

Financing, participation, and environmental protection in community renewable energy projects

IÖW Summerschool Lüneburg August 2023

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Member German Parliament (1998 -2013)

ENERGYWATCHGROUP



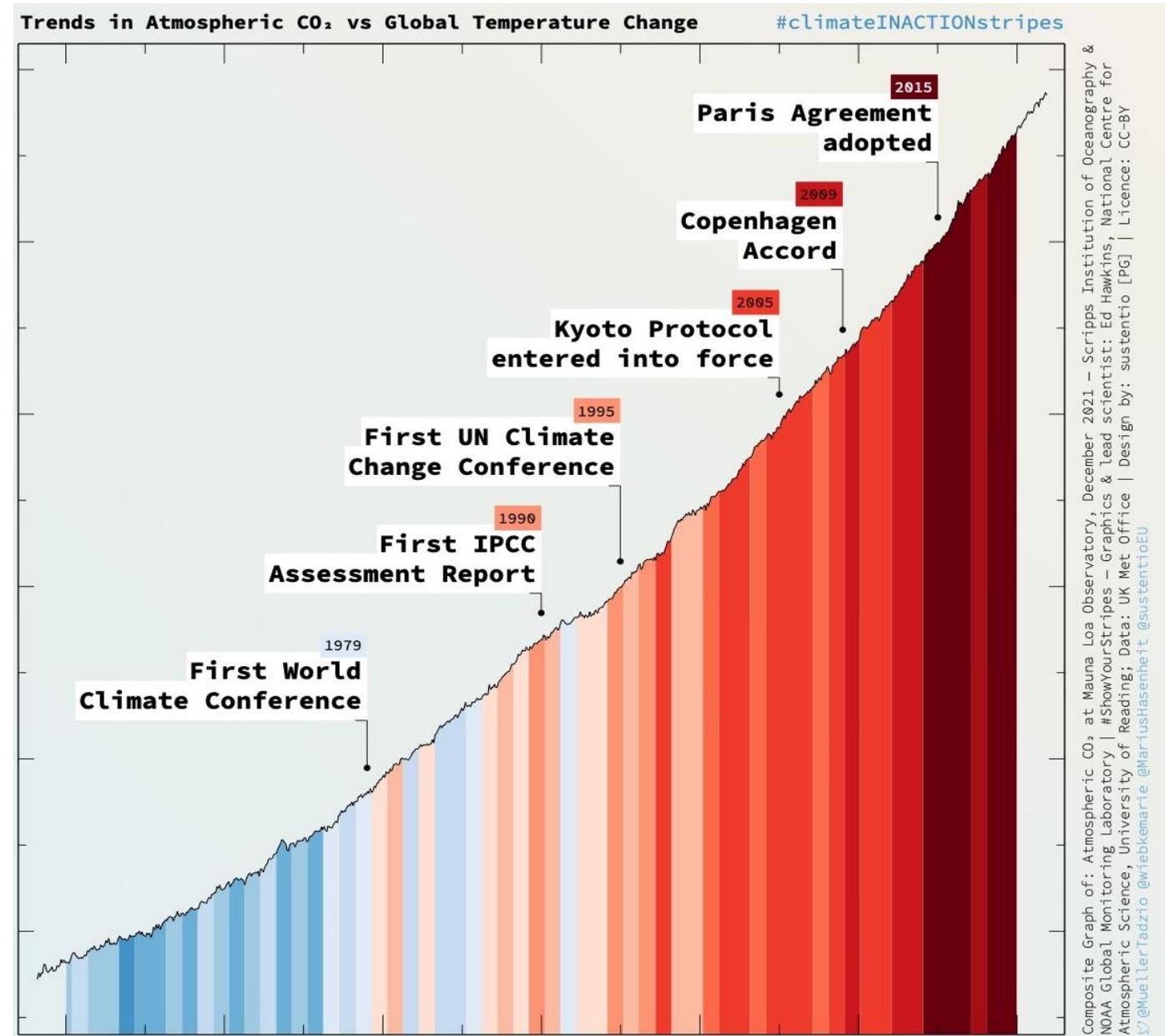
Bad news:

Today: 423 ppm

Green house gas concentration is still **going up.**

the higher the concentration,
the faster the heating

Climate **change** is
happening much **faster**
than predicted.



The Impact of 3°C Global Warming by 2050: The Existence of Human Civilization is Threatened

2050 Scenario: degradation, sea level rise and scarcity of resources lead to 1 billion people being displaced, an increase of armed conflicts and a possible nuclear war.

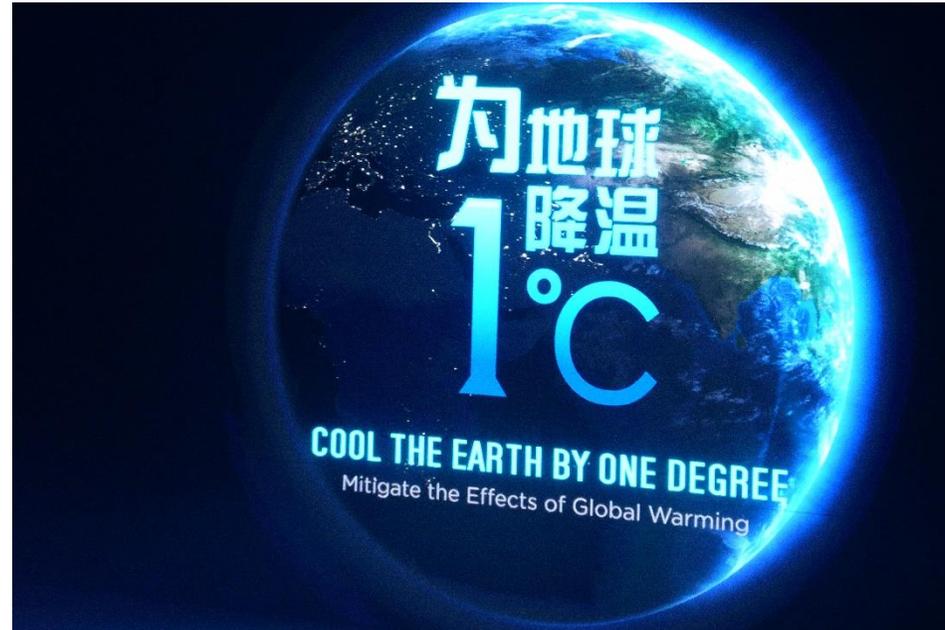
3°C (“business as usual”) means for 2050:

- **Sea level rise of 0.5m by 2050:** Miami, New York, Shanghai, Amsterdam threatened by inundation.
- Annually, 55% of the global population are subject to more than 20 days of **lethal heat conditions**.
- **Desertification emerges over more than 30% of the world’s land surface:** Food production inadequate to feed the global population. Water scarcity affects 2 billion people worldwide.

This can only be prevented by a **global zero-emission system by 2030 at the latest**.



Leonardo di Caprio 17.4.2017 in Shanghai at Presentation of new BYD E-cars: **Global Cooling by 1°C**



Vision

350 ppm

The mission is:
no emission plus negative emission

Pseudo solution for climate protection: Low Carbon

- Nuclear
- Natural gas
- Fossil CCS (carbon capture storaging)
- Blue Hydrogene
- Fossil efficiency
Hybrid car,
- Geoengineering



Crises climate warming and energy dependencies can be solved with two parallel strategies:

1. Stop greenhouse gas emissions (best by 2030)

(Not only reduction of emissions)

- Switch to 100% renewables
- Completely stop the use of fossil and nuclear energies in energy, chemistry, transport, agriculture and industry feedstock
- Circular economy

2. Take out carbon from the atmosphere

- Convert plants to humus soil (biocoal)
- Reforest big areas, green the deserts
- regenerative agriculture
- **No fossil CCS**

The target must be 350 ppm CO₂
This leads to global cooling instead of global warming and to energy independency

Joint Declaration 2021 of the Global 100% RE Strategy Group

- With political will a transformation of global energy sector by 2030-2035 appears to be possible.
- Solar & wind + flexibility will be the key pillars of energy supply.
- A 100%RE system will benefit the world economy.



AALBORG UNIVERSITY
DENMARK

RethinkX

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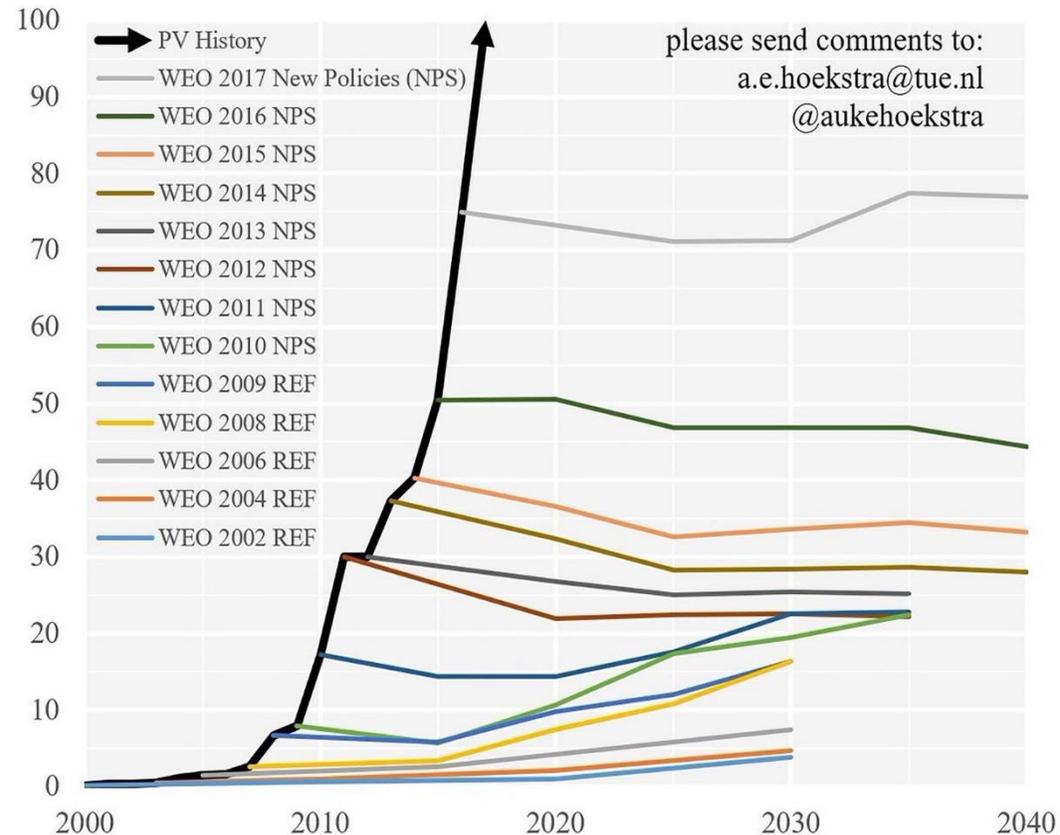
Australian
National
University

esmc
European Solar Manufacturing Council

<https://global100restrategygroup.org>

Annual PV additions: historic data vs IEA WEO predictions

In GW of added capacity per year - source International Energy Agency - World Energy Outlook



