

Energy transitions and impact on the CEE region: Case study of Energiewende and the Czech energy sector

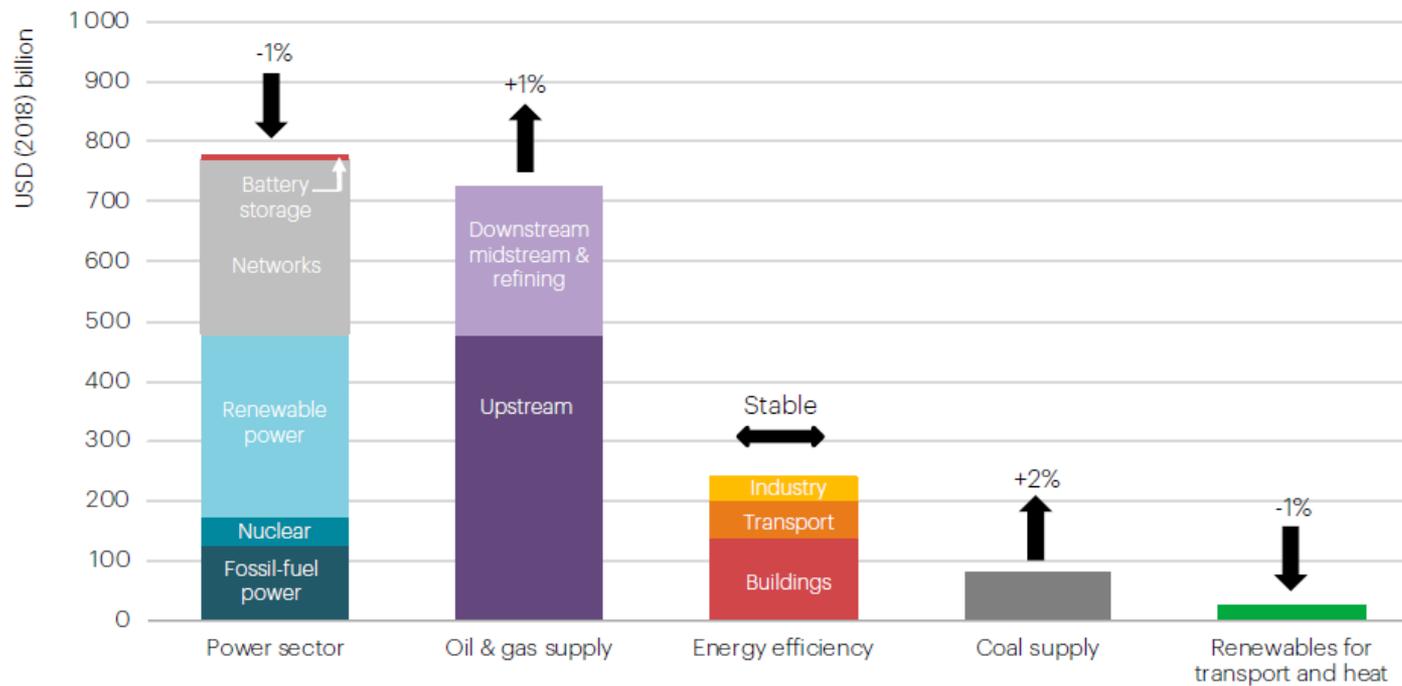
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Energy transition - decarbonization

- Driven by the climate change
- Low-carbon policies are introduced (esp. in Europe)
- Uncertainty about the future – how the system based (largely) on RES will look like?
- The energy sectors in the CEE region are rather conservative, but are exposed to the external pressures (neighboring countries, the EU)

