Energiewende

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Why Energiewende

- Germany as an economic and political leader of the EU.
- „Laboratory“ of the energy transition.
- Largest energy sector, with both direct and indirect impact on the neighbouring countries.
- Energiewende has some serious geopolitical consequences (RES + natural gas from Russia).

Origins of EW

1st pillar: nuclear phase-out.

- Long and successful tradition of nuclear industry in Germany – in 1970s 17 000MW.
- German anti-nuclear movement – Ausserparlamentarishe Opposition in 1960s (leftist students), environmental movements, local opposition.
- Three Mile Island in 1979, Chernobyl in 1986.
- 1998 Greens in federal government (with SPD) – Germany´s plan (2002) to gradually withdraw from nuclear.
- In 2010 the Atomic Energy Act amended – NPP´s lifespan extended, production limits on nuclear electricity increased.
- 2011 Fukushima – phase-out by 2022.

Origins of EW

2nd pillar: climate and environment protection measures.

- In 1970s anti-nuclear sentiment, environmental consciousness and oil crisis raised the issue of RES.
- 1974 first RES subsidy program – PV parks. Strengthened in 1977 – 25% of investment costs reimbursed.
- 1990 – Act on the Supply of Electricity from RES into the Grid (StrEG).
- 2005 – Merkel´s great coalition (CDU/CSU + SPD) – ambitious climate plans, incl. RES and energy efficiency.
- 2010 – Energy Concept for an Environmentally Sound, Reliable and Affordable Energy Supply -> Energiewende.

Economic growth, power & energy consumption, GHG emissions 1990 - 2020.

Data: BMWi 2021, UBA 2021.

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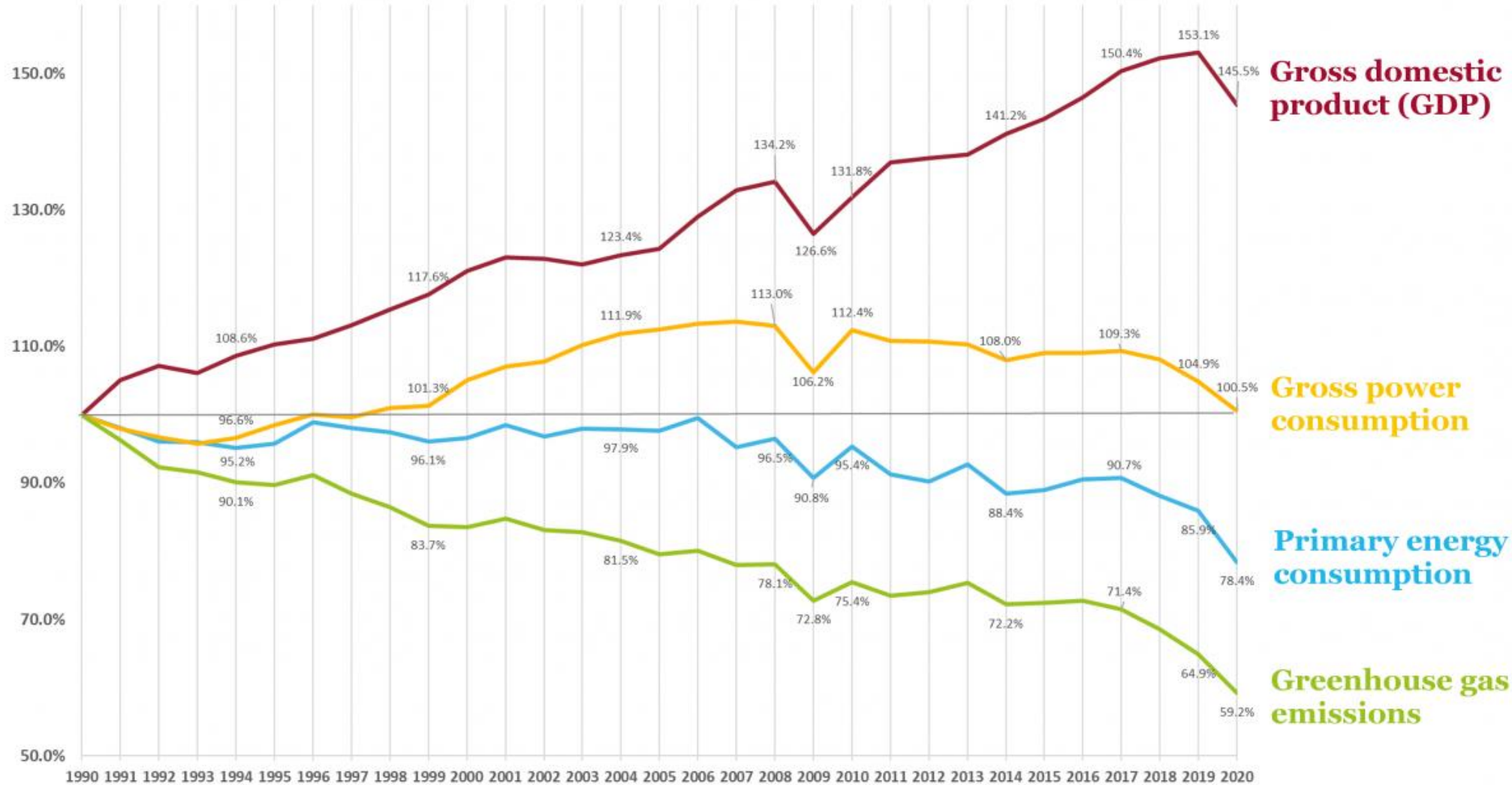
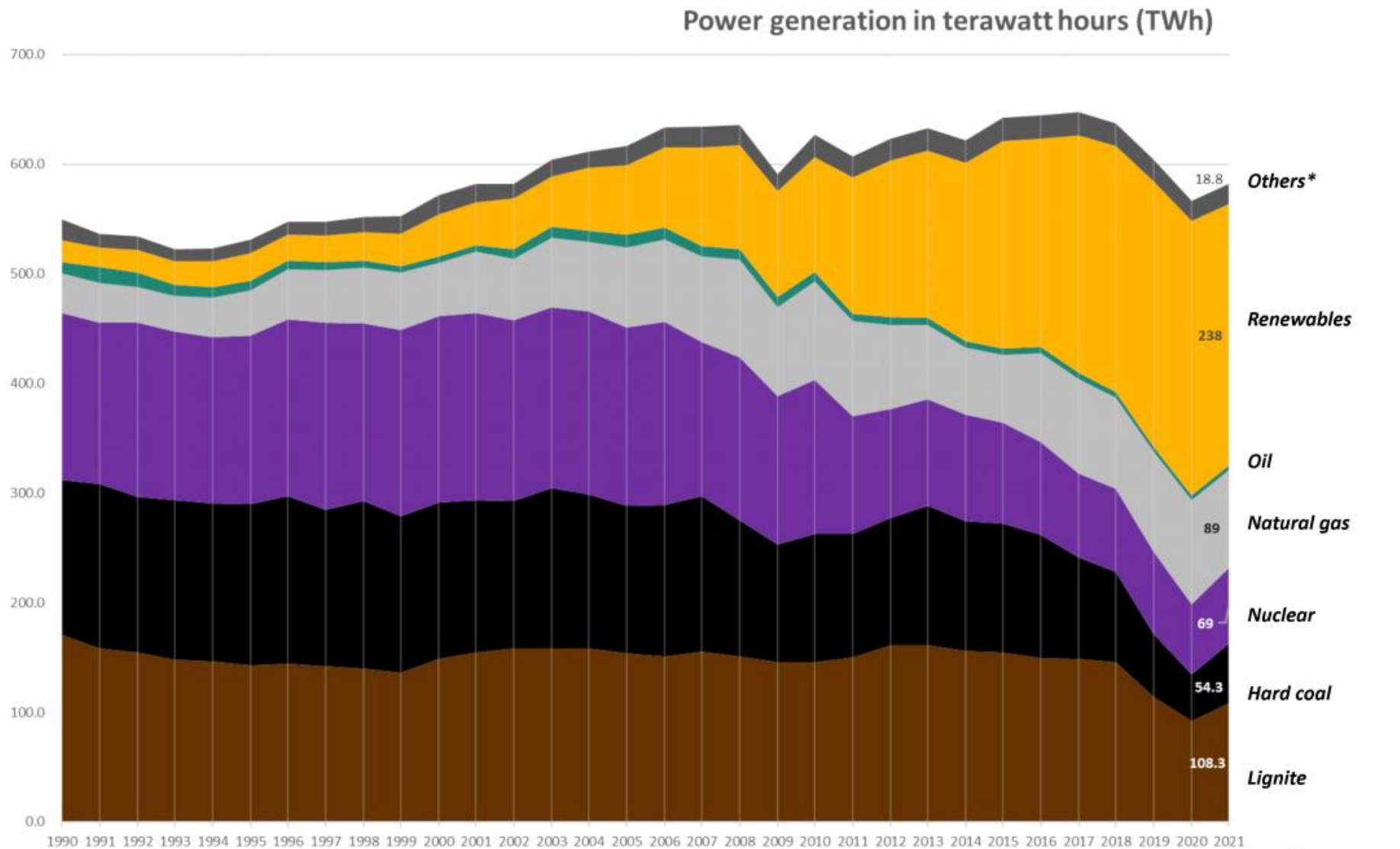