Good news:

IEA and the world leaders constantly underestimating growth of solar PV

The renewable transformation is happening much **faster than predicted.**

Huge afforestation in China, Desert Gobi Huge Carbon sinks



- 45 Millions hektare wood afforested (bigger than Germany)
- 313 Millions new Jobs
- Almost no more sandstormes in Beijing

My visit in June 2023 at Ordos PV Power 2,2 GW Zero emission electricity and desert greening



All 16 000 Buses in Shenzhen drive electric since 2019

Shenzhen, China, 12 Million inhabitants

CO2 Reduction:
135 Mio to/a

Also all 12500 Taxis
drive electric



Source: screenshot BYD
https://c1cleantechnicacom-wpengine.netdna-ssl.com/files/2012/09/byd-e6-electric-taxi-in-service-in-shenzhen-china_100348441_1.jpg

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Präsident der Energy Watch Group

China is on the way to 100% Renewables by 2030

The government's goal of climate neutrality in 2060 can and must be achieved much sooner: best in 2030



China 2022: 7% Renewable electricity

Yearly new installation doubles every 2 Year
This means 100% renewable electricity around 2030

e.g. PV:

2022 installed capacity about 400 GW

New installation in 2023: up to 150 GW

Car sales in 2023: 35% E-Cars

In 2030: nearly 100% E-Cars

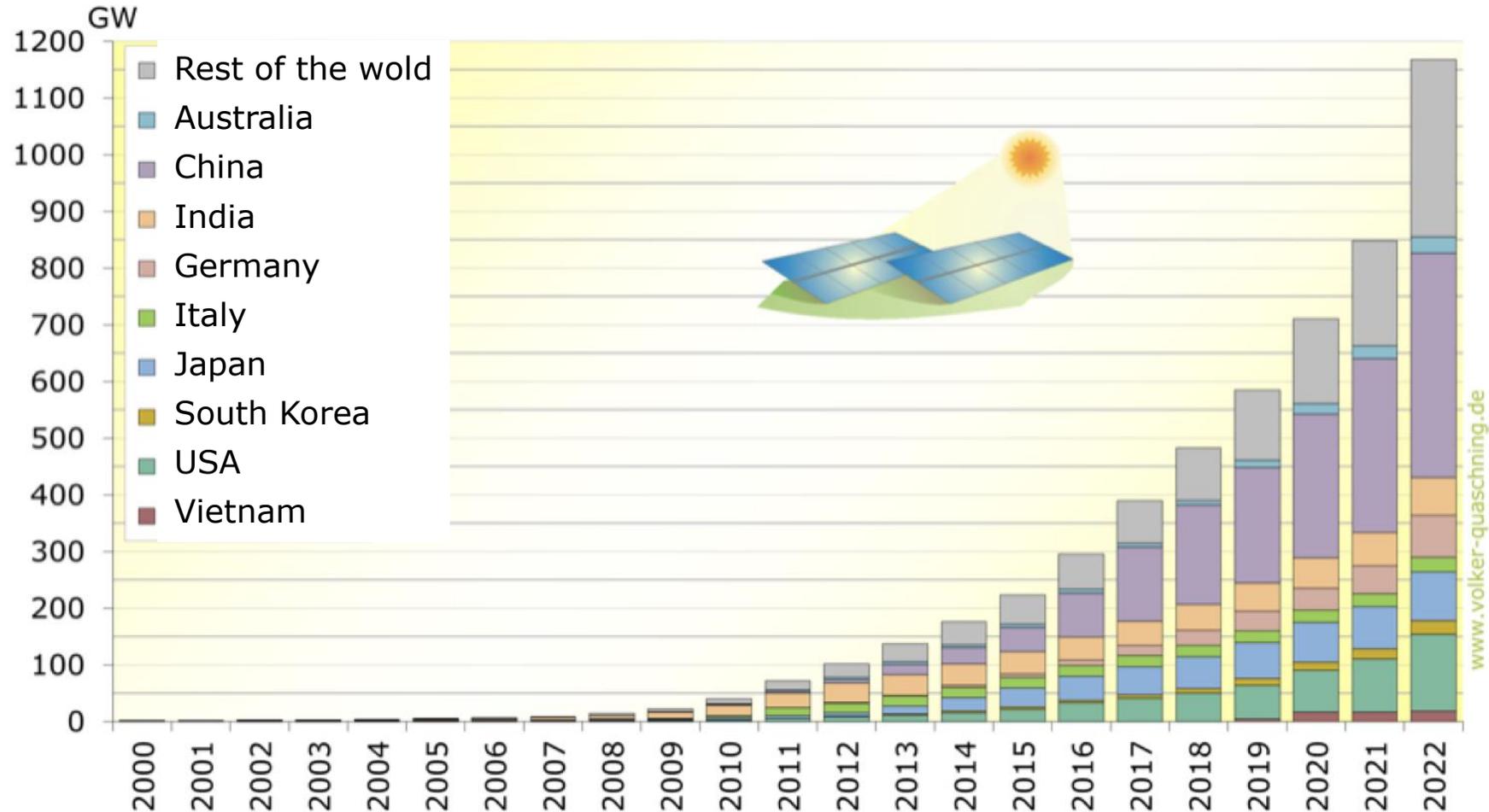
PV Production capacity:

2022: 500 GW

2024 estimated: 1000 GW

Global installed photovoltaic capacity from 2000-2022

China is leading the world



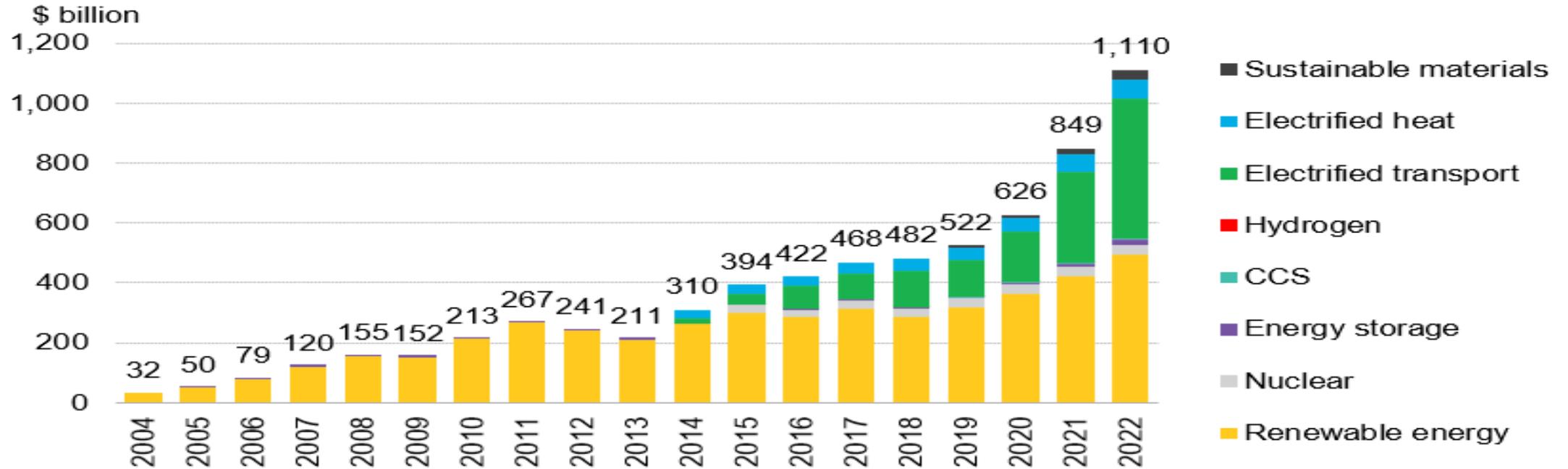
Source: Quaschning, 2023

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Global new investments in the energy transition by sector

Nuclear power does not play a significant role

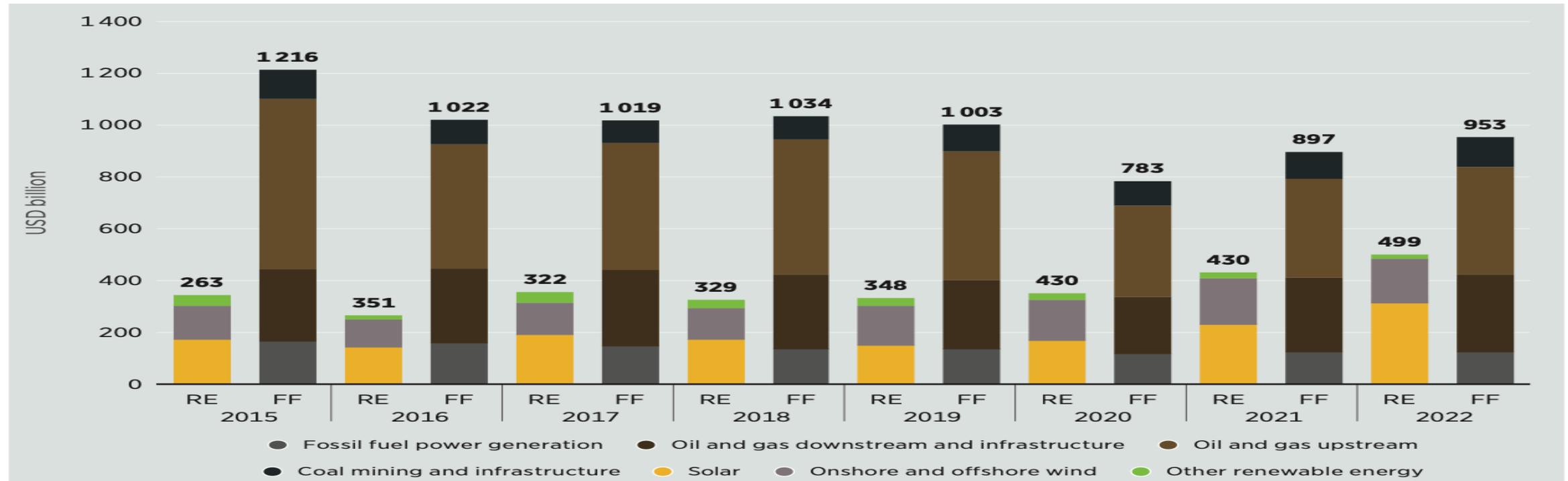
Figure 1: Global investment in energy transition by sector



