

# The Solar Revolution

Germany's major future electricity source  
and what's in for local supply chains

November 2022

# Topic Pipeline



**PV**



**Onshore**



**Offshore**



**Heat**



**Smart networks**



**Grid  
expansion**



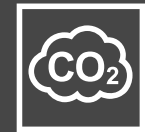
**Mobility**



**Hydrogen**



**Gas/LNG**



**CCUS**

“

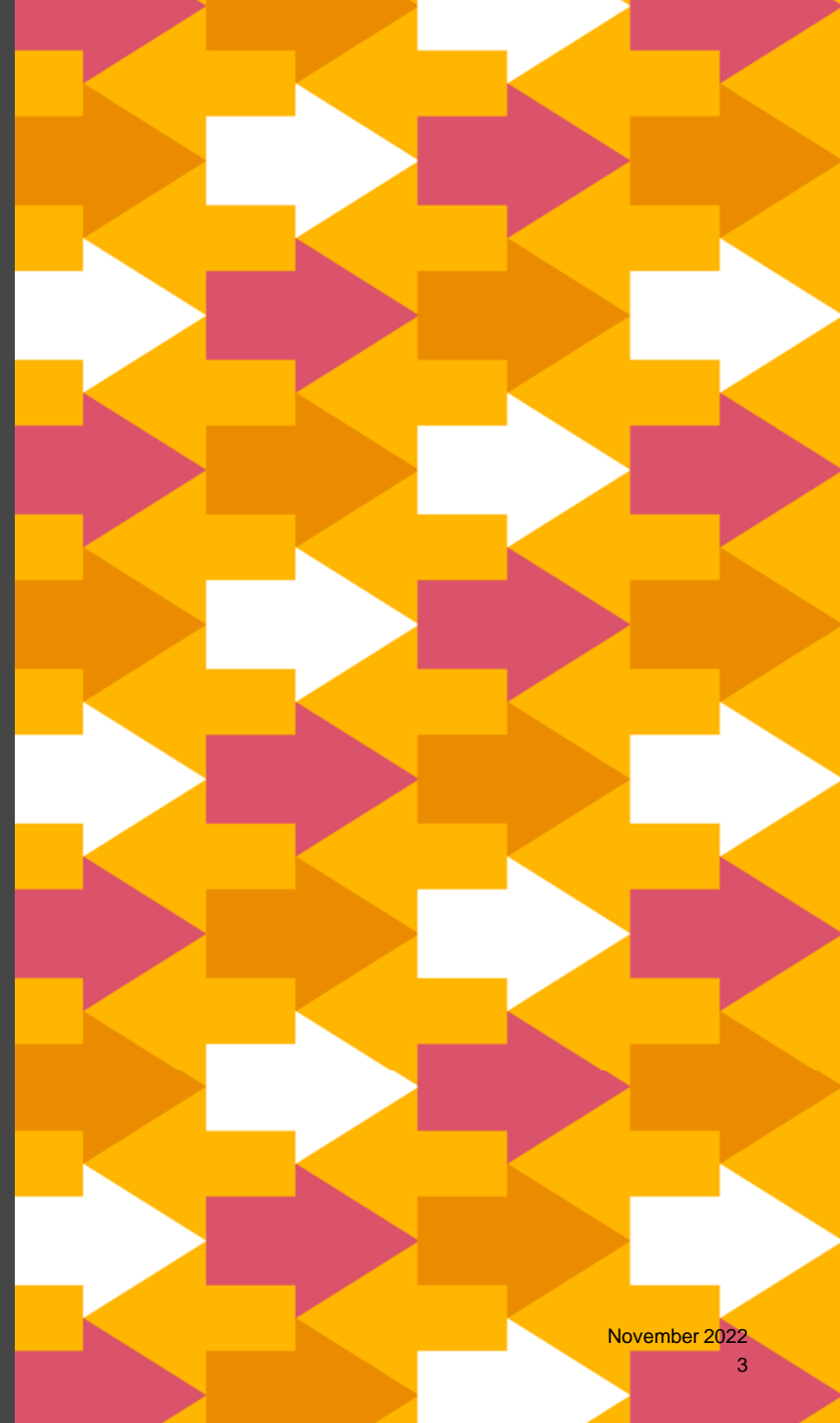
We have to switch our energy system over as quickly as possible, out of fossil fuels and into renewable energy sources.