Note: As a general rule, emissions data for the last year shown can expected to be preliminary.

Gross power production in Germany 1990 - 2021, by source.

Data: BDEW 2021, data preliminary.



*** Without power generation from pumped storage.**

German energy sources' share in primary energy consumption 1990 - 2021.

Data: AG Energiebilanzen 2021, preliminary.

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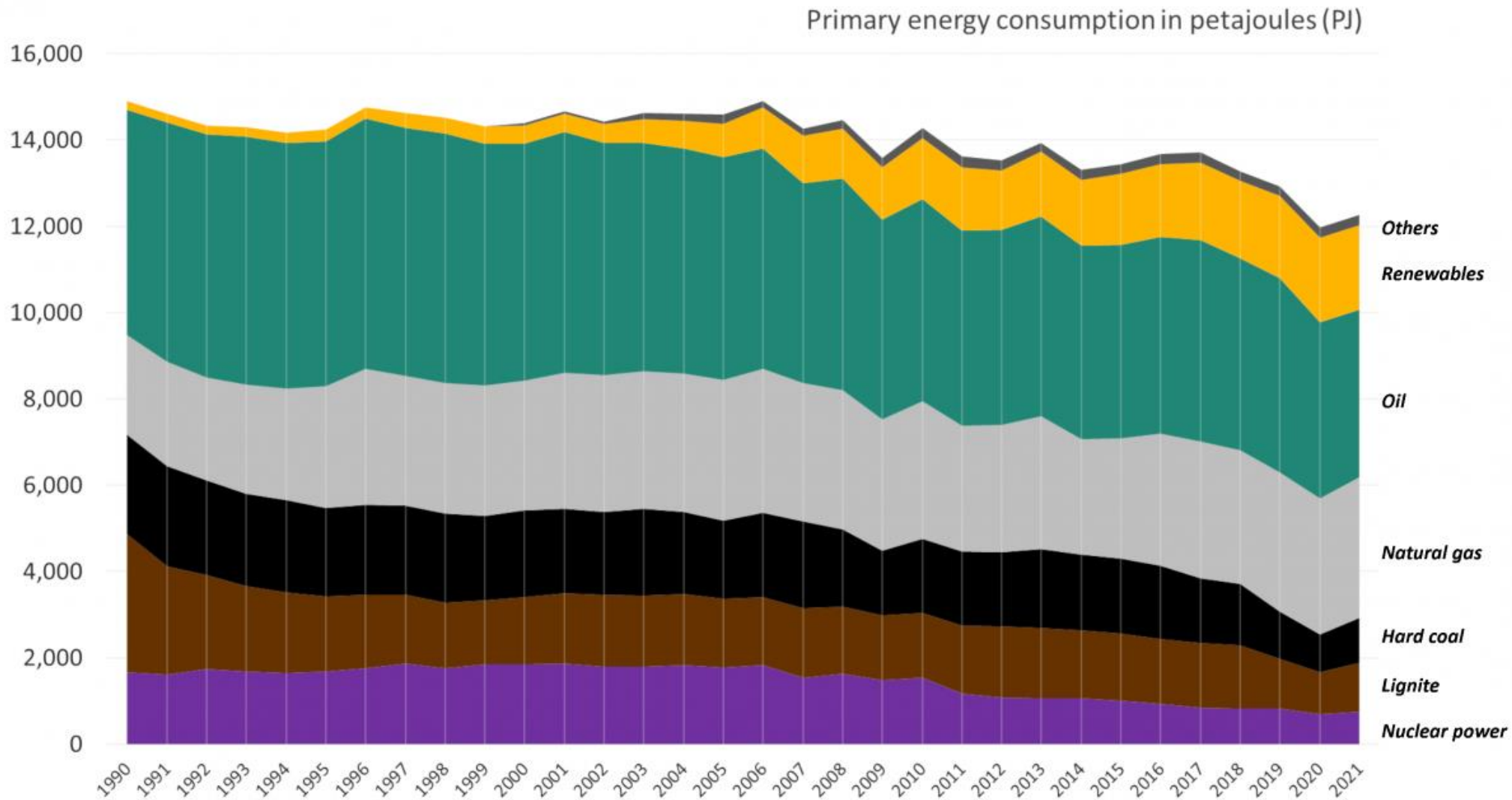

German power export balance 1990 - 2021.