Source: BloombergNEF

Fossil investment is still twice as big as renewables

Figure S.2 Annual investment in renewable energy vs. fossil fuels, 2015-2022

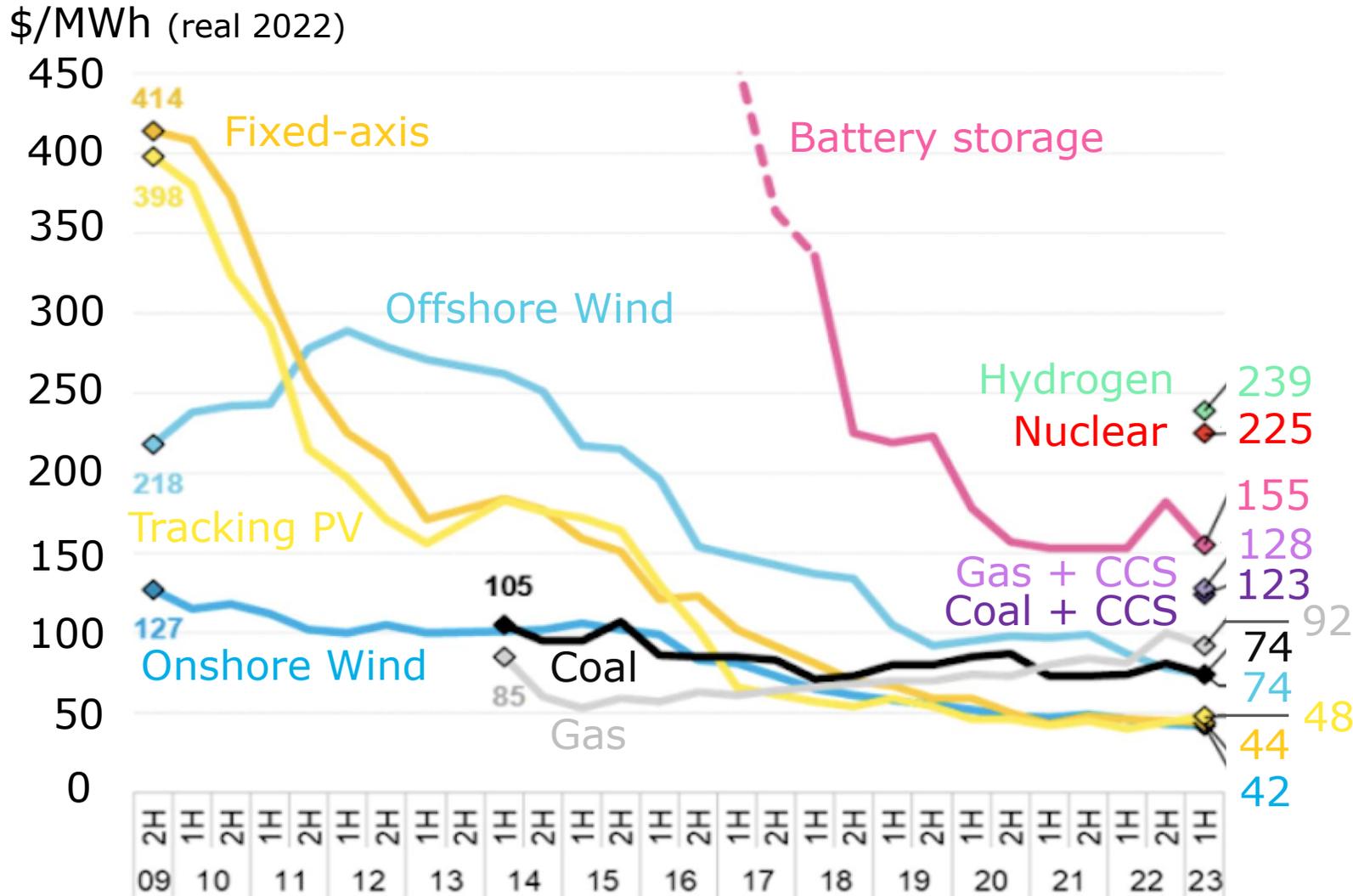


Note: FF = fossil fuel; RE = renewable energy.

Based on: CPI (2022a) and IEA (2022b).

The world must stop all fossil investments and invest only in renewable energies and emission-free industry.

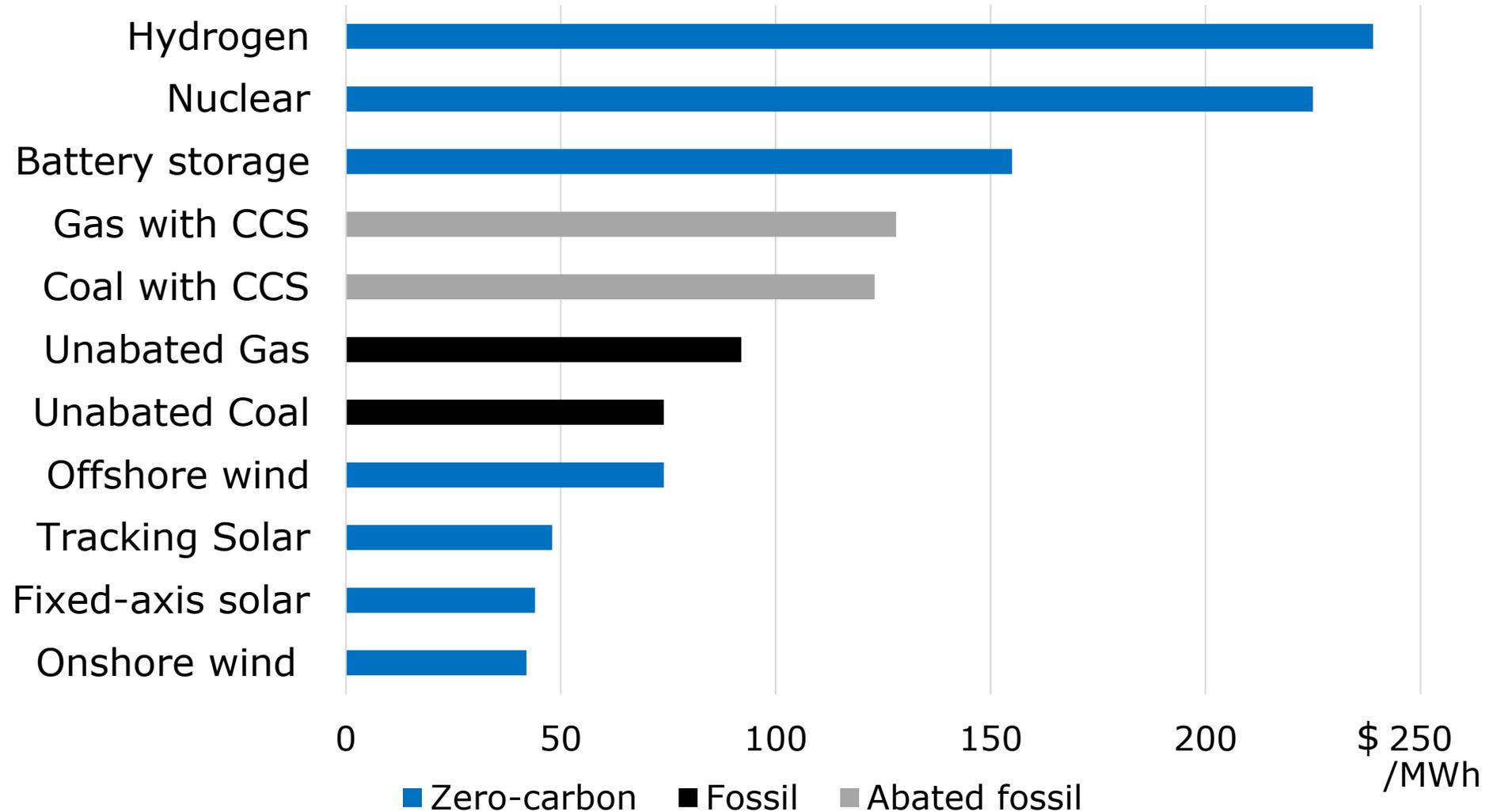
Global levelized cost of electricity benchmarks, 2009-2023



Source: Adapted from BloombergNEF (2023)

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Green electricity is much cheaper than electricity generation from hydrogen, fossil fuels and nuclear power