This sends a clear signal to the markets and will give solar energy a decisive shot in the arm.

“

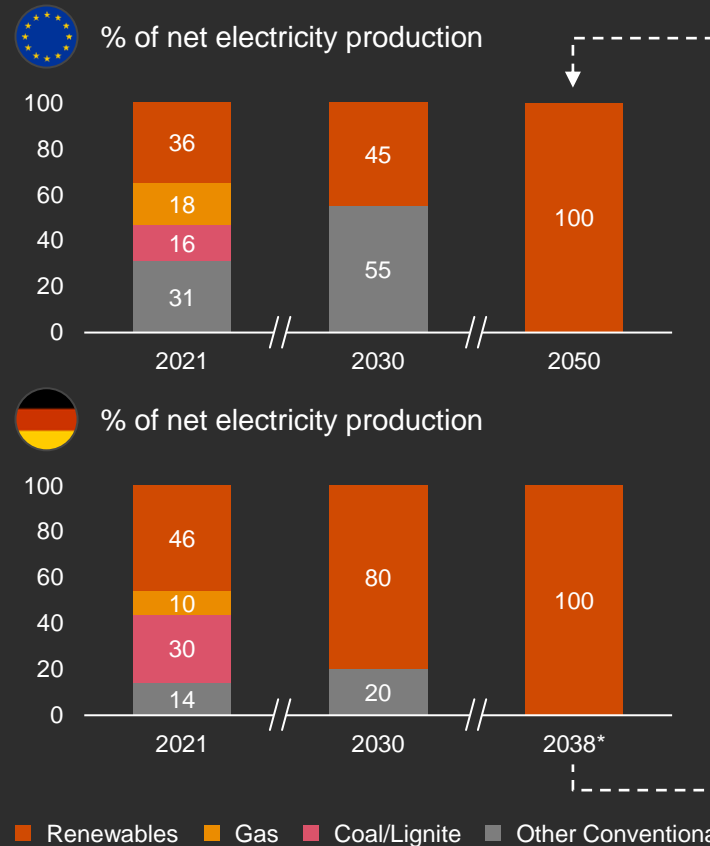
**Robert Habeck**

Federal Minister for Economic Affairs and Climate Action



# New ambitious renewable energy targets are driven by the urgent need for decarbonization due to the climate crisis...

## Share of renewable energy in current and future net electricity production in Germany and the EU



Germany **>10 years earlier** at 100% green electricity with an **almost 30% higher** planned average annual growth rate