Data: BDEW 2021 (2021 data preliminary).

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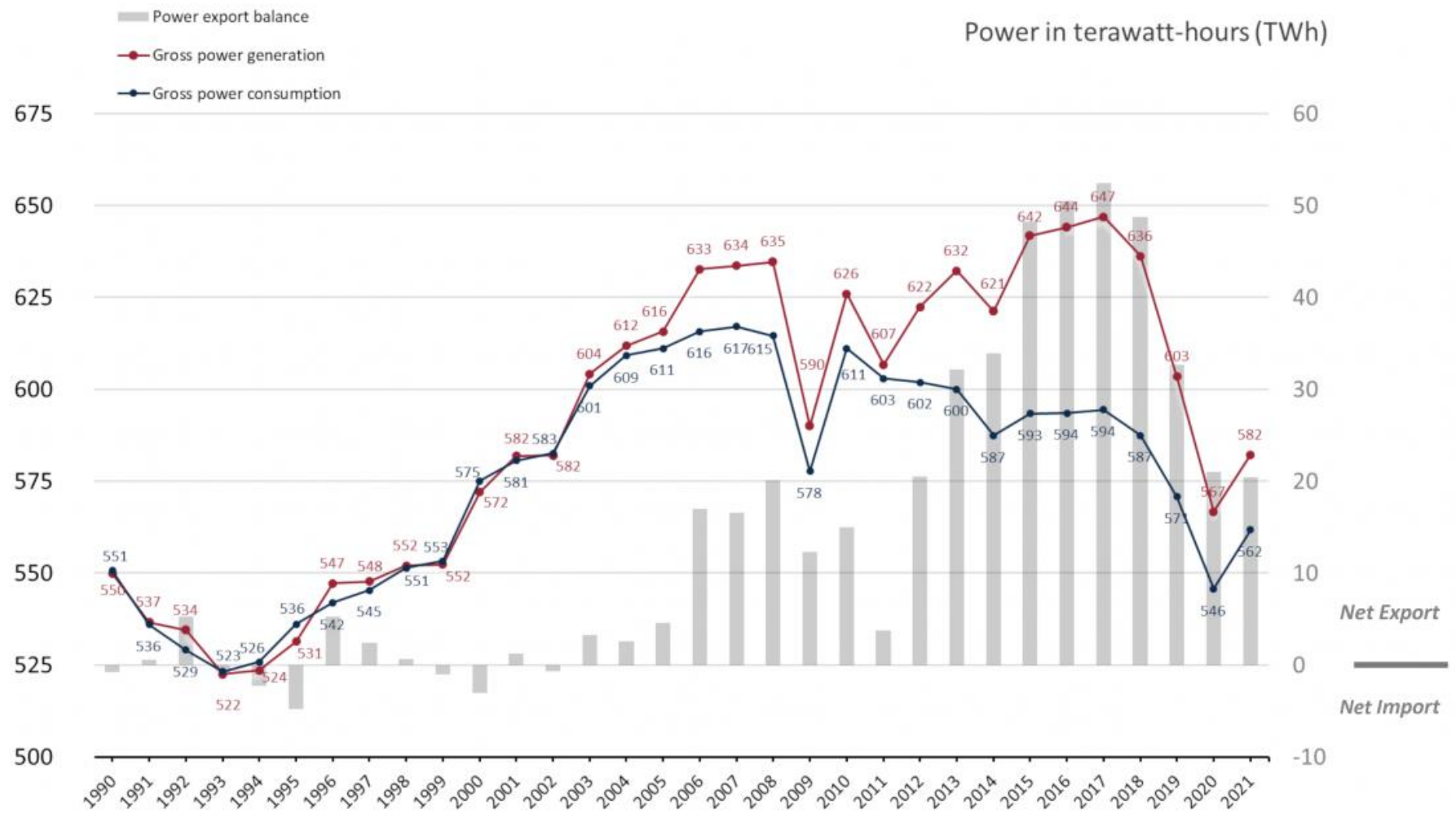
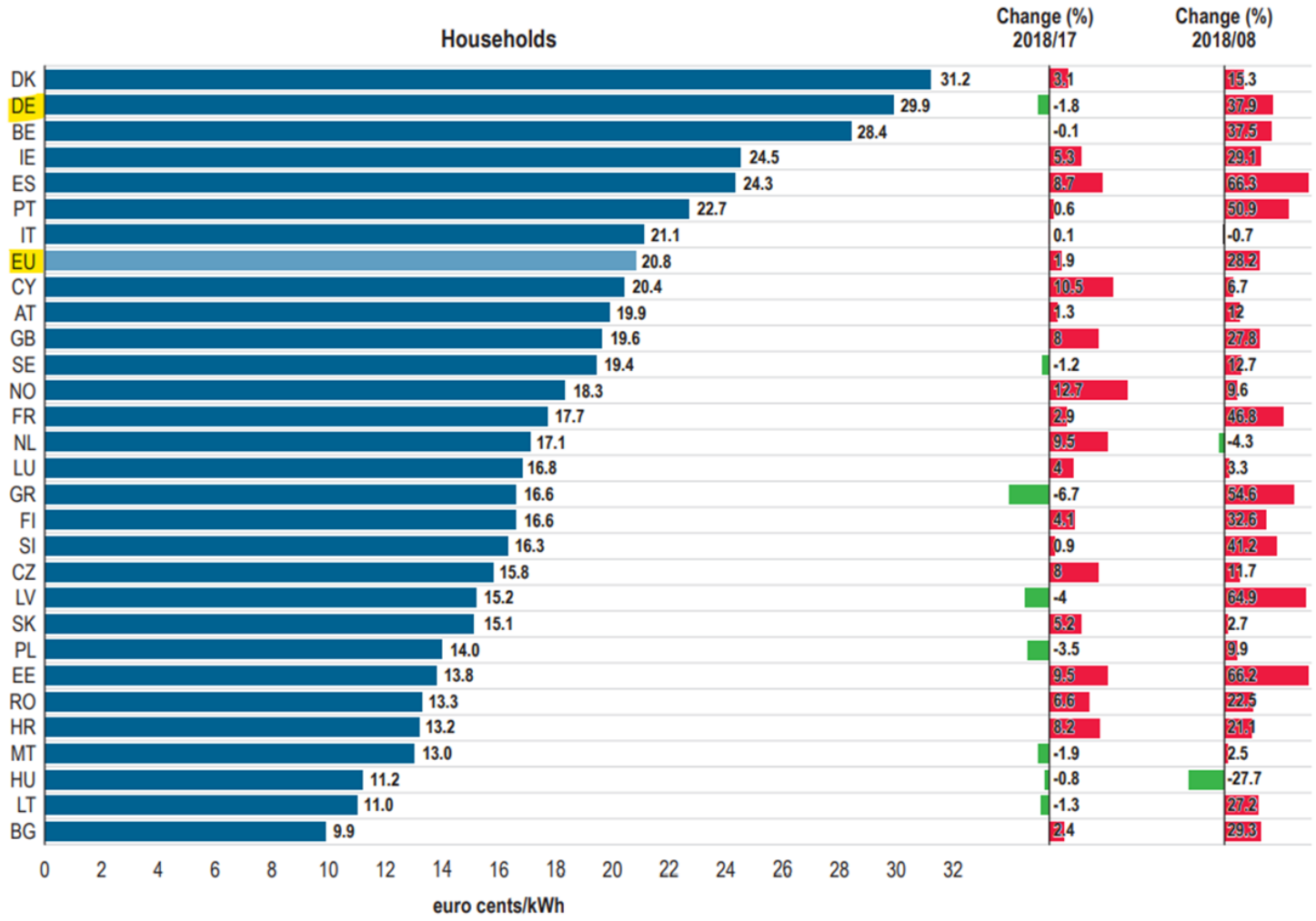


