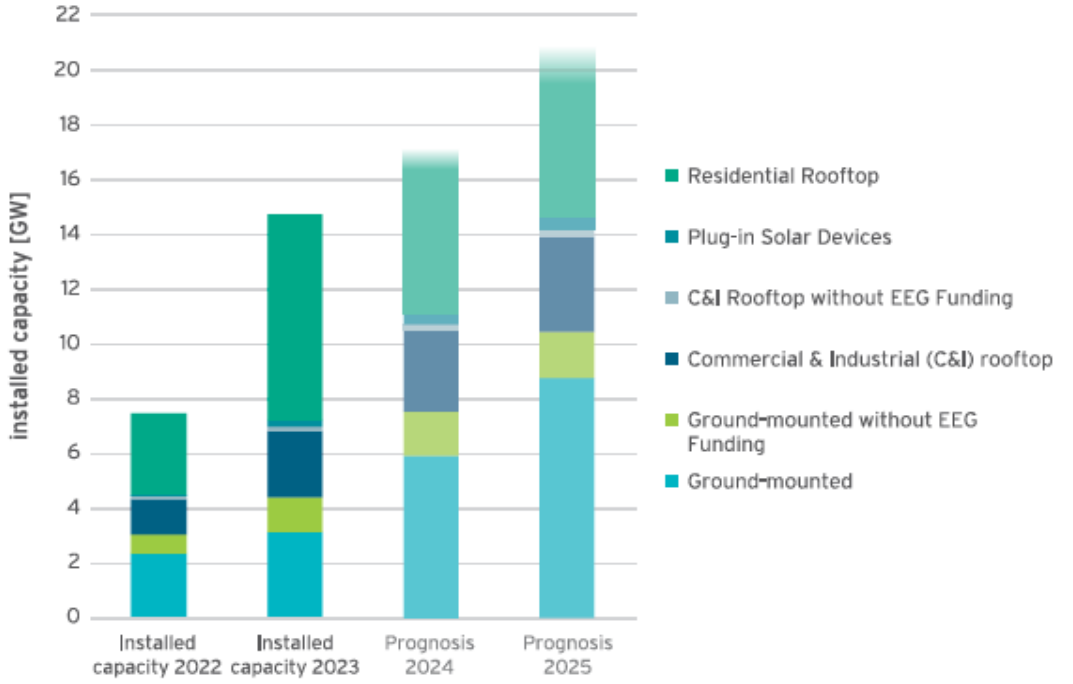

Figure 71: Scenario for annual PV capacity expansion in Germany by market segments

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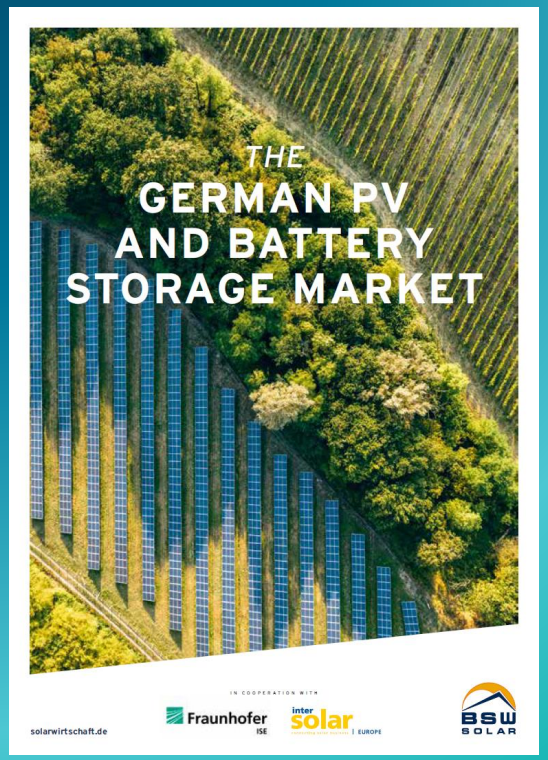
FUTURE TRENDS AND EMERGING MARKET SEGMENTS

Selected topics

1. **PV capacity growth in Germany** is expected to continue in the coming years.
2. PV systems are increasingly **combined with battery energy storage systems**.
3. Investments in additional **production capacities for PV components** will strongly depend on the political frameworks at national and EU level.
4. **Integrated solutions for PV systems** that incorporate these solutions such as heat pumps and electromobility, along with energy storage, will the standard.
5. **Energy-sharing communities** are becoming more common.
6. Starting in 2024, **agrivoltaics, floating-PV, moorland, and parking lot PV** will be specifically subsidized in a separate auction segment.