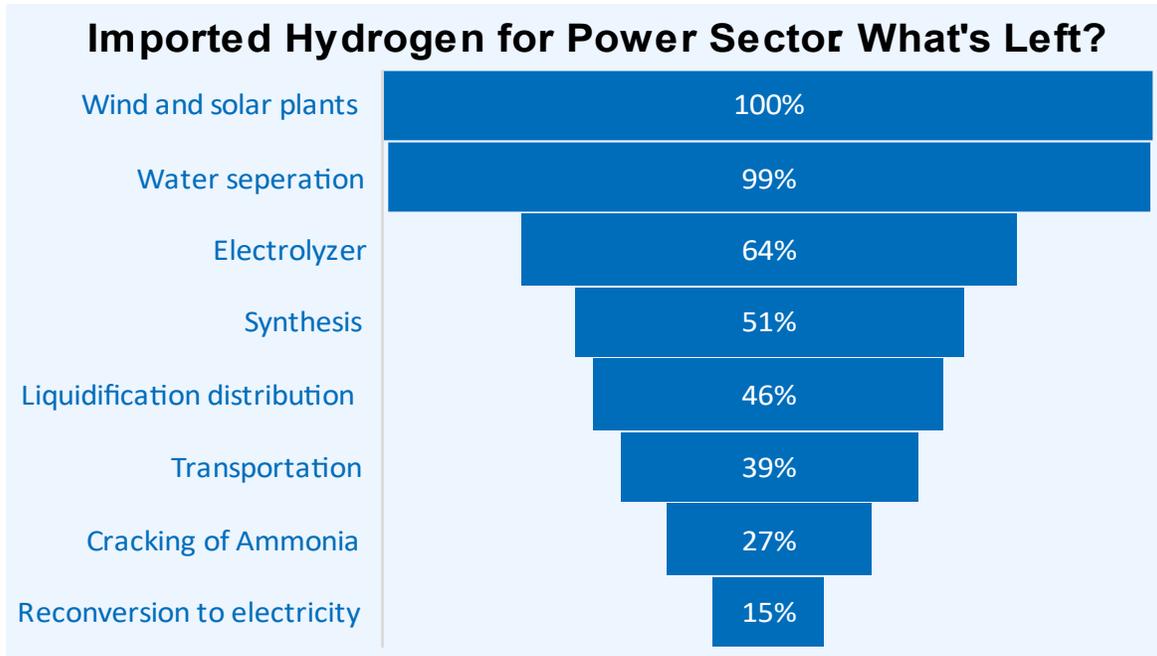


Source: Adapted from John Raymond Hanger (2023) & BloombergNEF (2023)

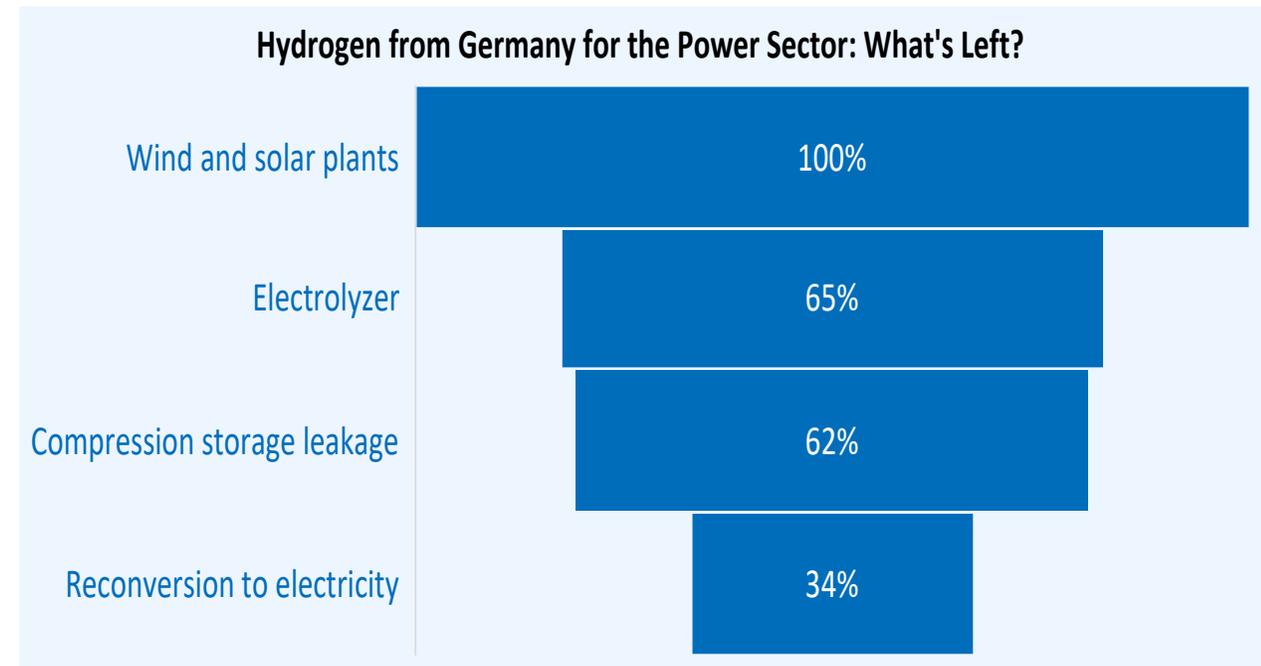
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Hydrogen imports for the electricity sector vs. domestic hydrogen as electricity storage

Overall efficiency



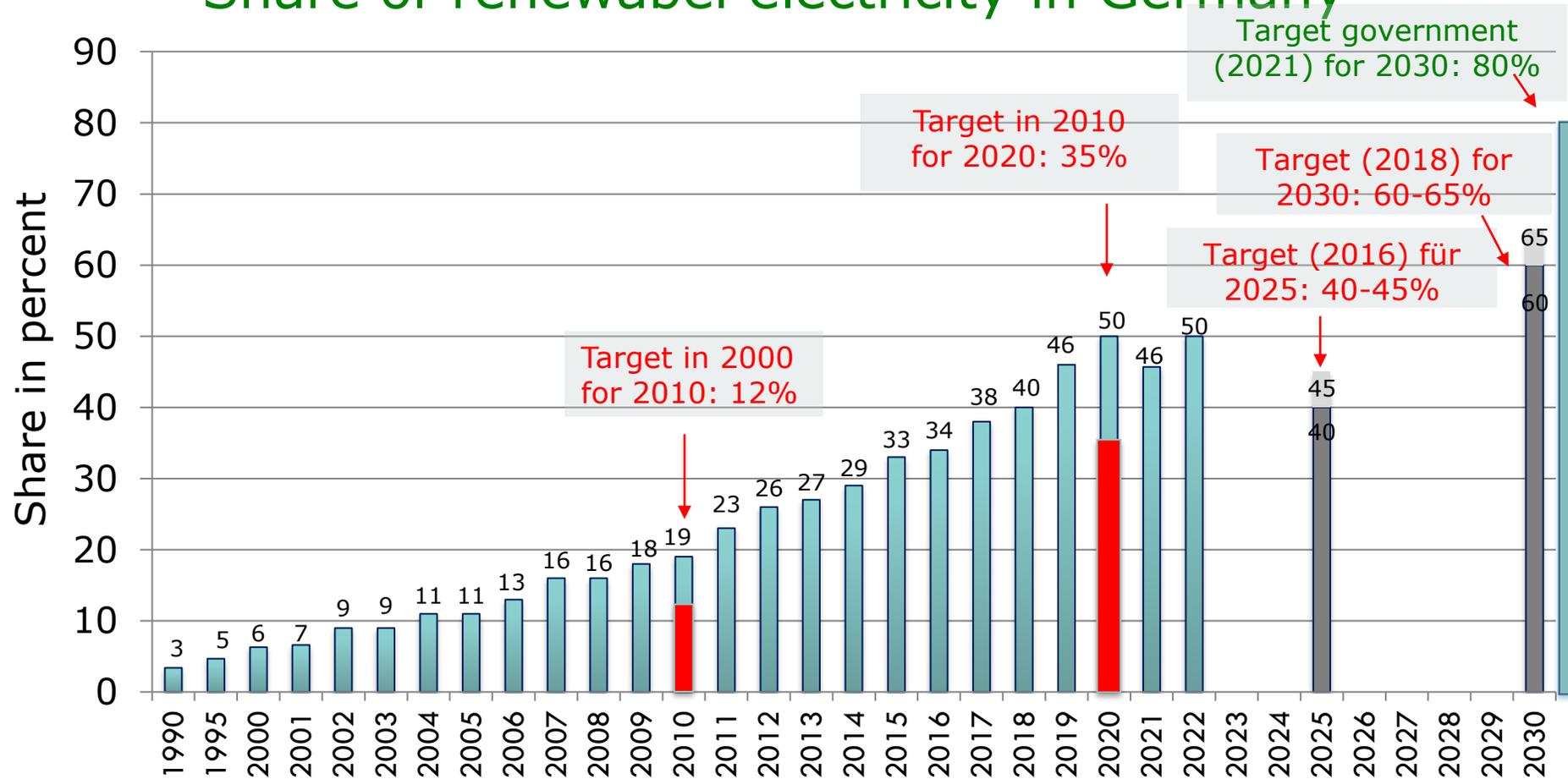
Imported hydrogen,
e.g. Australia to Europe.
Efficiency: 15%



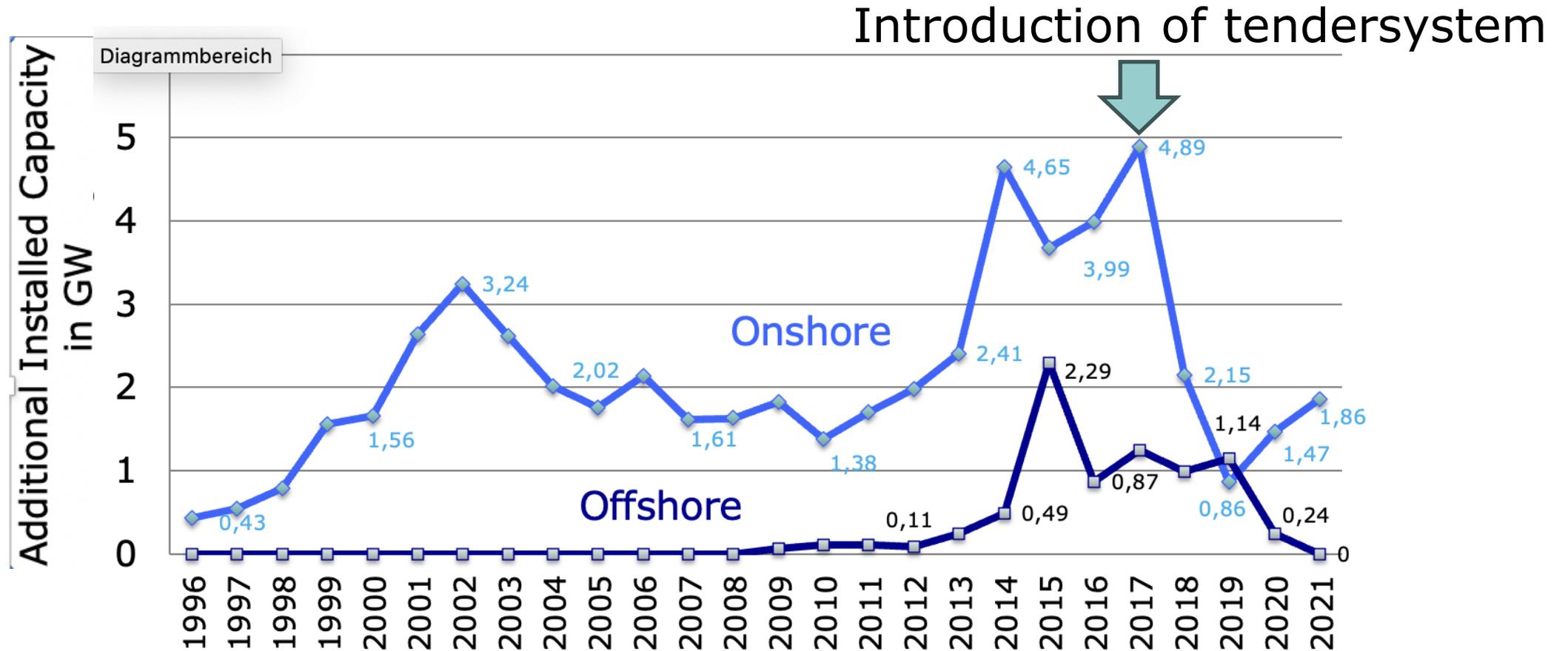
Domestically produced hydrogen
as storage with reverse power generation
Efficiency : 34 %