Note: Without power generation from pumped storage.

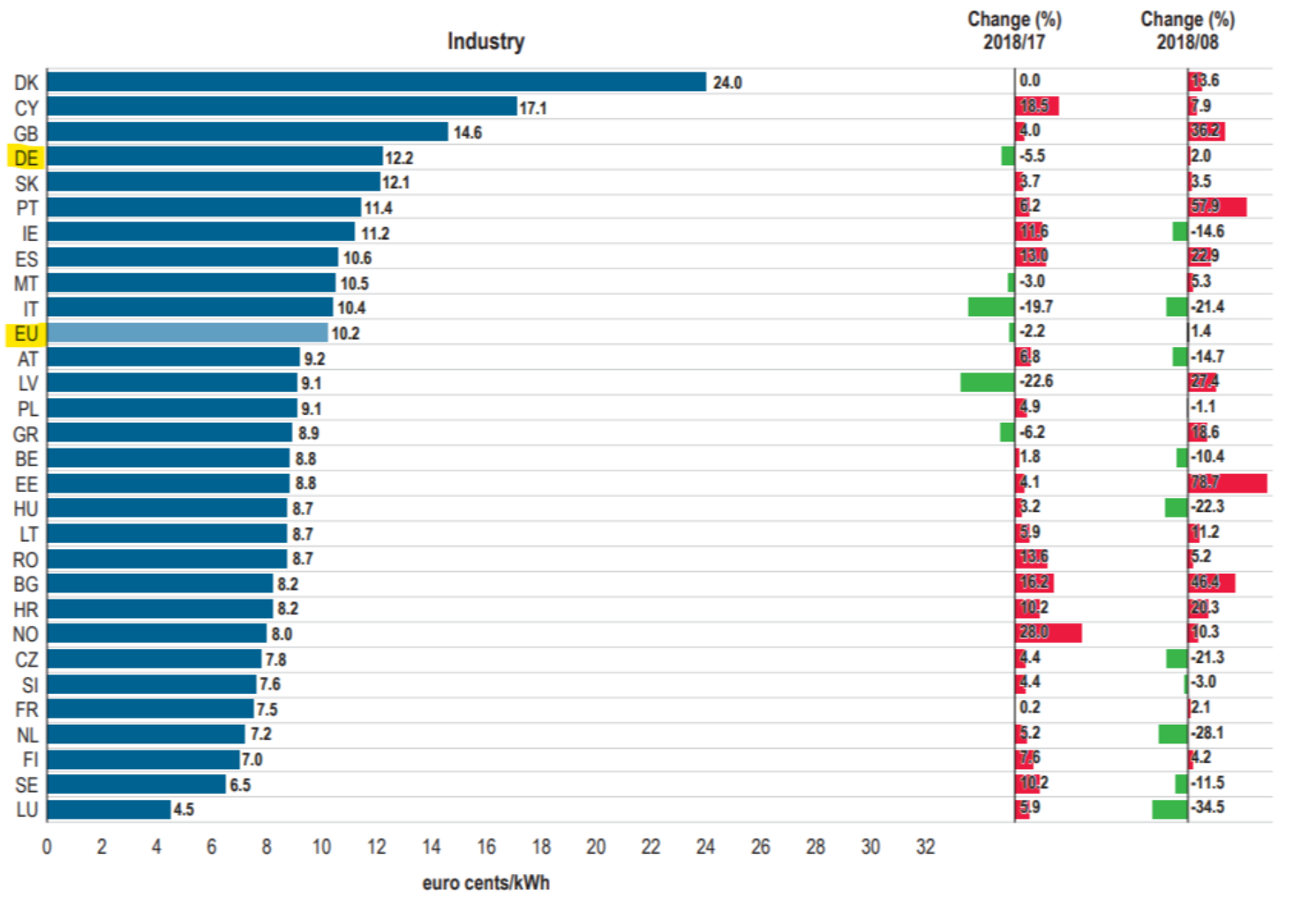
1) Costs of EW

- Impossible to be measured properly. Investments in hundreds of billions of euro by the end of 2030s.
  - Costs of Atomausstieg.
  - RES surcharges.
  - Grid investments and management.
  - Activities in heat and transportation.
- vs.
  - Benefits and avoided costs of investments in the stranded assets, less energy imports (in the long term), less carbon payments.
- Wholesale prices of electricity among the lowest in the EU.
- Households pay one of the highest prices in the EU (regulated component of prices).
- Cost unevenly distributed in favour of companies.
- Transition to auctions, from 2022 RES surcharge cancelled!