Summary on regional PV development in Germany



1. All segments are growing in all federal states
2. Ambitious targets: Most of the states have to increase their capacity by 100% to 200% within seven years
3. Potentials are available, also in smaller federal states (Berlin, Hamburg, Bremen) : No excuse!
4. Solar obligations in many states in place: New buildings, refurbishment, public buildings

Study download under www.solarwirtschaft.de/en/the-german-pv-and-battery-storage-market/

Vielen Dank für Ihre Aufmerksamkeit!

Thank you for your attention!

Dr. Christoph Kost

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Study download under www.solarwirtschaft.de/en/the-german-pv-and-battery-storage-market/

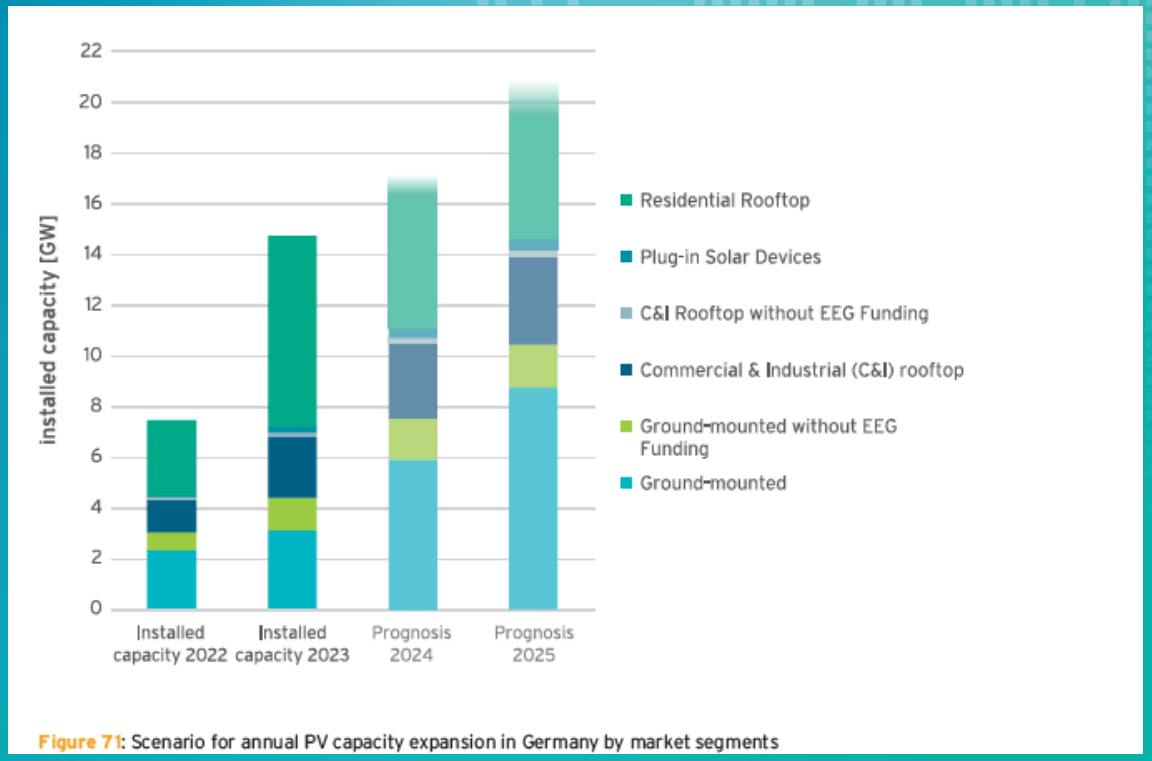


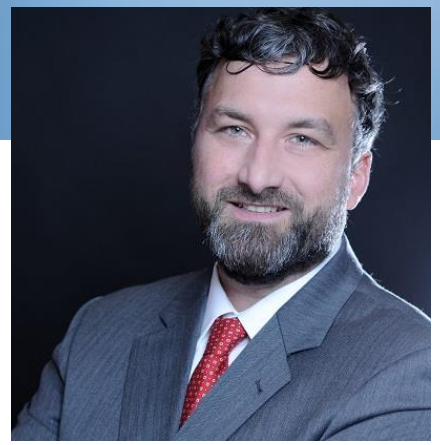
Figure 71: Scenario for annual PV capacity expansion in Germany by market segments

ASK YOUR QUESTIONS IN THE EVENT CHAT

FAQ

WEBINAR

MANY THANKS TO OUR GUESTS



Speaker

David Wedepohl

Managing Director International Affairs, BSW-Solar

Speaker

Dr. Christoph Kost

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