Energy transition - decarbonization

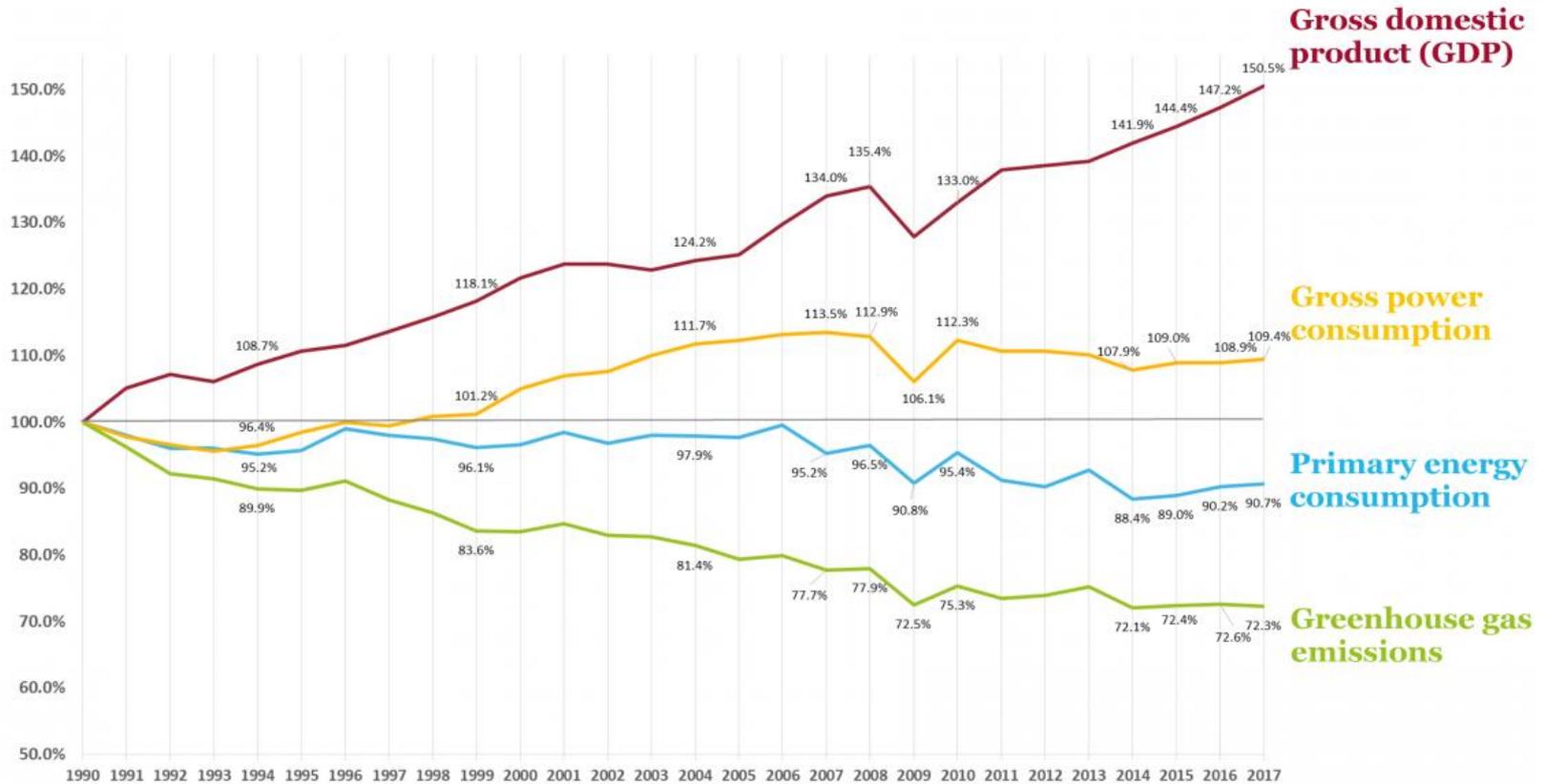
Global energy investment in 2018 and change compared to 2017