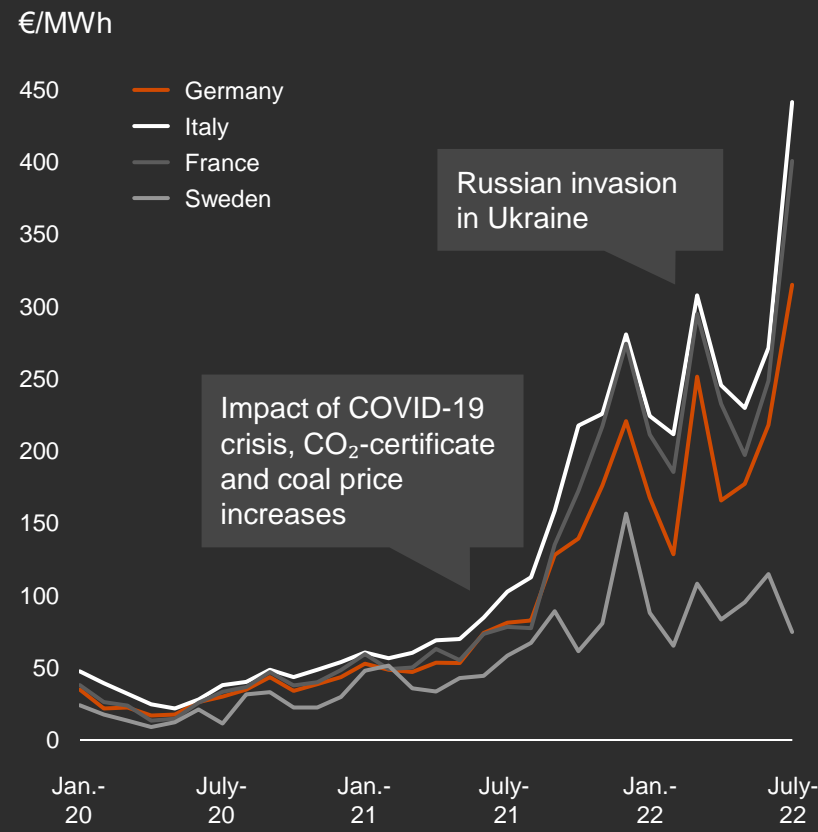
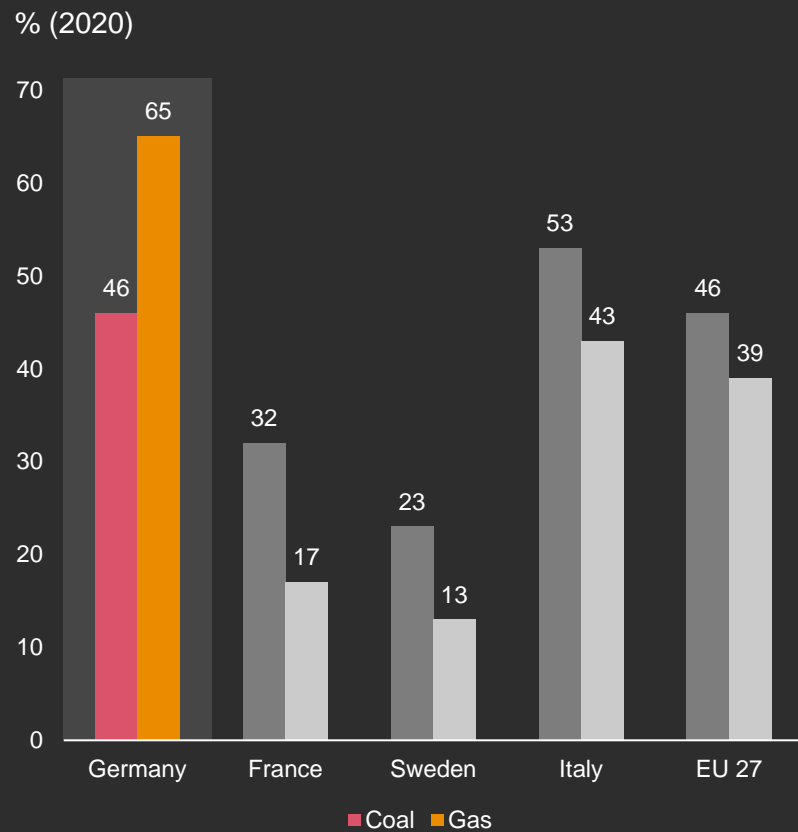
### Key Takeaways

- The increasingly visible and often **dramatic impacts of climate change** within Europe and Germany require an acceleration of the decarbonization of all sectors including electricity.
- The **share of conventional generation** technologies in the European and German electricity mix **is still high** but shall be reduced significantly.
- The new German coalition has set **unprecedented target levels** for this technological transition path; far above European average.

Source: BMWK (2022), Fraunhofer (2022), European Commission (2022) | \*The aim is to achieve carbon neutrality after the completion of the coal phase-out (latest 2038)

...and for energy independence and diversification of energy sources due to the European energy crisis.

Share of Russian imports of gas and coal for selected European countries and their recent electricity price increase

