

Massive Deployment of Renewable Energies



Francisco Pérez Spieß



Where are we coming from ?

Main goals:

- CO2 free generation by 2035 (!!)
- Increase energetic independence

"As simple as possible,
as complex as required"

Legislative Foundations

Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, EEG)

where national policy targets are set for:

- share of electricity from renewable sources,
- remuneration of electricity from renewable sources
- connection of renewable energy to the electricity grid
- tendering procedures for funding of REs
- direct selling by producers

Legislative Foundations

Energy Act (Energiewirtschaftsgesetz)

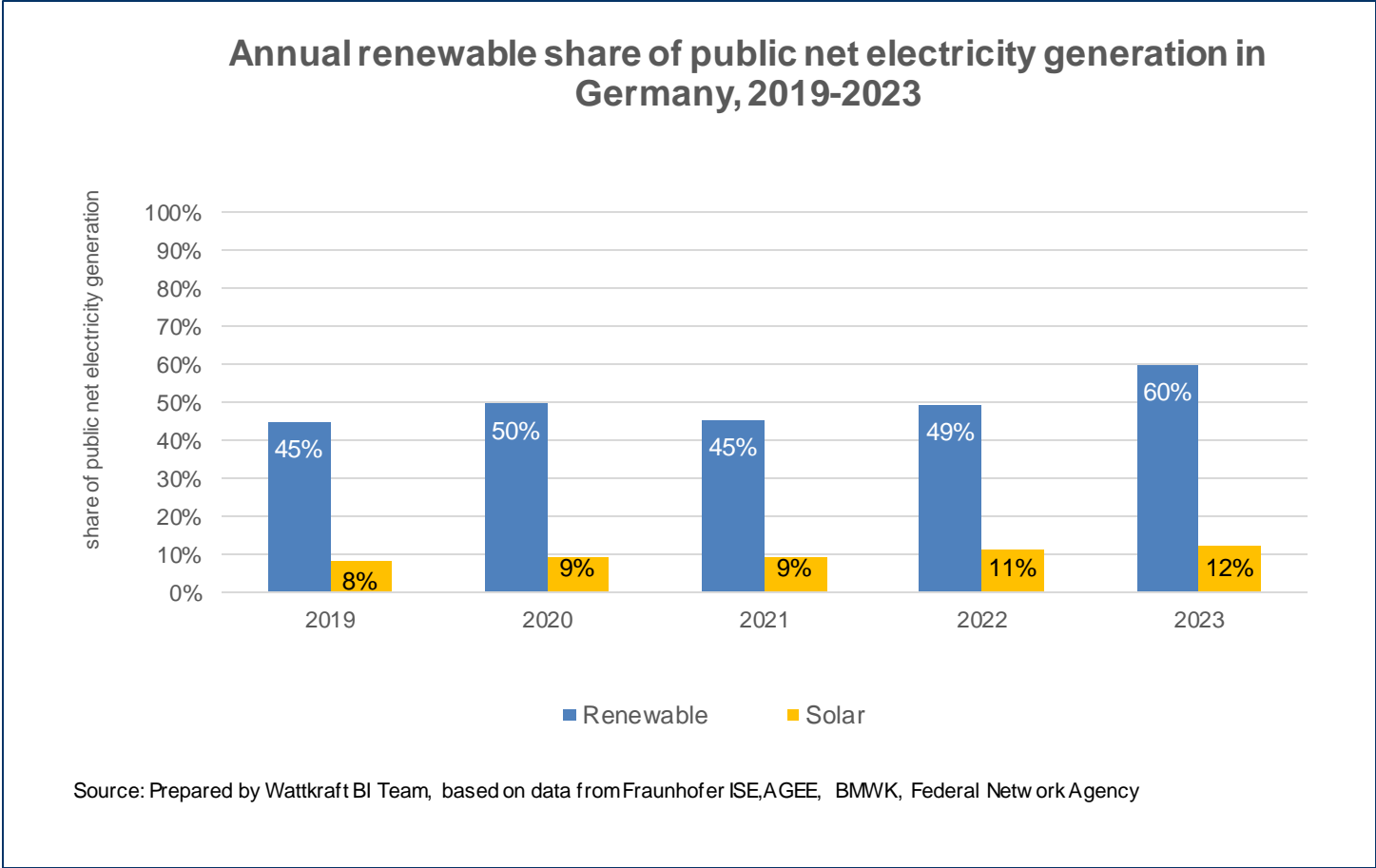
covers broader aspects of the energy sector, also including renewables:

- access and connection to electricity networks
- network charges
- rules for the operation, planning, and expansion of the electricity network.