Policy measures support or suppress the growth of renewable energies

Share of renewable electricity in Germany



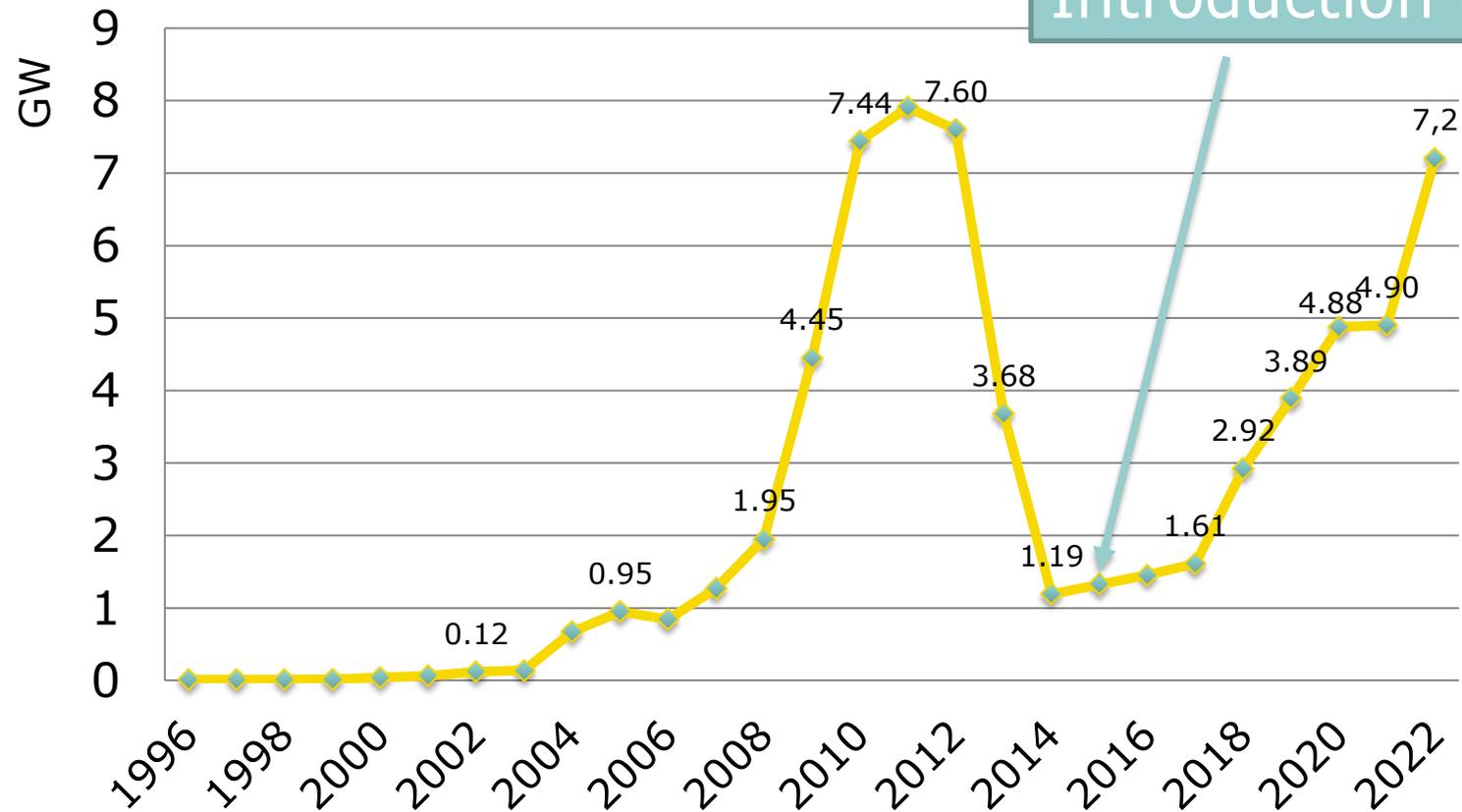
Decline of Wind Energy in Germany caused mainly by the switch to auctions



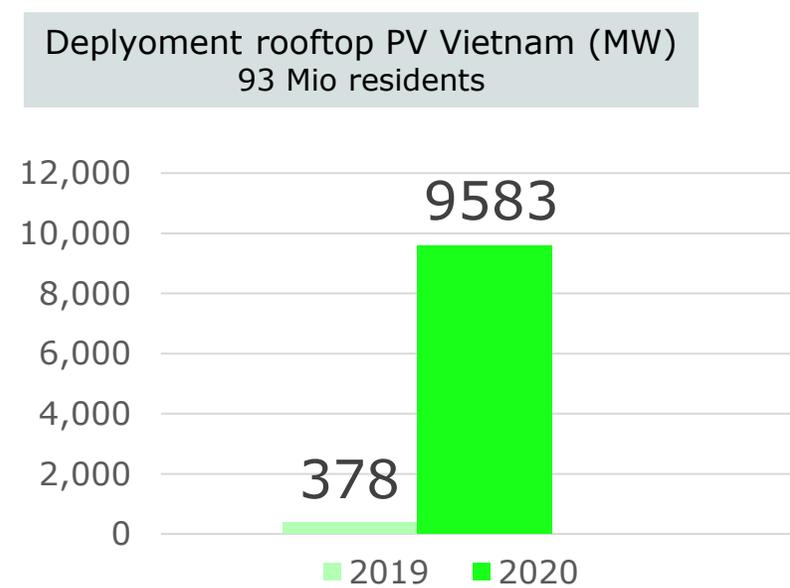
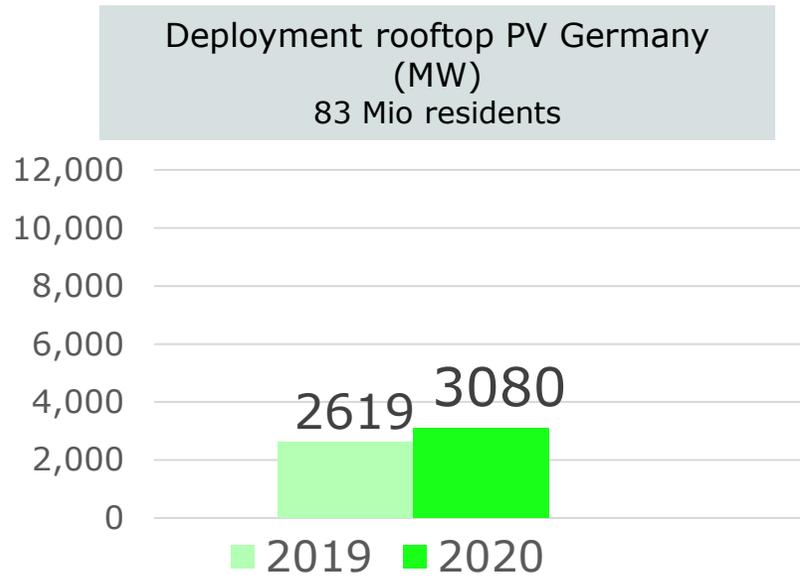
Yearly Added Capacity PV in Germany (1996-2022)

Drastic degrees of feed in tariffs 2012

Introduction of tender system



Disruptive deployment of rooftop PV: Vietnam shows what's possible with political will



- Reasons:**
- Bureaucracy
 - Auctions
 - „Solar tax“

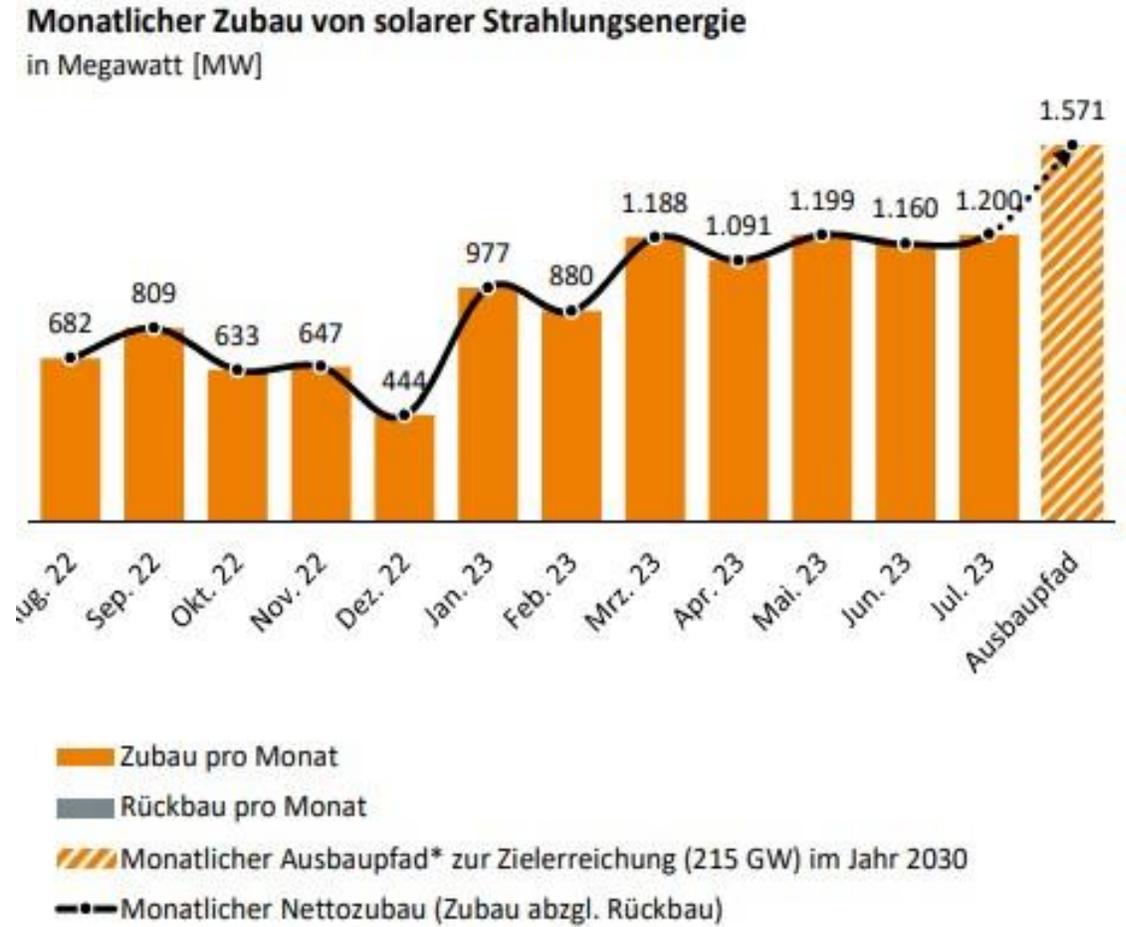
- Reasons:**
- ✓ Good RE law (FIT)
 - ✓ 0.082 USD/kWh