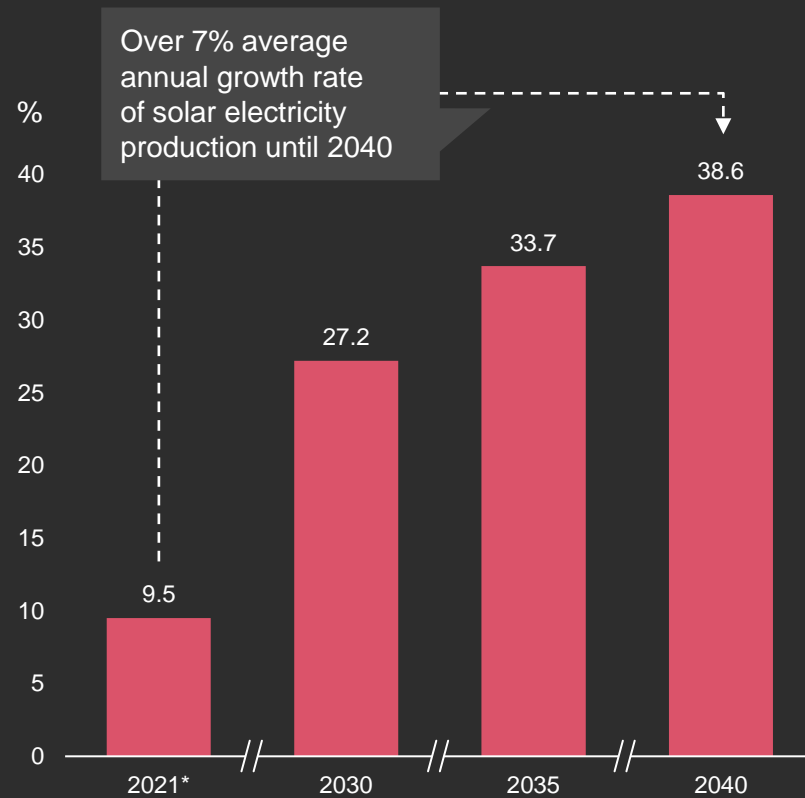


### Key Takeaways

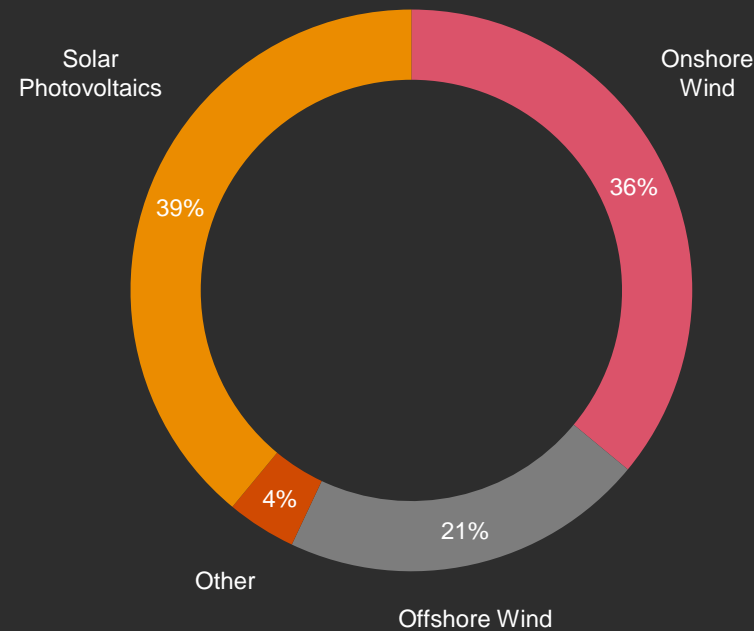
- Germany and other major European economies have a **high dependency** on Russian gas and coal imports.
- Compared to its European peer group Germany's **dependency on Russian gas is above average**
- The high dependency on Russia's gas and coal and the impact of the COVID-19 crisis are the main catalysts contributing to the **rising electricity costs**.

# Solar Photovoltaics has been identified as a major source of electricity in the future German electricity mix...

## Expansion targets for Solar PV as a share of gross electricity generation in Germany and the projected German electricity mix for 2040



~40 %



### Key Takeaways

- The German government sets the target of covering 80% of Germany's electricity consumption with renewable energies as early as 2030 and increasing this share to **100% by 2038**.
- **Solar PV shall be a major source for electricity production** in 2040 covering almost 40% of generation.
- Over the next 20 years solar electricity generation will have to **increase by over 7% annually**.

Source: Agora (2022), BMWK (2022), Fraunhofer ISE (2022) | \* 2021 solar electricity production figure includes own consumption