Electricity prices: Households (Eurocents/kWh)



Electricity prices: Industry (Eurocents/kWh)



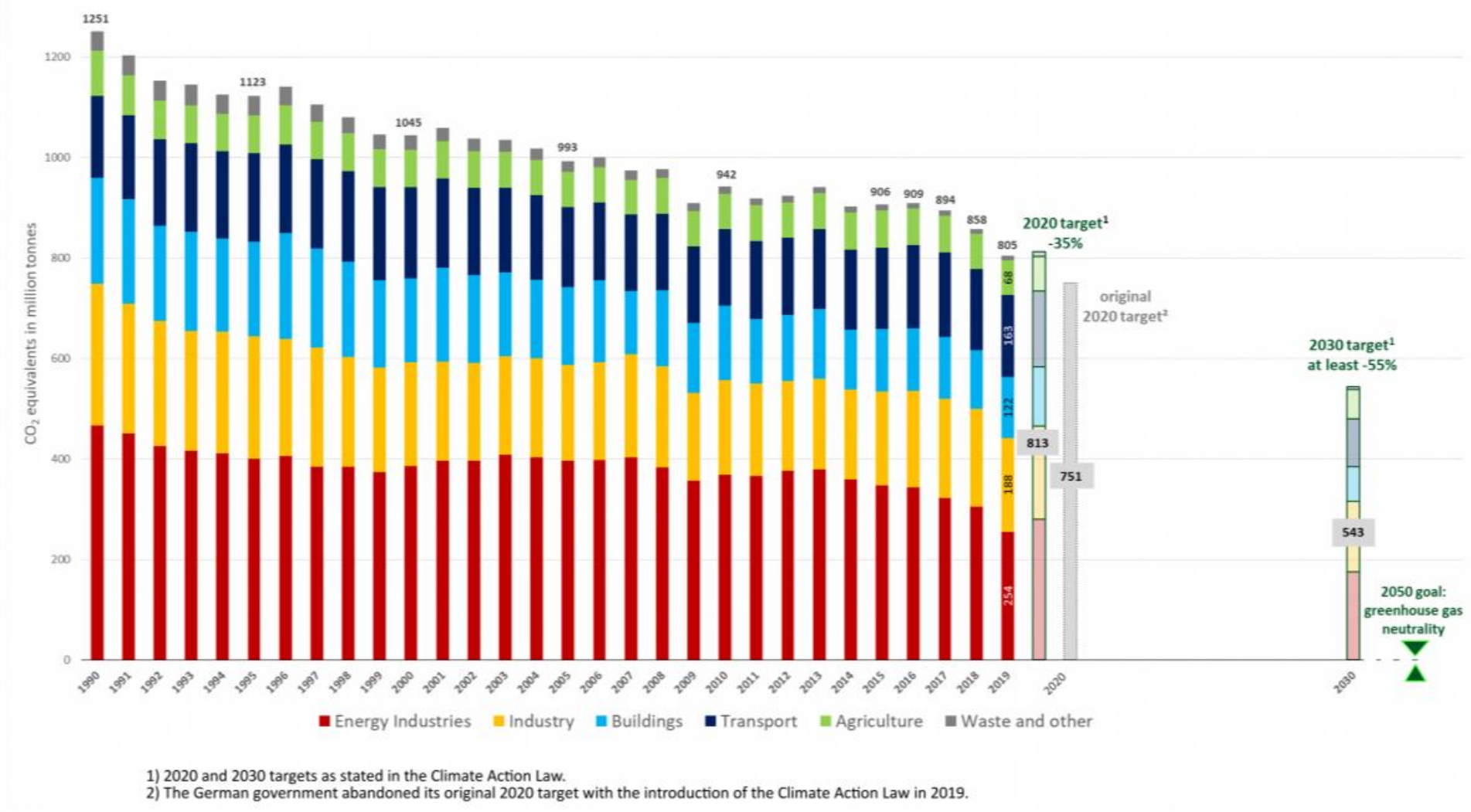
2) Nuclear phase-out

- 81% of Germans support the phase-out (2015 poll).
- Costs of decommissioning (EUR 38 billion earmarked for this purpose – may not be enough). Stability of the companies impacted.
- Nuclear waste.
- Operators (E.ON, RWE, EnBW, Vattenfall) are claiming compensation – more than 30 lawsuits and constitutional complains.

3) The future of coal

- In 2018, 22.5% of electricity from lignite, 12.8% from hard coal. Last hard-coal mine closed in 2018, but Germany still largest world producer of lignite.
- Multi-stakeholder Coal Commission – roadmap (1/2020) for shutting down the lignite-fired plants and on compensations (about EUR 4.35 billion + up to EUR 5 billion of social benefits by 2030).
- Auctions to shut-down hard-coal power plants by 2026, then forced closures. Ban on new coal plants with exception of Datteln plant (Uniper).
- No coal after 2038 (aiming at 2030).