Even in 2023, PV expansion (like RE as a whole) is far below the necessity.

The monthly PV expansion in Germany in 2023 is between 1000 - 1200 MW.

1571 MW would be necessary to achieve the government's goal of 80% green electricity by 2030.

Climate protection requires 100% renewable total energy and not only 80% green electricity.



Campaign against Renewables organised by fossil and nuclear Lobby

Fakes: Renewable would

- be expensive, high subsidised
- rise Energy Prices
- be a burden for economy
- cannot grow fast
- cause blackouts,
- need fossil, nuclear baseload
- Main killer of bird species
- etc.

All these arguments are fakes!



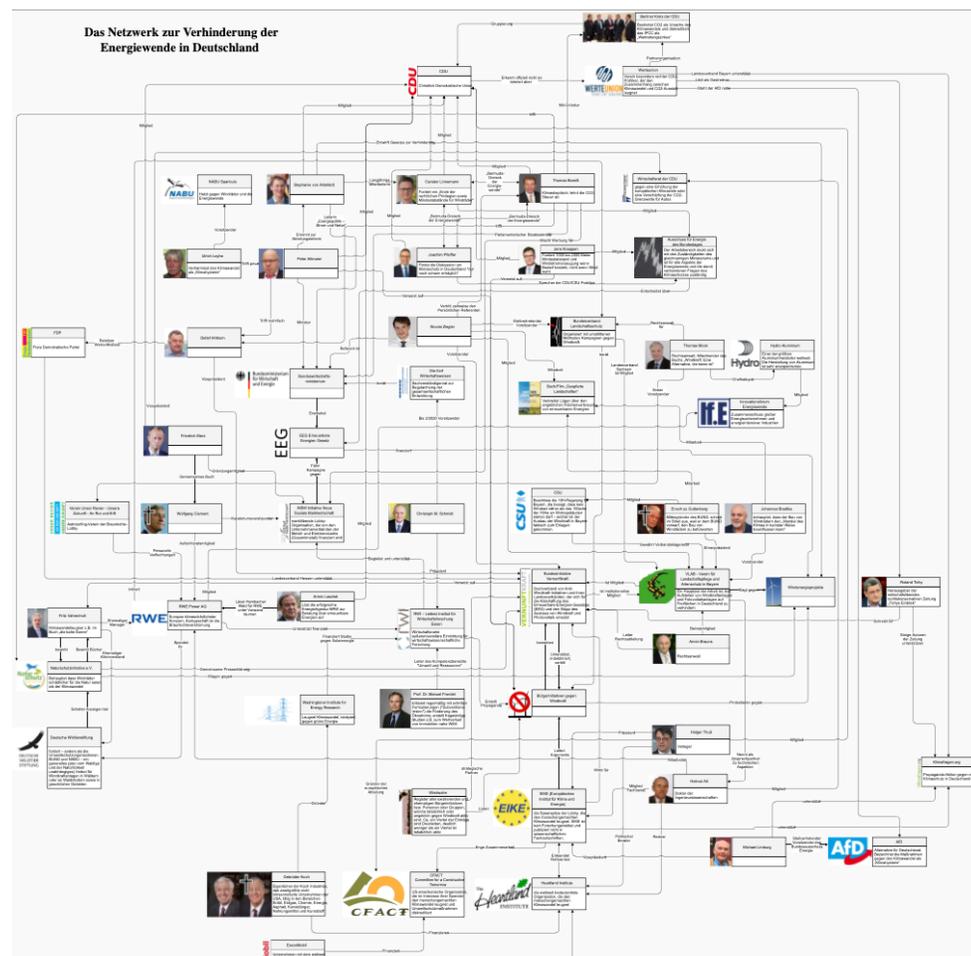
Without green electricity, electricity prices in Germany would be about 70.6 billion euros more expensive.



Germany: Strategists of Obstruction

A wide-spreading network against the renewable energy and climate protection*:

- Fossil fuel industry
- Federal administration,
- Political parties, structures
- “Environmental” organisations

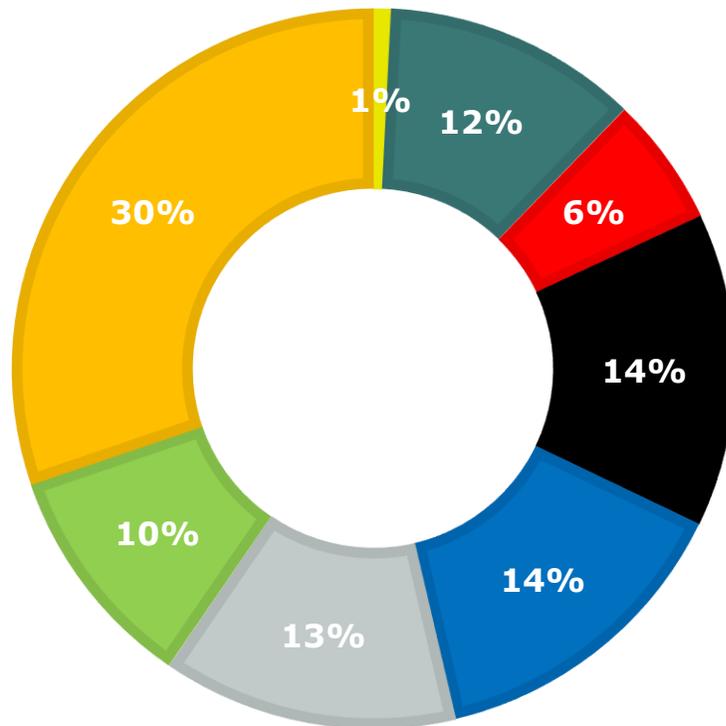


* Source: <https://energiewende.eu/wp-content/uploads/2021/02/Verbindungen.pdf>

Renewable Community Energy

Distribution of owners in the nationwide installed capacity for electricity generation from renewable sources in 2019

OVERALL: 118,3 GW



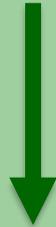
- Others 0,8%
- Energy providers 11,4%
- "Big three" energy providers 5,8%
- Funds / Banks 14,1%
- Project Planners 14,2%
- Commerce 13,2%
- Farmers 10,2%
- Private individuals 30,2%

German District Rhein-Hunsrück: Energy Transition - A Success Story



1995

- Energy import ratio: 100%
- Costs: €300m (\approx 13% BIP)
- Almost 100% fossil energy
- Unemployment rate 1995: 8,3%



2018

- Unemployment rate 2018: 3,5%
- Financial Zero-Emissions-District across the sectors power, heat & waste
- Renewable energies provide over 300% of power demand
- Annual revenue of €44m due to renewables
- Reserves of €84m held by municipalities
- Lowest debt level in the whole state
- Approx. 53% GDP-growth since 1999 (5% above state-wide average)

Sources: mueef.rlp.de, statistik.rlp.de (2017), statistik.rlp.de (2004), swr.de, dw.com, rhein-hunsrück.de

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PV on plenty areas

Agri PV



Flower PV



Roof top PV



Motorway PV



Even in crowded cities there is PV room for private people.



Balkonia
modules in Kyiv,
Ukraine

High acceptance in population, with community power



100% RE requires approx.
24,000 wind turbines with 5 MW each

Today, there are already approx.
30,000 with an average of 1.8 MW each.

Repowering a part of the built turbines plus new construction with modern **5 MW turbines** would result in fewer wind turbines than today.