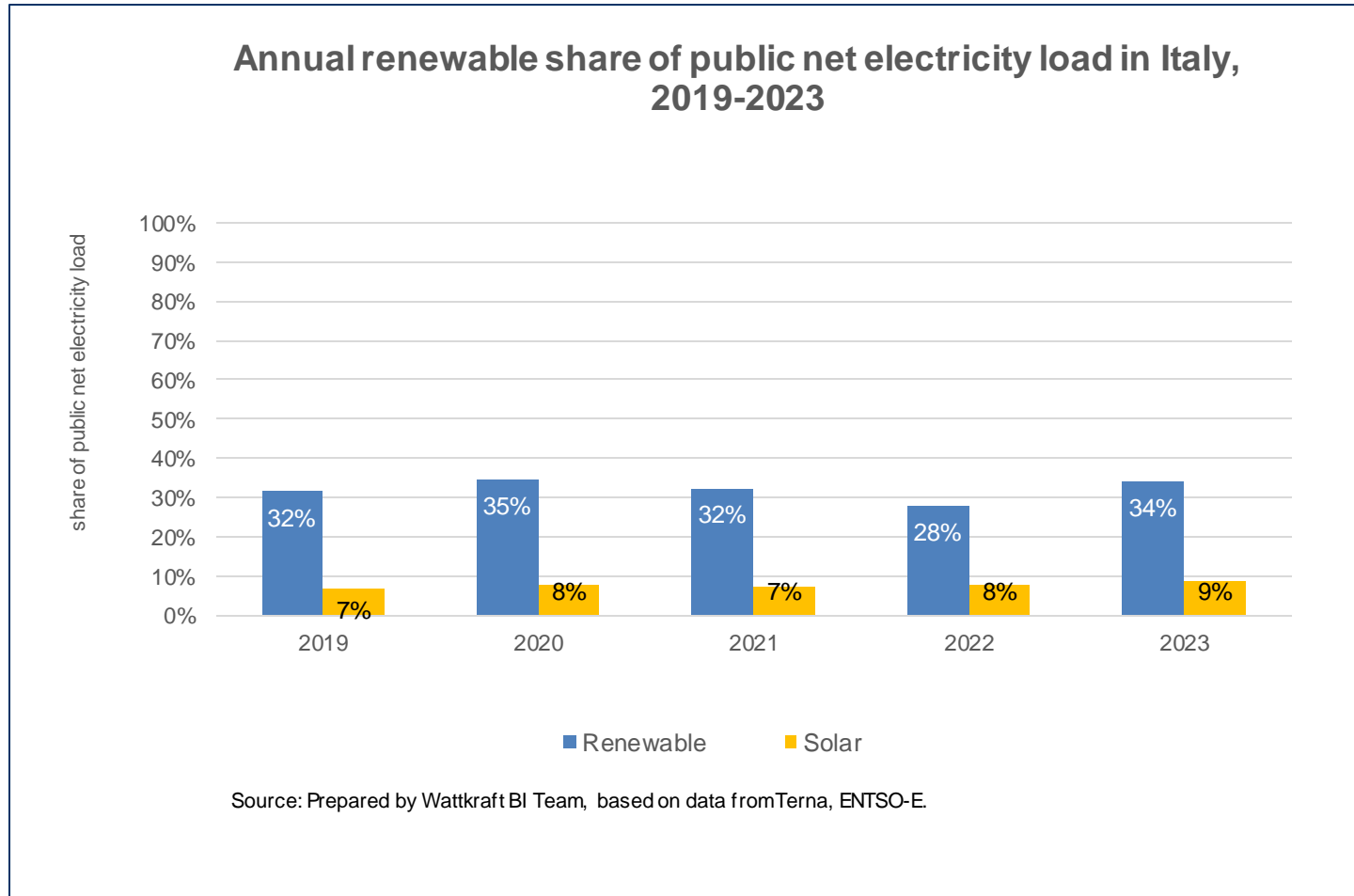


Renewable energy net installed electricity generation capacity is growing massively