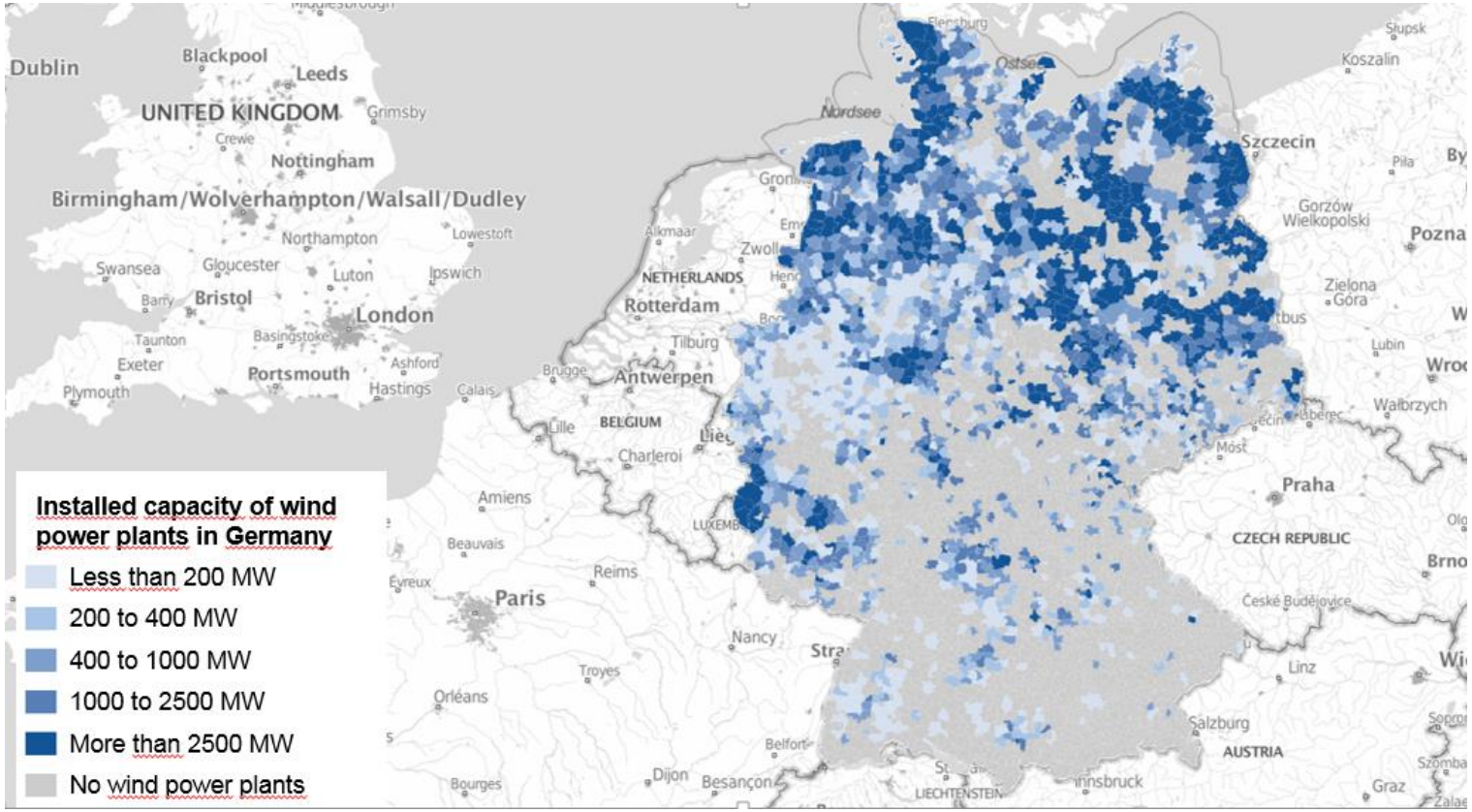
GHG trends by sector



1) 2020 and 2030 targets as stated in the Climate Action Law.
2) The German government abandoned its original 2020 target with the introduction of the Climate Action Law in 2019.

4) Grid capacity

Grid is unable to accomodate 1 500 000 PV units and 23 000 wind turbines.



Share of energy sources in gross German power production in 2021.

Data: BDEW 2021, preliminary.

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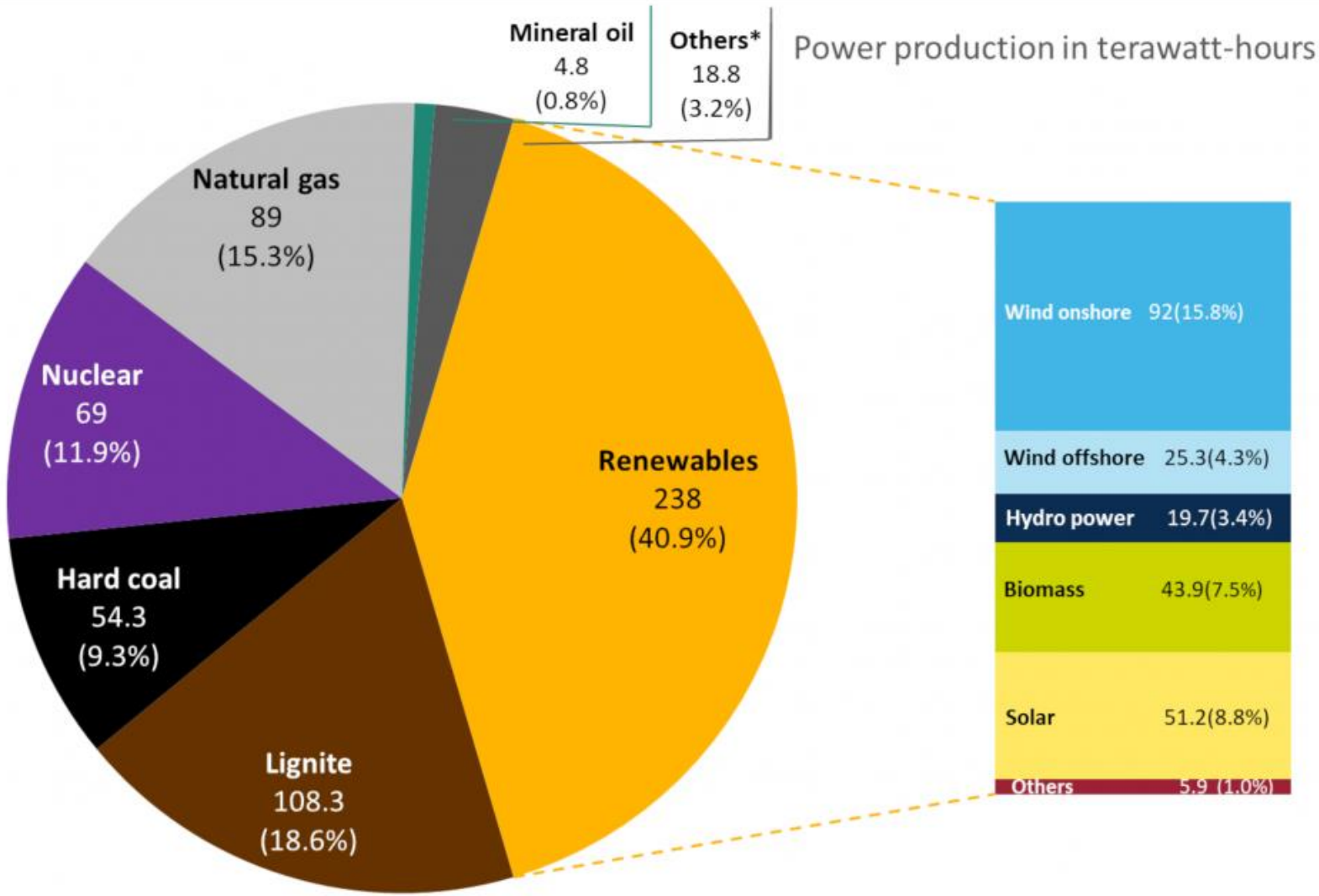
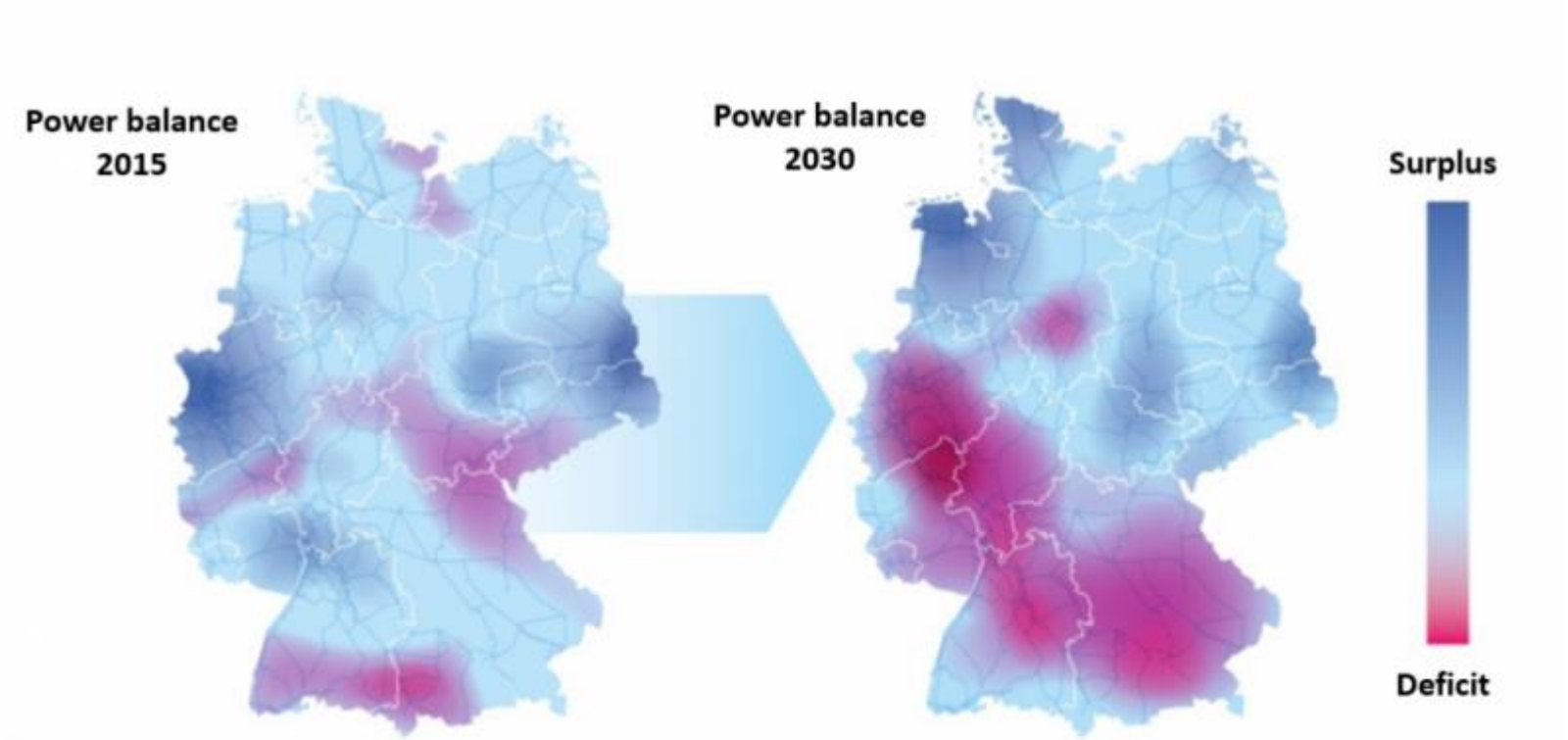