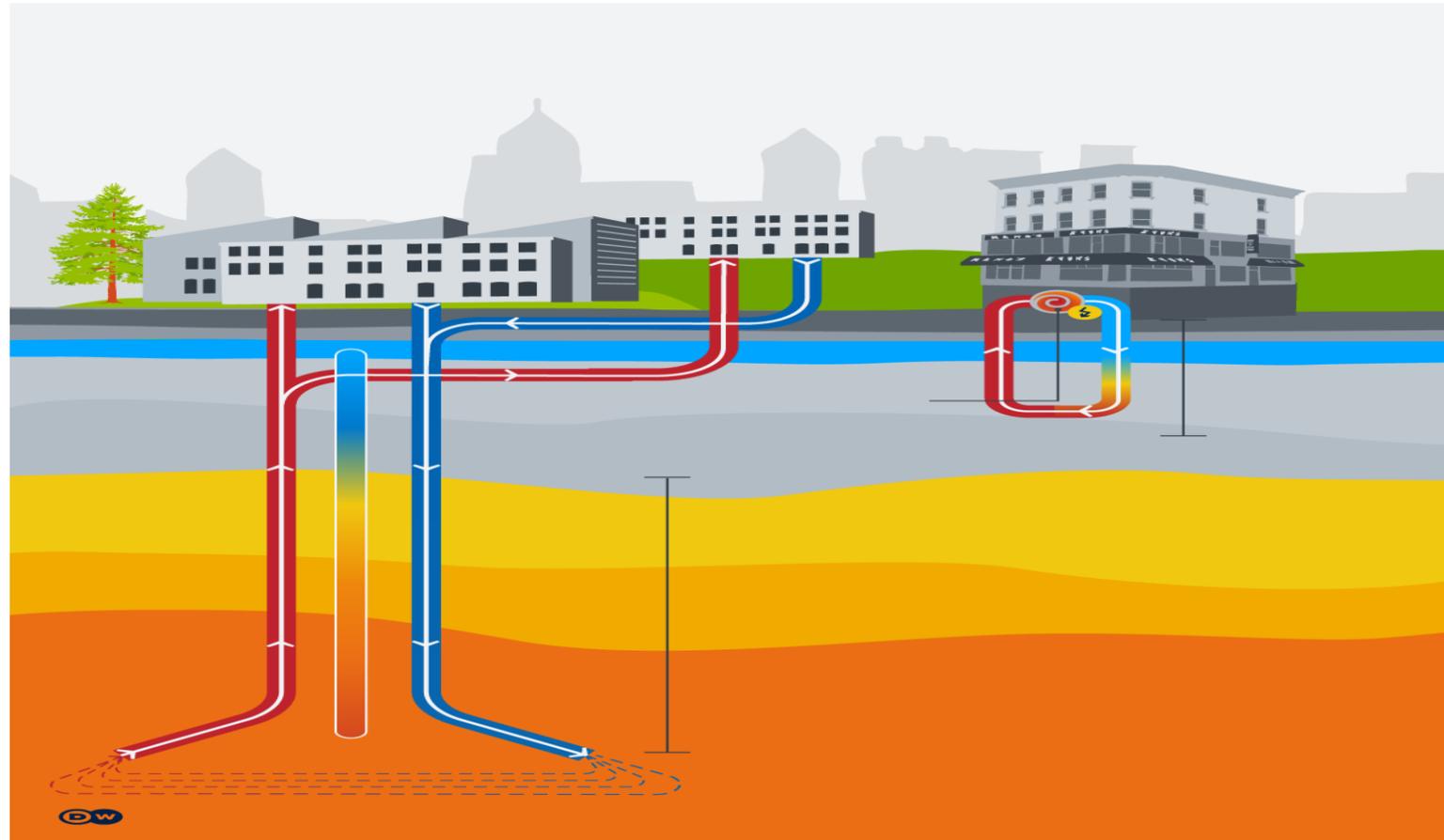
2 % of Germany's surface area is sufficient for this.

Mörzdorf in Hunsrück

Geothermal Energy

Deep until 5000m
100 – 200°C

Surface until 400m
10- 20°C with Heatpump

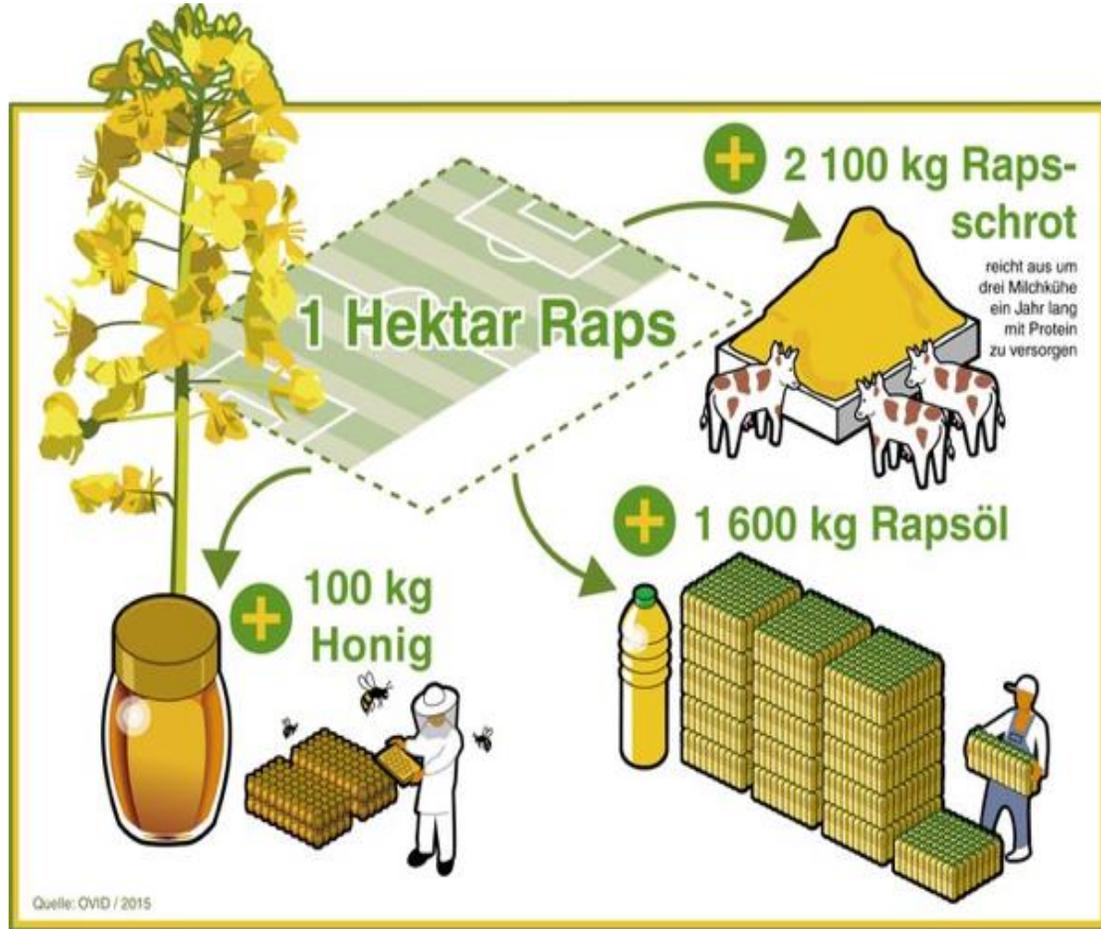


Biogas: Heating and electricity in winter



District heating systems for entire villages

Oil plants provide much more besides energy that solar and wind power cannot



- Energy storage (seasonal)
- Protein-rich fodder
- Honey
- Oxygen
- Leaves and stems via biogas plant:
 - Biogas
 - Fertiliser
 - Humus build-up

Jatropha: Fighting Desertification & Producing Renewable Biofuel; Biokerosin

Jatropha:

- Global growth potential: 6,7 mio km²
- Energy potential: 2,2700 TWh
- Cultivation in areas unusable for food production
- No conflicts between food & Jatropha

Benefits:

- Job Generation (e.g. 84 mio in Africa)
 - Preventing forced migration
- Jatropha oil able to substitute aviation fuel demand (263 mt)
- Creating new Farmland
- Natural Carbon Sink
- Jatropha plantations in semi-arid areas is a powerful tool to fight climate change, desertification, poverty and migration at the same time



Jatropha plant in Fuerte Ventura

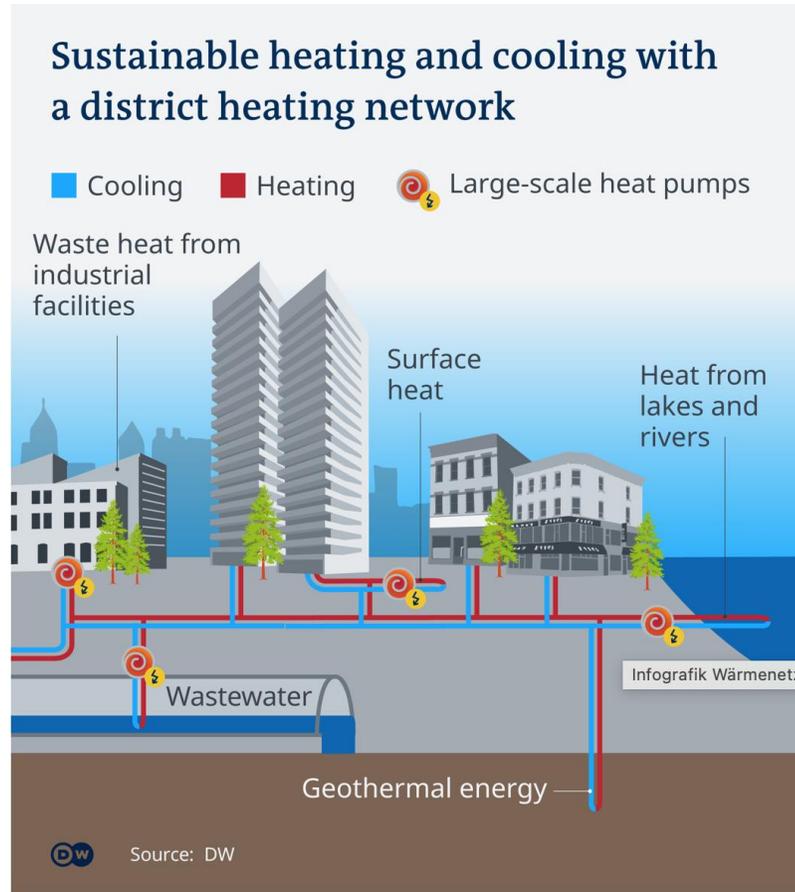
Hydropower supports the grids in rural areas Gives flood protection and drought protection



Water snail: power increase at existing hydropower;
fish and eels can pass unharmed;
plant on the Alz,
north of Chiemsee in FFH area