Energiewende

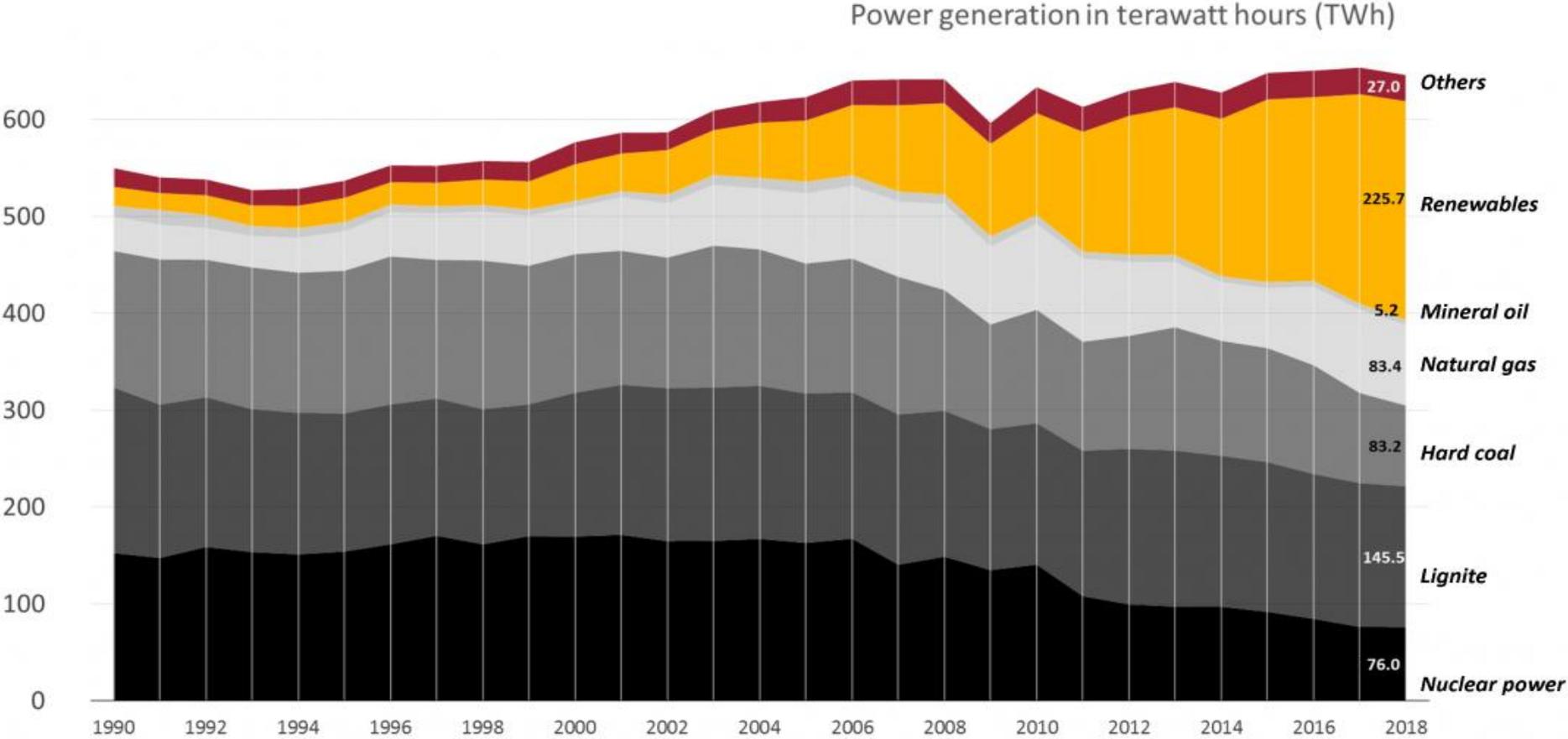
		Status Quo	2020	2022	2025	2030	2035	2040	2050
GHG emissions	Reduction of CO ₂ emissions in all sectors compared to 1990 levels	-27.6% (2017)*	-40%			-55%		-70%	-80 - 95%
Nuclear phase-out	Gradual shut down of all nuclear power plants by 2022	12 units shut down (2017)	Gradual shut down of remaining 7 reactors						
Renewable energies	Share in final energy consumption	13.1% (2017)	18%			30%		45%	Min. 60%
	Share in gross electricity consumption	36.1% (2017)*		40-45%			55-60%		Min. 80%
Energy efficiency	Reduction of primary energy consumption compared to 2008 levels	-5.9% (2017)*	-20%						-50%
	Reduction of gross electricity consumption compared to 2008 levels	-2.9% (2017)*	-10%						-25%