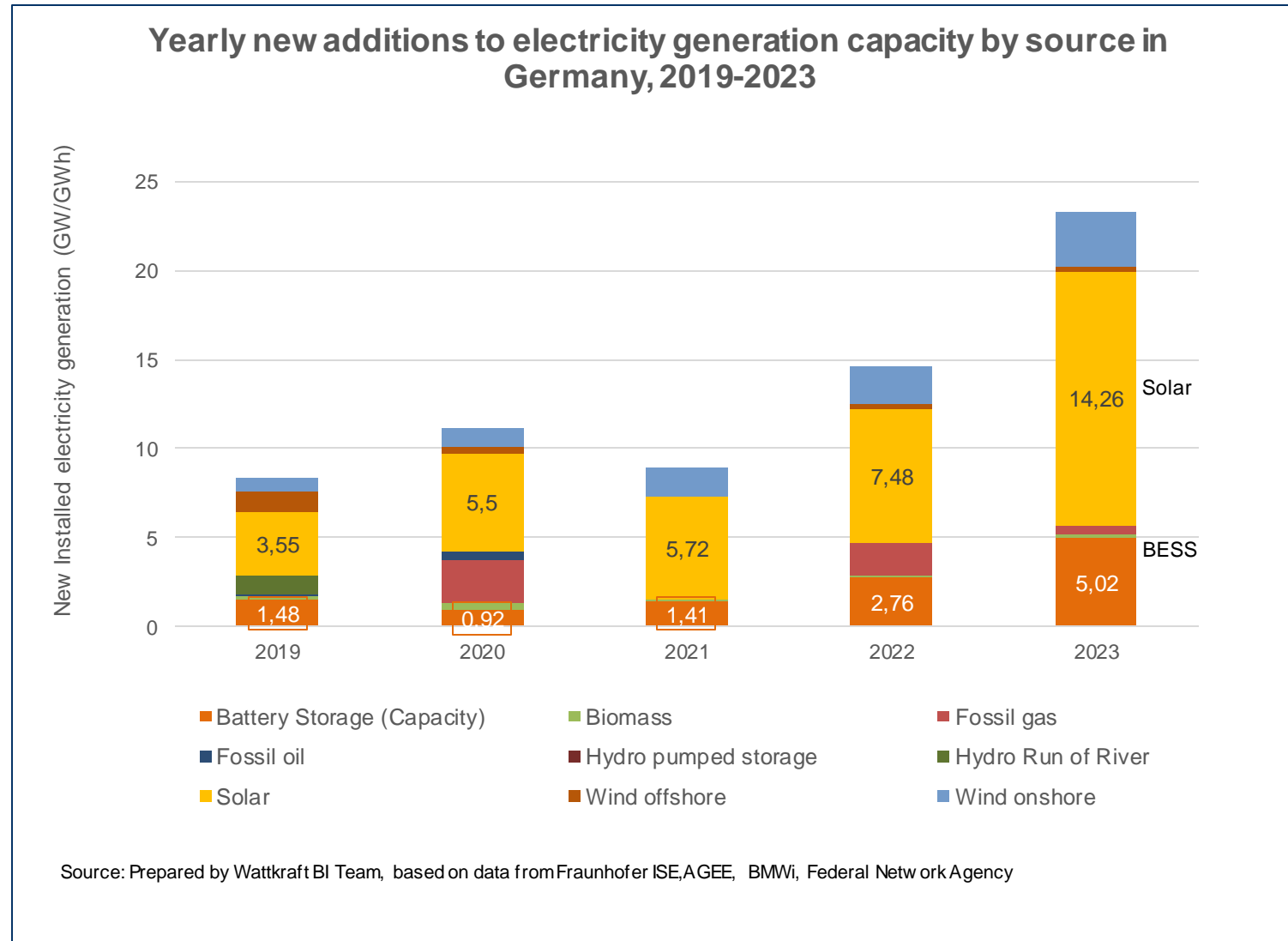
60% Renewable share in Germany



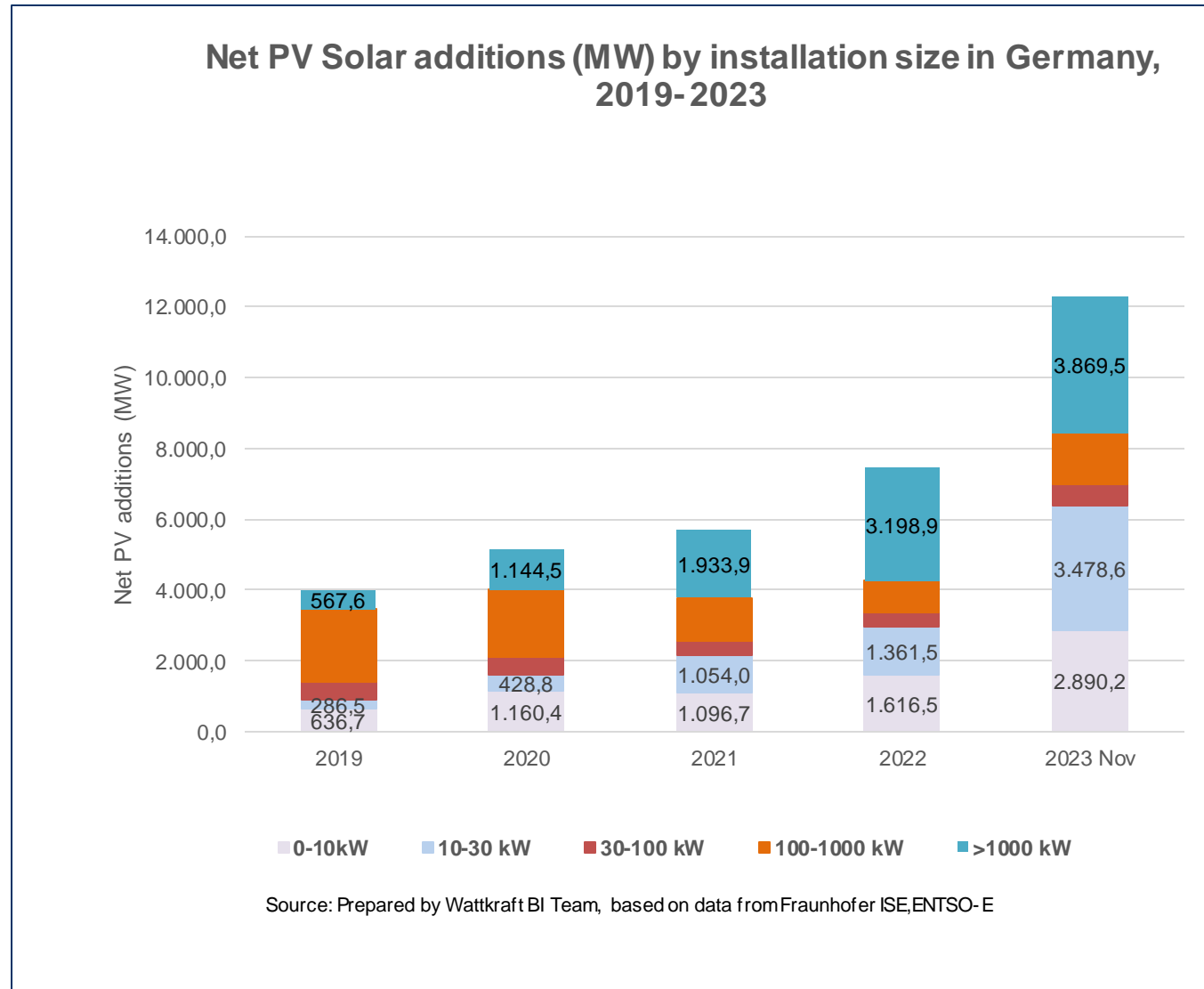
35% Renewable share in Italy



Additions by source in Germany



Additions Solar PV Germany



CHALLENGES

Grid Integration Challenges

Grid stability

- Frequency Control
- Voltage Stability (HV and LV side)
- Reactive Power Control

Curtailement

- Increasing exponentially
- Important economical damage

APPROACH

Grid stability and safety

- A lot of new regulations (jungle!)
- VDE-ARN-4110 (LV) / 4120 (HV)
- PPC even for small plants (PV >135kWp)
- Grid capacity expansion (slow!)