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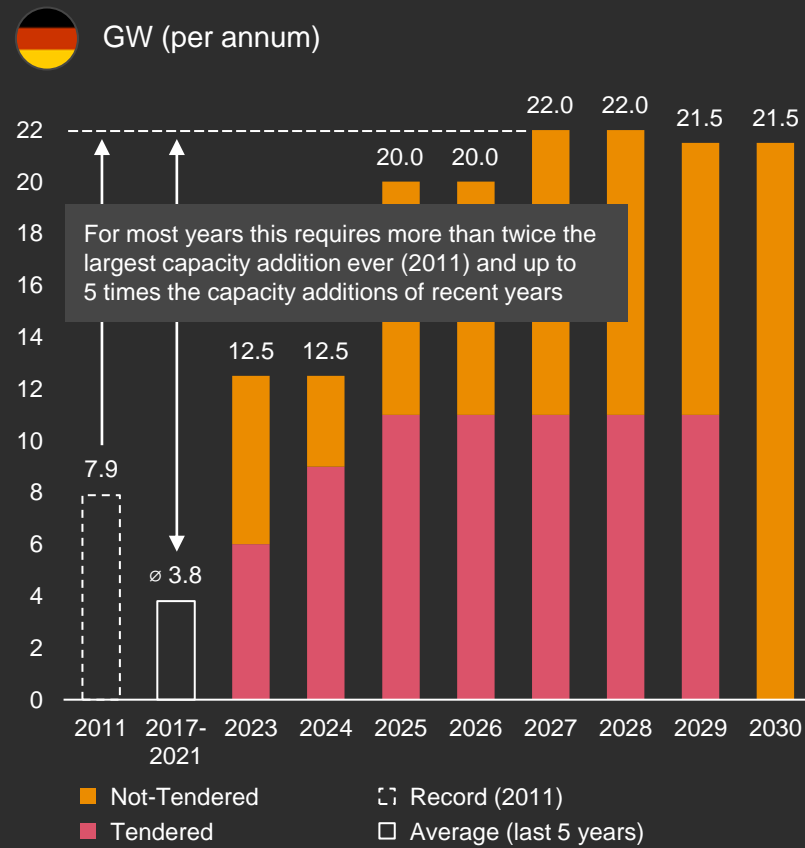
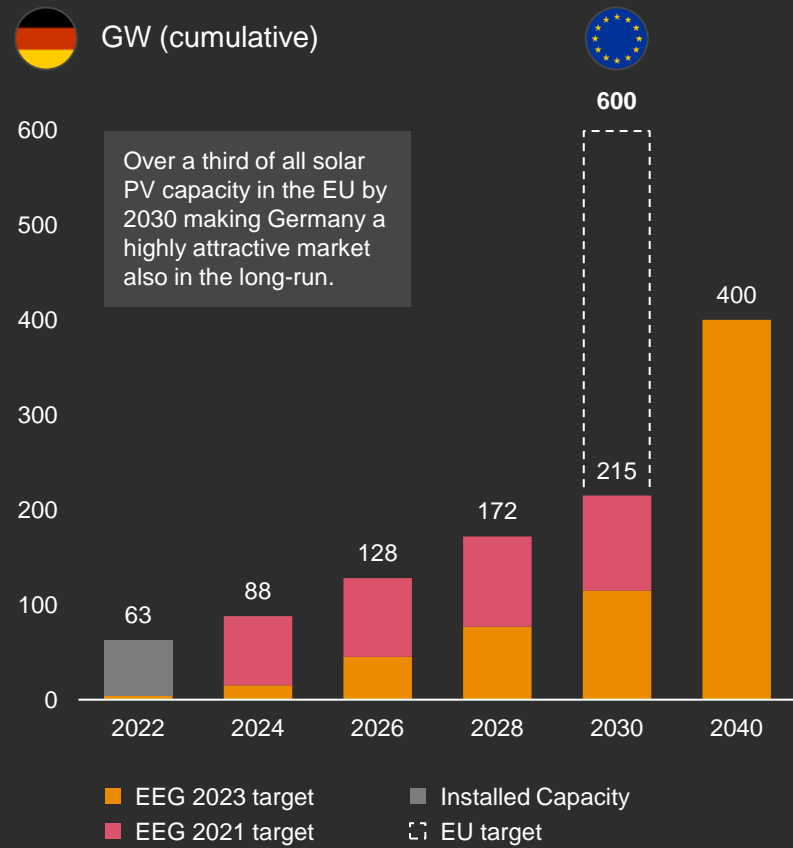
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# ...requiring a massive increase in the amount of annual Solar PV installations in Germany.

## Solar PV capacity expansion targets and the required amount of annual GW addition required to achieve those targets



### Key Takeaways

- Germany will have to **massively speed up its capacity addition** of all types of Solar PV installations with some years over 22 GW new installations planned.
- For the years to come this means **doubling or almost tripling** the quantity added in **the record** year 2011 of 7.9 GW.
- Based on an average module capacity of 440 Wp this translates to a requirement of **up to 50 million PV modules** per year (e.g. 2027/28).