Economic growth, power and energy consumption, GHG emissions 1990 - 2017

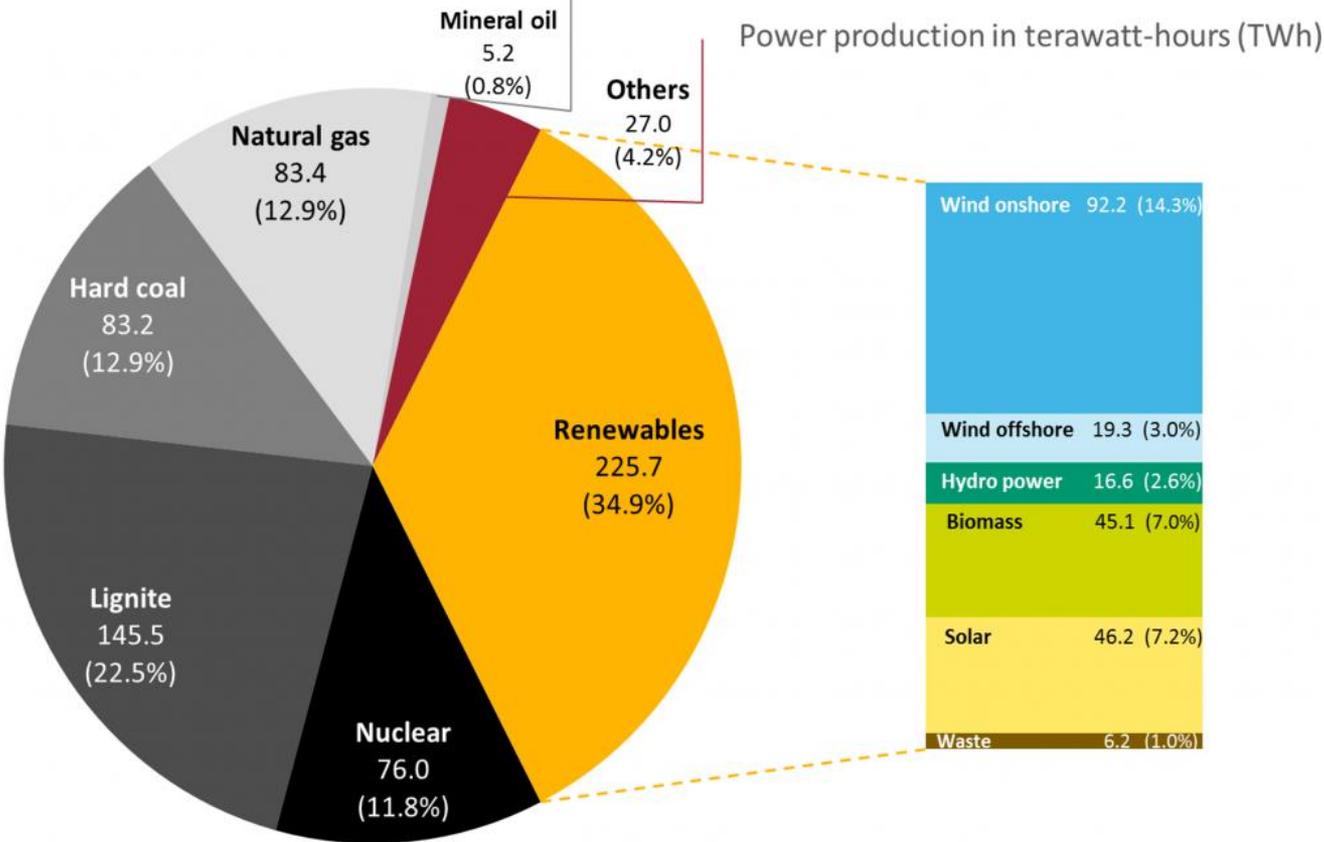


Note: As a general rule, emissions data for the last year shown can be expected to be preliminary.