Curtailment / generation – demand unbalance

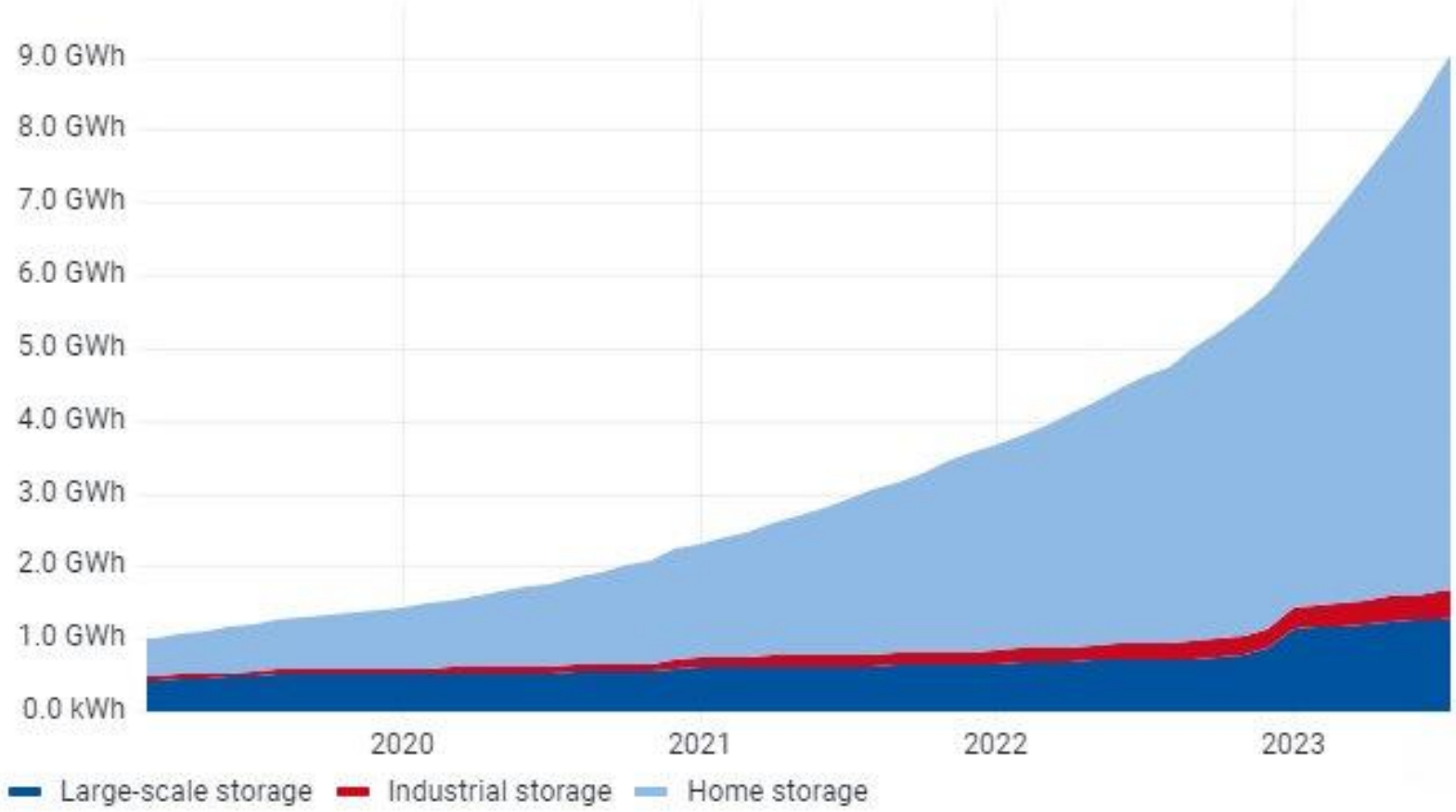
- Support for large storage systems
- Ancilliary power and storage

The background image is a composite of two scenes. The left side shows a modern, single-story building with a prominent glass facade and a chimney, set in a green, park-like environment with several trees. The right side shows a person jogging on a paved path that curves through a grassy area with large trees. The sky is clear and bright, suggesting a sunny day.