Source: BMWK (2022), REPOWEREU Plan (2022), European Commission (2022), EurObserv'ER (2022)

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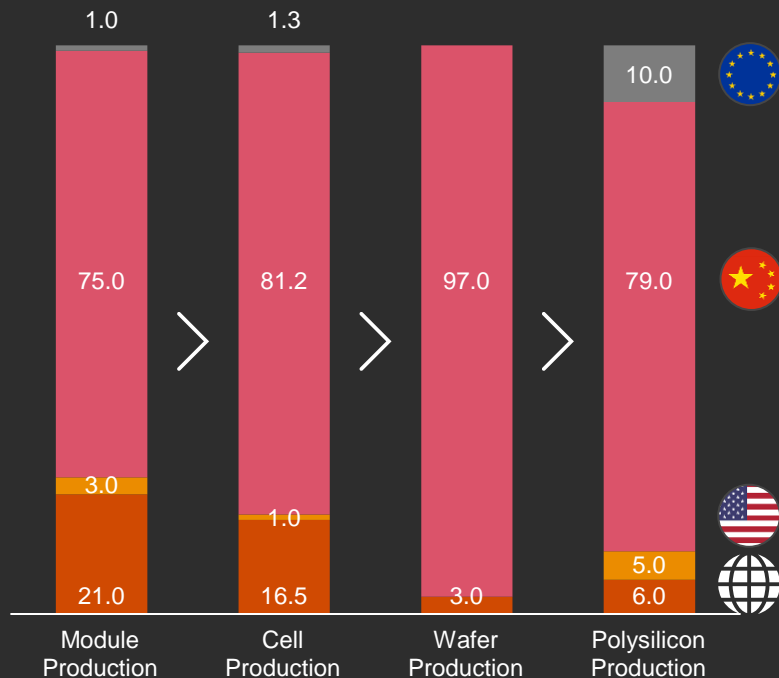
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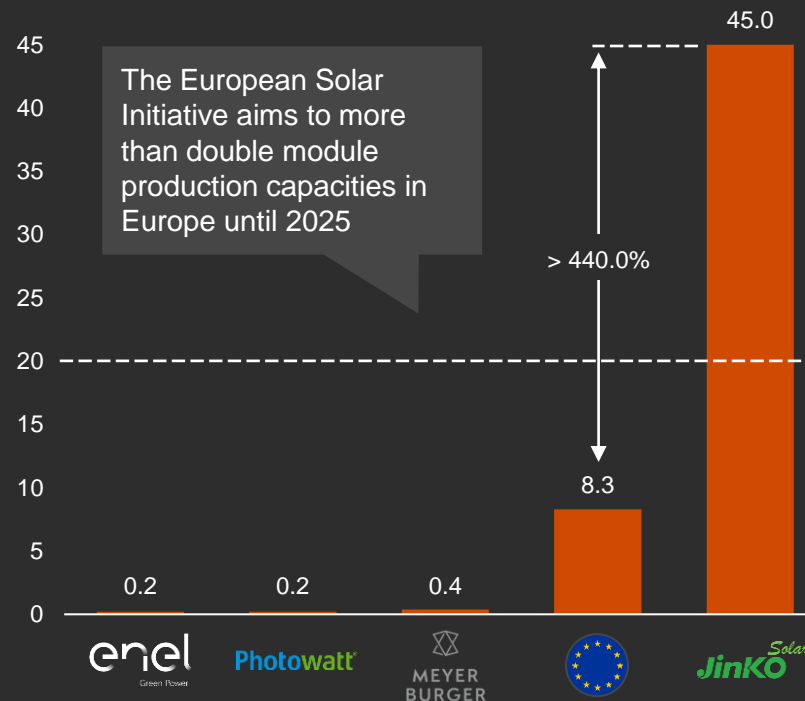
# Germany and the EU are, however, even less diversified with regard to Solar PV than with respect to fossil fuels...

## Module, cell, wafer and silicon production shares and comparison of module production capacities of selected European and Chinese producers

Market share in % (2021)



Annual module production in GW (2021)



### Key Takeaways

- Since the politically induced decline of the German and European solar module industry around 2010 **production of modules, components and raw materials is dominated by Chinese manufacturers.**
- **Production capacities** of Chinese module manufacturers are **often more than 100 time larger** than any of the European competitors.
- The **entire EU production** capacity is well below individual major Chinese competitors (e.g. Jinko).