***Without power generation from pumped storage**

Note: Government renewables targets are in relation to total power consumption (561.8 TWh in 2021), not production. Renewables share in gross German power consumption 2021 (without pumped storage): 42.4%.

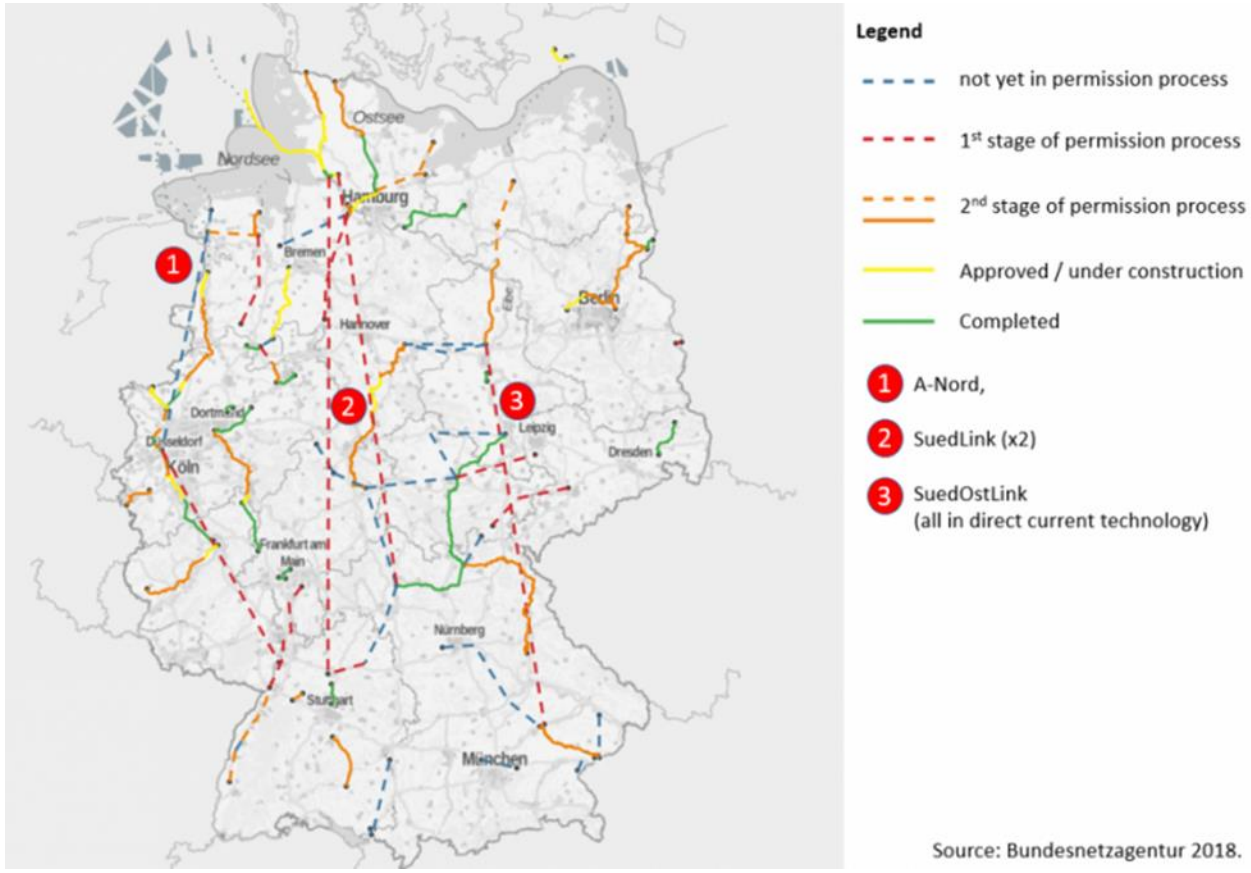
Building of the grid

Grid is unable to accomodate 1 500 000 PV units and 23 000 wind turbines.