Gross power production in Germany 1990 – 2018 by source, in TWh



Share of energy sources in gross German power production in 2018

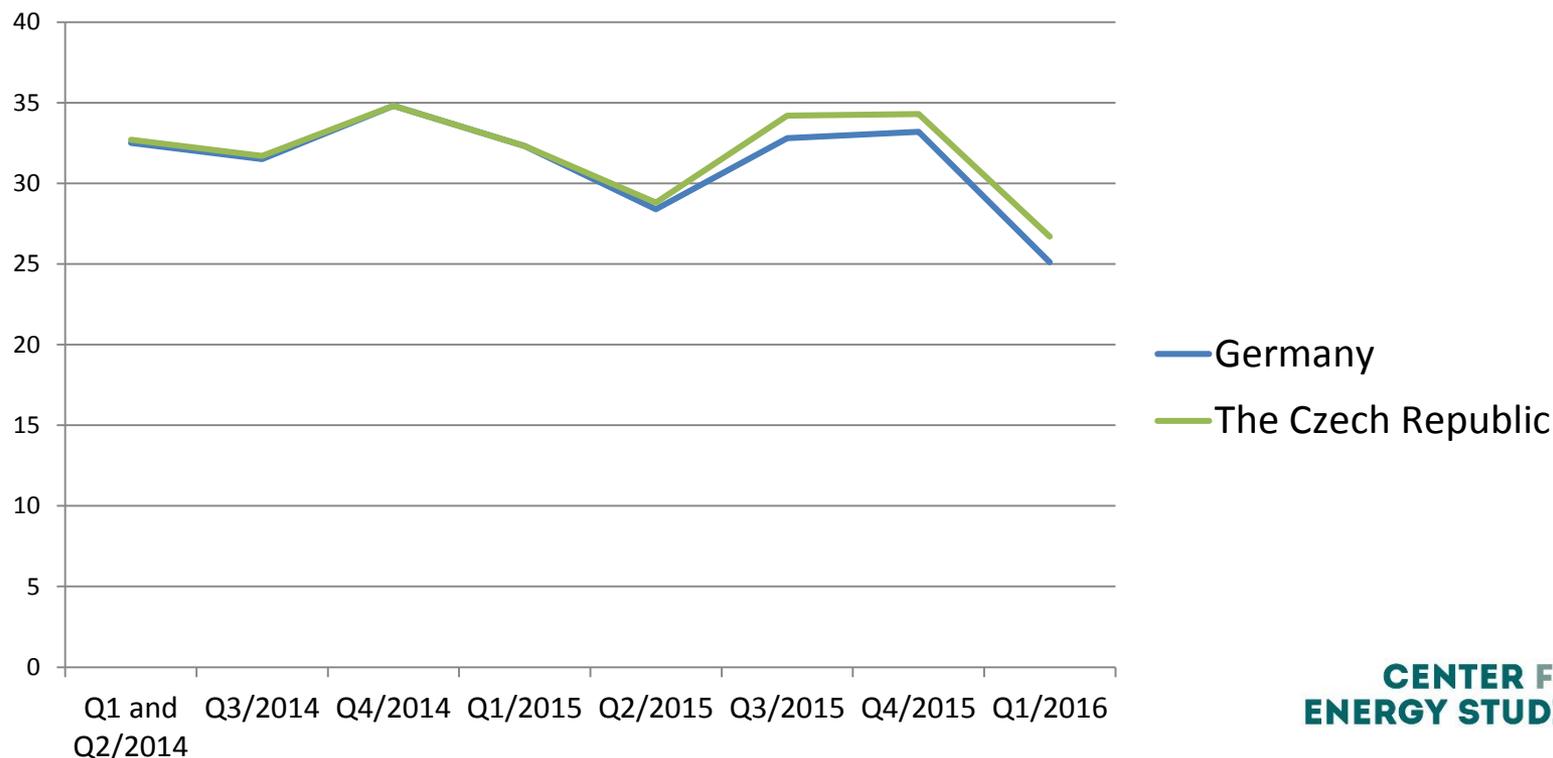


Impact of EW on the Czech Republic

Trading with electricity – price convergence

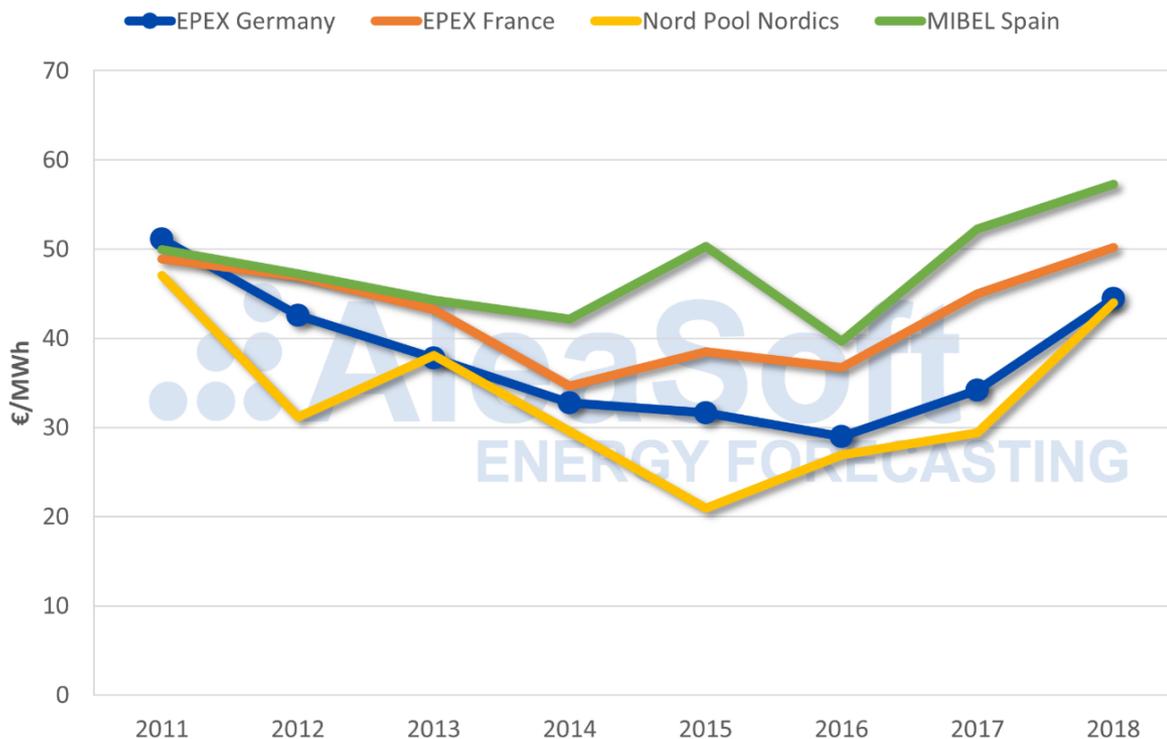
- Size of the German and Czech electricity market – 631TWh and 86TWh (average for 2011-2015).