Source: IEA-PVPS (2022), Enel (2022), Photowatt (2022), Meyer Burger (2022), Reuters (2022), Jinko Solar (2022), SolarPower Europe (2022)

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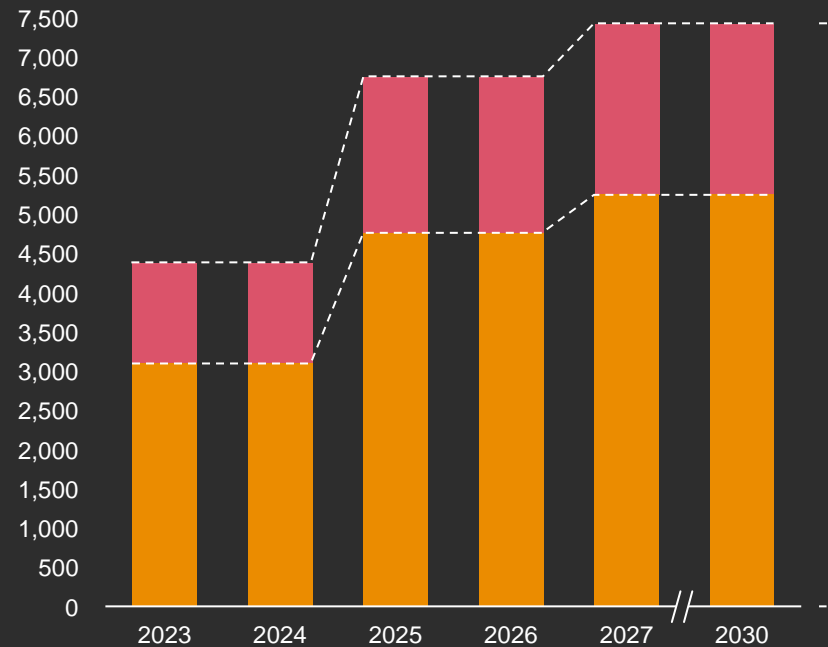
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...which is not only strategically challenging but also does not raise the full potential for economic growth and employment.

## Projected market volume of PV modules in Germany and selected economic, social, political and environmental benefits

€ (millions)



Simplified projection of **German PV module market volume**, if solar PV capacity expansion targets are met based on 2021 and 2022 prices and module capacities.

■ Based on 07/2022  
Average Module Price

■ Based on 07/2021  
Average Module Price



Substantial market volume



Positive employment effects



Long-term value creation



Synergies with other sectors



Increased standards of living



Improved energy security



...etc



### Key Takeaways

- The capacity additions for solar PV could lead to an **annual market volume of ca. 5–7 billion EUR** in Germany by the mid-twenties for **PV modules alone**.
- Adding inverters, cabling, mounting systems or transformers the overall **market volume for PV components** and all related services will be **substantial**.
- The **number of employees** in the PV sector could **double** to about 100,000 according to BSW-Solar.

# Solar PV will play an unprecedented role in the future German electricity mix offering many opportunities for the market

## Key take-aways and implications



### Decarbonization and Energy Security

The severe impacts of climate change and threats to energy security stress the **need for an accelerated decarbonization** of the German economy.

With an almost 30% higher planned average annual growth rate as its European peers, Germany aims for **100% renewable electricity by 2038** already.



### The New Role of Solar PV

Based on the current expansion targets Solar PV will become a **major source of electricity production** in Germany by 2040.

Achieving these targets will require up to five times higher annual capacity additions as in recent years adding at times **over 50 million new modules per year**.



### Supply-Chain Dependencies and Opportunities

With respect to PV modules and other components, Germany's supply chains are **even less diversified** than those for coal and gas with only very marginal local production.

With an estimated potential annual volume of **5–7 billion EUR in Germany**, reviving the solar module market could be highly beneficial to energy security, employment and economic growth.



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Our dedicated PwC Germany Renewable Energy team was established in 2000 and has ever since been working exclusively on renewable energies. We focus on commercial and financial advice for solar PV, on- and offshore wind projects. We offer M&A advice, benchmarking, valuation and financial modelling as well as strategic advice. Our clients include project developers, utilities, banks, strategic and financial investors.

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