Drop height 2m
Flow rate 2x 9m³/s
Power = 440 kW

Sustainable heating and cooling with a district heating network



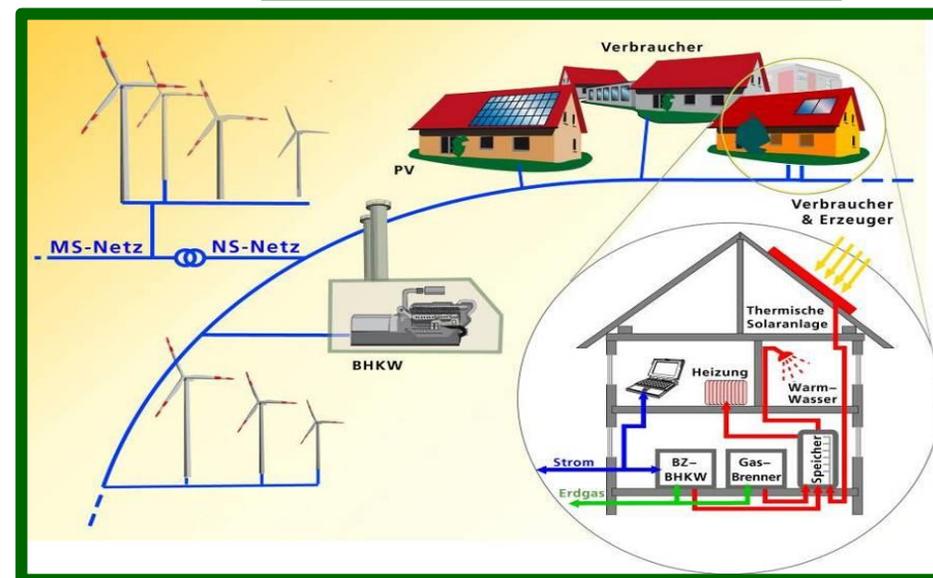
District heating with 100% Renewables:

Solarthermal, PV,
Windpower, Bioenergy,
Geothermal,
Heatstorage

Complete Concepts for 100% Renewables

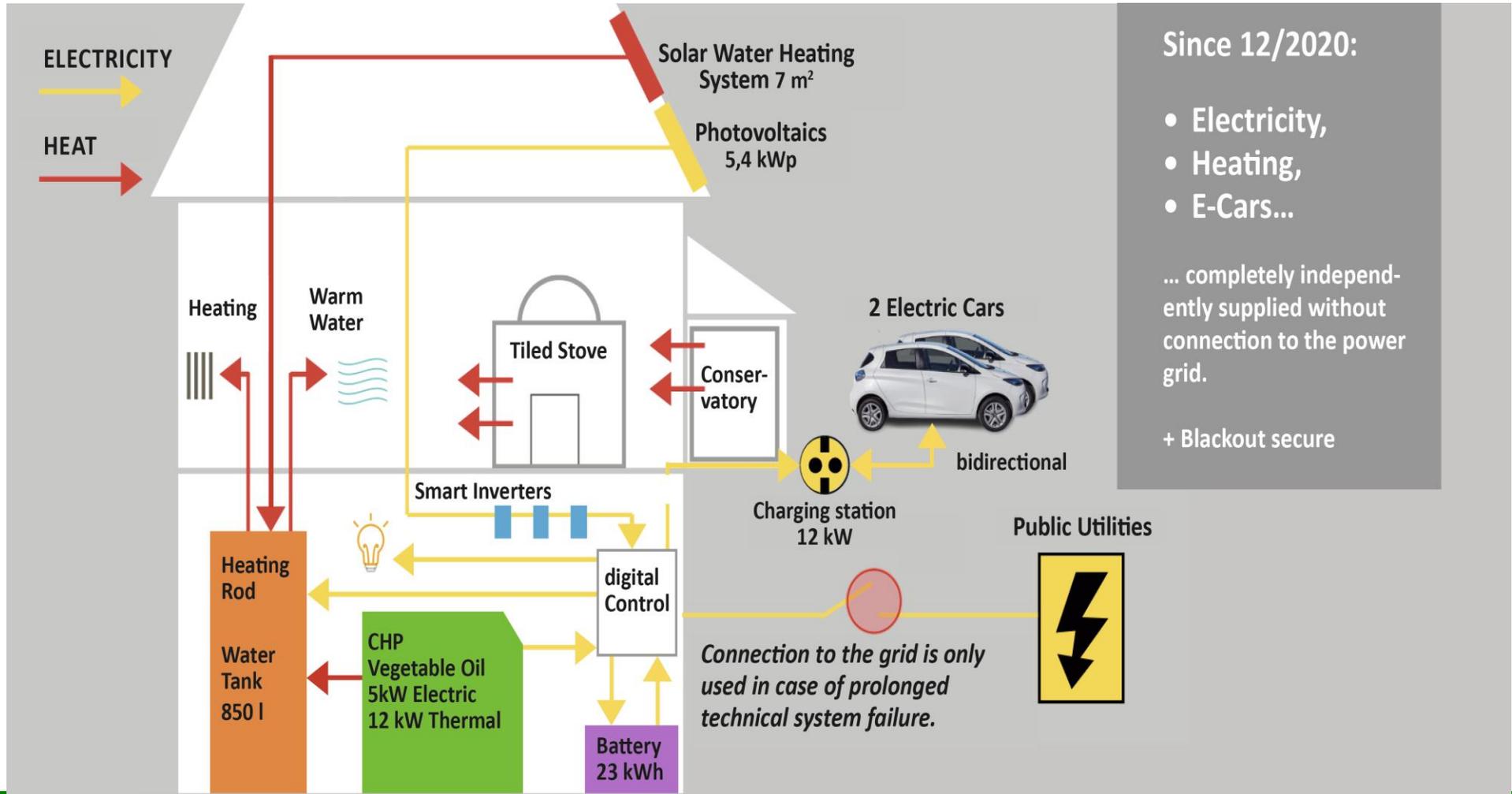
- **Renewable energy** for:
heat, cooling, mobility,
electricity, industry
Wind, solar, hydro, waves,
bioenergy, geothermal
- **Storage:** hydro pump;
batteries, power to gas; ice
(heat) storage; bioenergy
- **Digitalisation:** Big data; smart
homes; smart cities
- Key: **bidirectional charging**

electric
vehicles



My home: self-reliance with 100% renewable energy, electricity, heating, e-cars at every hour of the year

Offgrid
for
more than
two years



Since 12/2020:

- Electricity,
- Heating,
- E-Cars...

... completely independently supplied without connection to the power grid.

+ Blackout secure

Research project University Fulda, Germany

Autonomous energy supply for buildings based on solar, battery and hydrogen

A Ship Container contains all the components for a self-sufficient building supply: Electricity, Heating, Mobility:

- photovoltaic inverter,
- battery,
- heat pump,
- heat and cold buffer storage,
- hydrogen electrolysis, storage,
- compressor,
- fuel cell.



Stadtwerk Haßfurt (local utility):

200% electricity production (Wind, PV, Biogas, KWK)

Wind power surplus is stored in hydrogen

District heating by hydrogen, biogas, solar heating

Blackout protection of water supply with RE

Financing with citizens (cooperatives)



Source: www.Stadtwerkhaassfurt.de

Clean water and soil

Hydrothermal carbonization (HTC)



Input: plants, organic agriculture and municipal waste

Output: biochar

Usage of biocoal

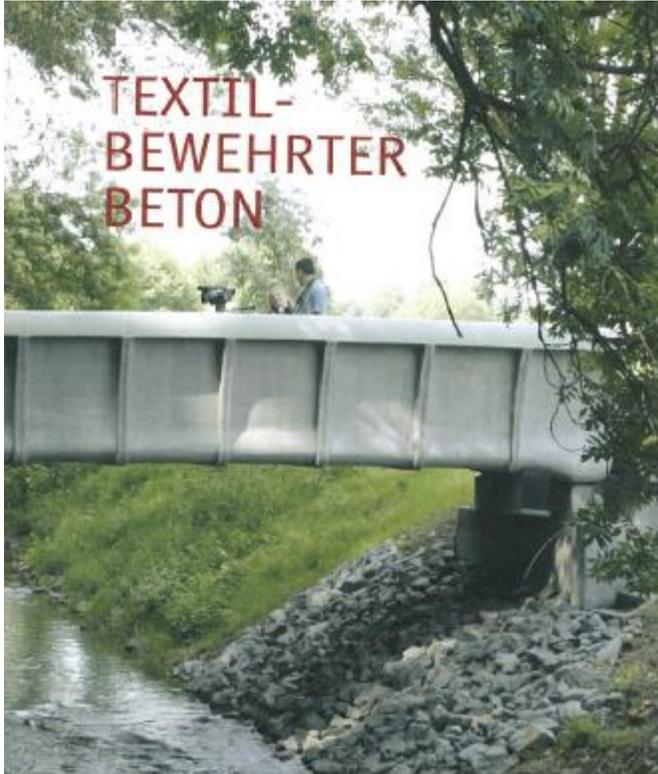
Fuel (e.g. in coal power)

Chemical base (oil substitute)

Fertiliser (carbon binding)



Textile Reinforced Concrete



- First textile reinforced concrete bridge developed by TU Dresden
- Advantages over armoured concrete:
- less corrodible, thinwalled manufacturing
- textile reinforced concrete has a higher workload
- drastic reduction of CO₂-emissions (avoiding the use of steel, less use of concrete)

Policies necessary for renewable growth & climate protection

Laws to stimulate investment

- **Feed-in-tariffs (FiT)** (GET FiT for developing countries)
- Tendering above 50 MW, auctioning
- Energy Sharing (RED II)

Cancelling subsidies for fossil & nuclear energy, fossil chemistry and intensive agriculture

Tax relief for renewables

Carbon tax

Research and education for renewables and organic farming

Reducing obstacles for approval

Dispose big areas for reforestation and greening

Not successful:

- Tendering under 40 MW or certificate systems
- Emission trading

Auctions hinder exponential growth of Renewable Energies

analysed in 20 country study by EWG, Haleakala, WFC

- Auctions fail to provide fair access & deter small-scale actors.
- Auctions do not promote a variety of project sizes, frequently excluding small & medium-size projects.
- Auctions foster market concentration by favouring financially strong & large actors.
- Auctions impair important conditions that support the acceptance of new projects.
- Auctions often suffer from under-subscription, project cancellations or delays,
- Auctions hamper the timely achievement of RE-expansion targets.
- Auctions do not guarantee low remuneration levels, nor have they caused the recent cost reductions of renewables.

Feed-in tariff for combined renewable power producer

Tariff paid for per law if:

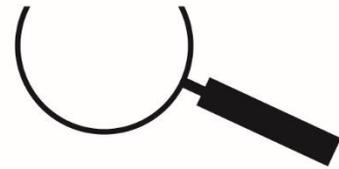
- Power generation meets demand each hour of the year
- Mix of 100% renewable power generation
- Frequency and voltage stability, reactive power is guaranteed

Effects:

- Grid stability is growing, decentralised bottom-up approach
- Integration of heating/cooling and electro-mobility
- Development of storage technology
- Emergence of smart cities

**Thank you very much for
your attention**

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