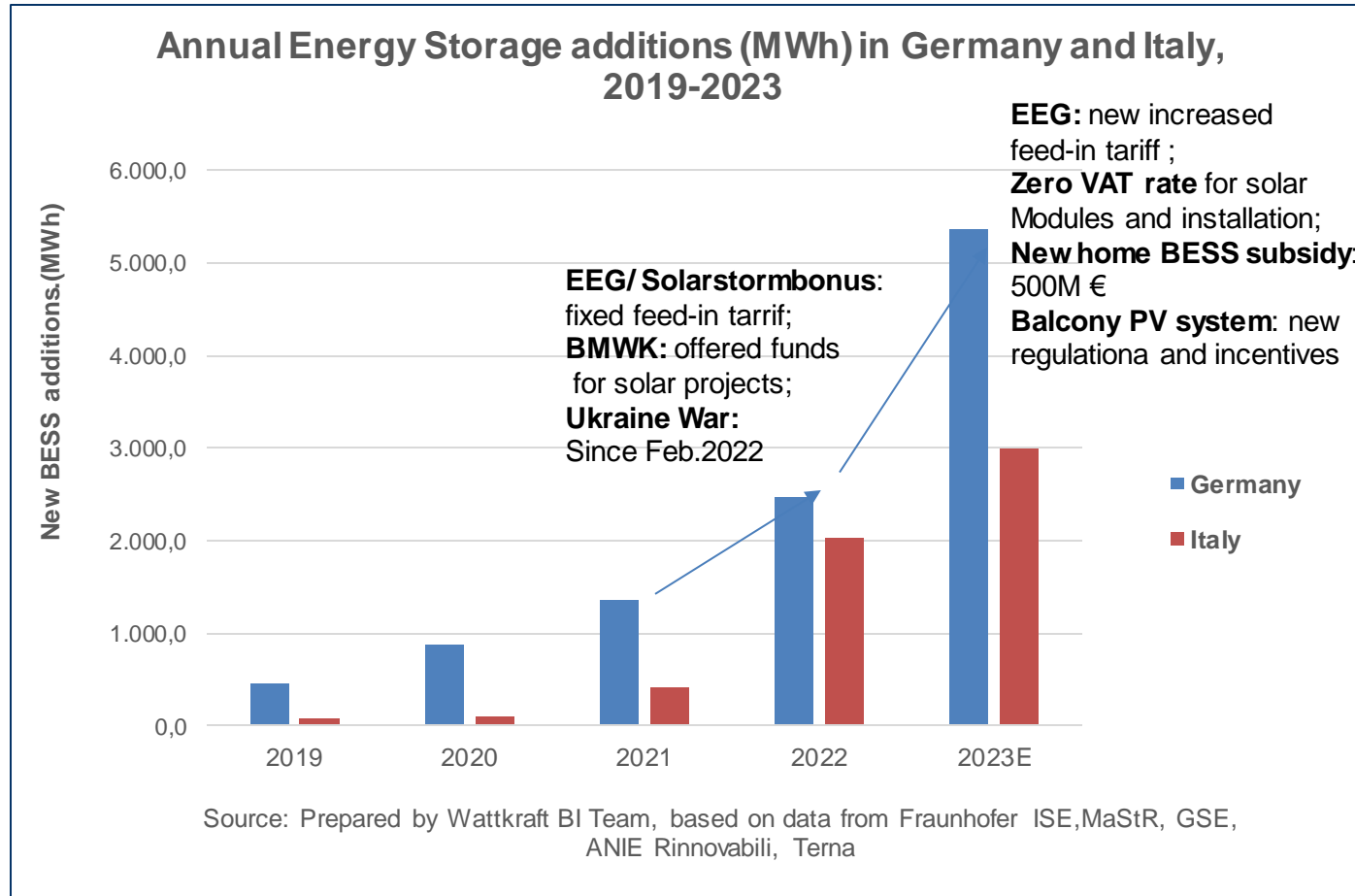
ENERGY STORAGE AS A VALID SOLUTION

Additions Storage Germany by type

Battery energy in Germany (All battery technologies, MaStR)



Additions Storage Germany / Italy



BIG OPPORTUNITIES AHEAD

Lessons learned from Germany

Important economical growth

- Residential and C&I plants generate distributed economy
- Utility scale plants generate strong investments and challenge the industry
- Own (new) industry develops
- Jobs are created
- Covid resilience (!)