Schematical overview

Source: Amprion.



Legend

- not yet in permission process
- 1st stage of permission process
- 2nd stage of permission process
- Approved / under construction
- Completed

1. A-Nord,
2. SuedLink (x2)
3. SuedOstLink
(all in direct current technology)

Source: Bundesnetzagentur 2018.

Suedlink – in 2028, instead of 2026.
SuedOstLink – 2027, instead of 2025.
Ultranet – 2027, instead of 2024.
A-Nord – 2027, instead of 2025.
3Q 2021 – only 1435km of about 11500km planned finished, another 1114 in construction.

5) Restructuralization of power production

- Extensive development of RES at the expense of traditional sources.
- New technologies needed to store electricity, manage fluctuations of RES, back-up them, integrate them in the system.
- New companies to emerge, traditional companies losing their ground.
- New regulation, trading mechanisms and financing mechanisms to be developed.

= the same for other energy-related sectors.

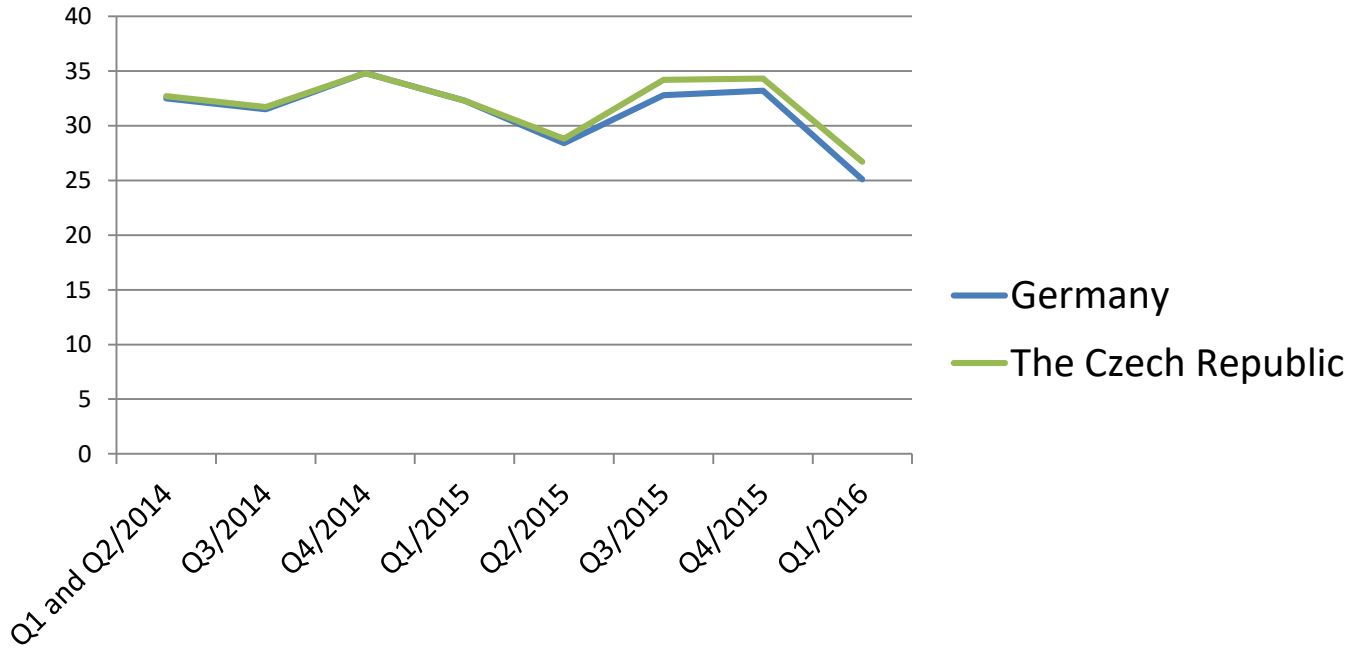
Regional impact

- Germany sets regional wholesale price of electricity – consequences for customers, producers, decision-makers.
- Ideological and political impact.

Price convergence

Germany 607, the Netherlands 120, Belgium 93, France 570, Austria 74, CZ 86, Poland 164, Denmark 29 (2019, in TWh).

Wholesale price of electricity



Reaction to Russia´s invasion

Olaf Scholz, 2/24/2022:

1) We must support Ukraine.
2) We must divert Putin (sic) from the path of war. (Swift, reserve currencies, oligarchs, export of technology + nothing is off the table).
3) We stand unconditionally by our collective defense obligations within NATO (troops to Lithuania, Romania, Slovakia, navy to North Sea, Baltic sea…).
4) Massive military spending, both short (EUR 100 billion) and long term (2% GDP+ by 2024).
5) Energy security – faster dissemination of RES, carbon neutral, reserve of coal (sic) and gas. Two LNG terminals.
6) As much diplomacy as possible, without being naive.

Germany´s paradigm shift in thinking

= Germany heavily dependent on Russian commodities.

- Control over strategic natural gas and oil assets (gas storages, Schwedt rafinery).
- NS2 halted.
- About EUR 200 bn over the next four years to „freedom energies“ (RES, e-car charging infrastructure, green hydrogen, compensation for high prices…).
- German energy sector almost fully decarbonized by 2035?

- Coal – 45% vs. 8%, oil 35% vs. 12%, natural gas 55% vs. 35%.

- Reaction of other countries in the region?

Sources

- BMWi (2015): Making a success of the energy transition.
- Clean Energy Wire
- Černoch et.al.(2017): Energiewende and the Energy Security of the Czech Republic and Poland
- IEA (2019): World Energy Investment 2019
- AleaSoft (2019): European electricity markets panorama: Germany
- Clean Energy Wire (2019): Germany´s energy consumption and power mix in charts