Lessons learned from Germany

Technological development:

- Efficient grid expansion
- Advanced grid operation technologies (smart grids)

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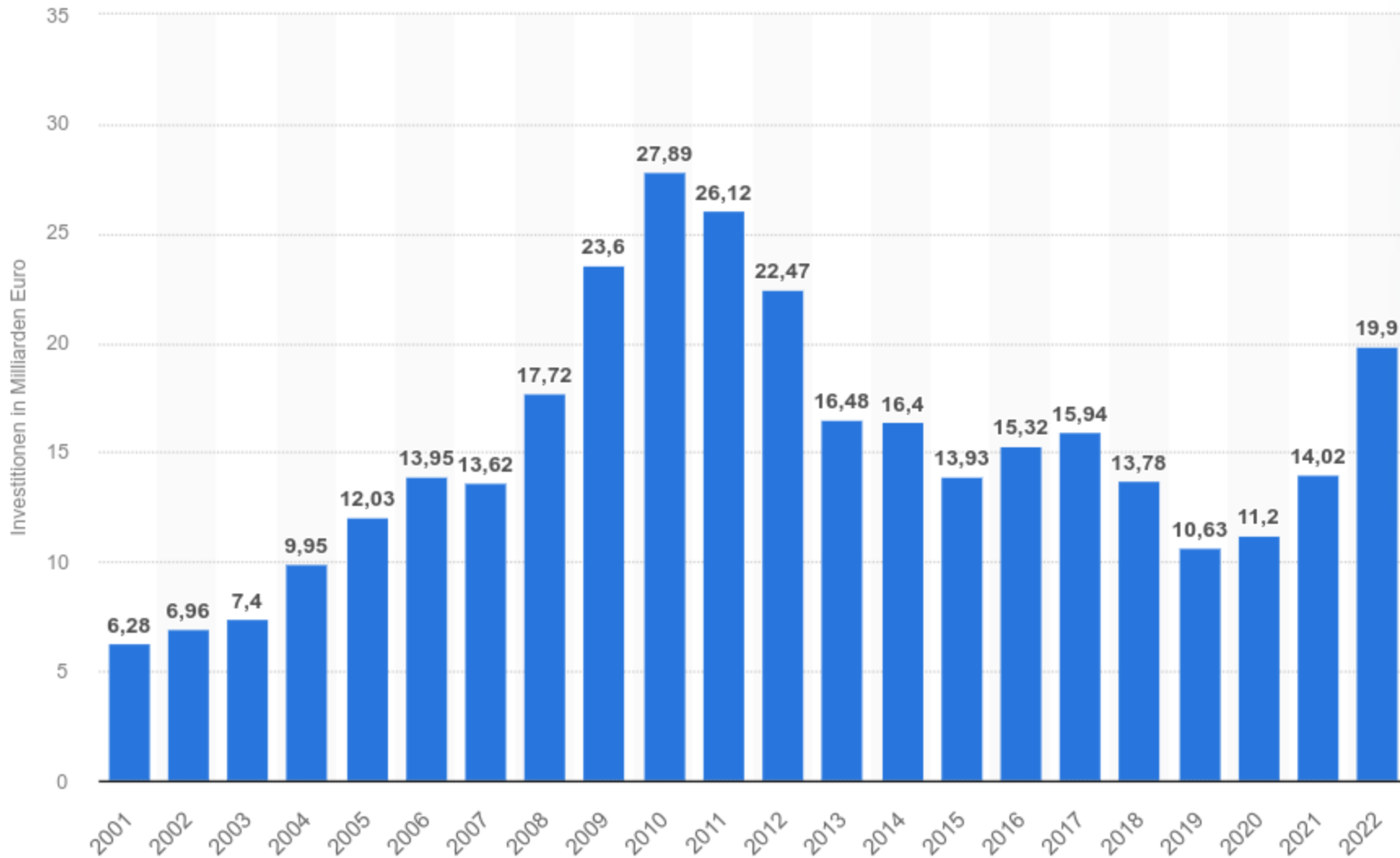
- Fast Energy Management Systems for medium and large BESS systems
- Fast PPC

Lessons learned from Germany

Challenges:

- Supply bottlenecks
- Educating new professionals:
 - Engineers
 - Installers
 - Planners
- Creating a (local) industrial ecosystem

RE Investments in Germany (billion EUR)



Source: Statista 2024

Main Markets until 2035

Renewable Energies

- Large scale storage (10-15GWh/year)
- Solar PV (12-16GW/year)
- Wind (offshore) (6-10GW/year)

... Nuclear (unlikely)



Thank you !