Wholesale price of electricity



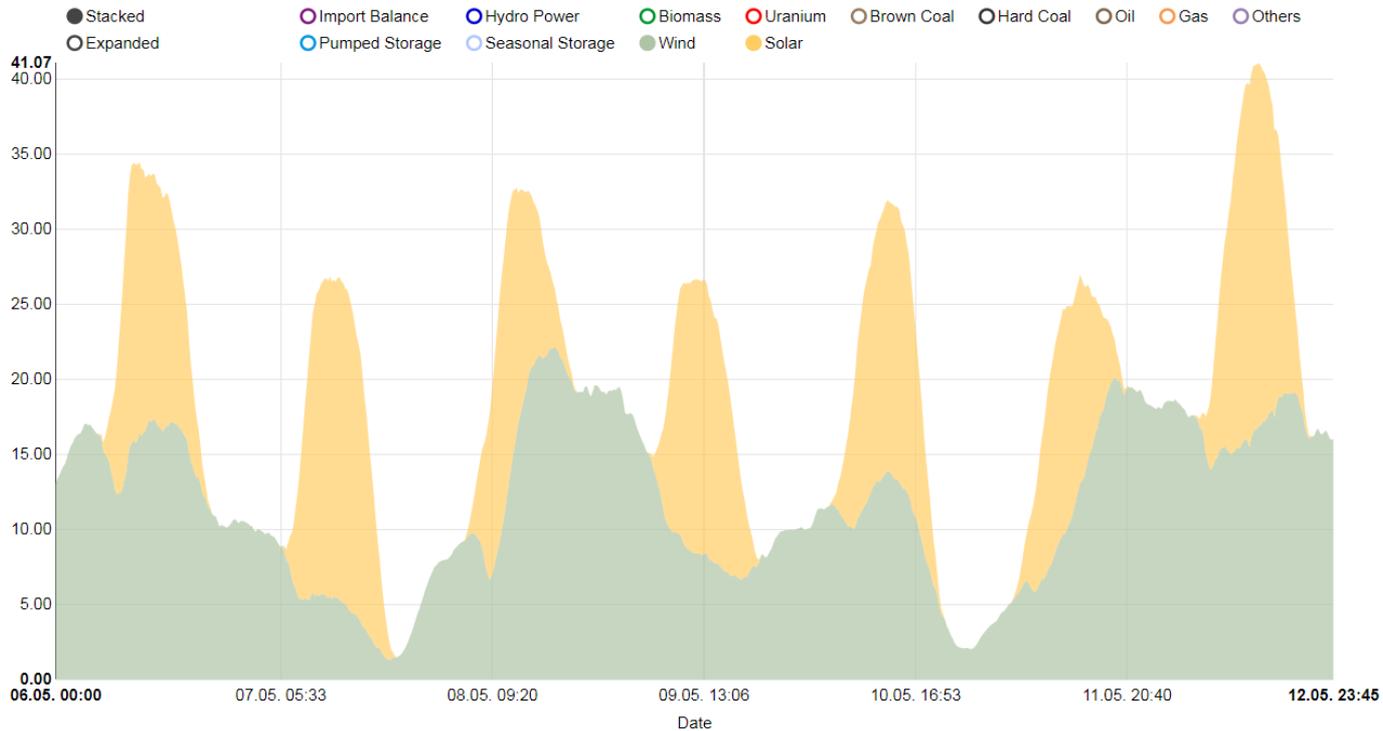
Market signals – decreasing price of power

- RES subsidies drive the wholesale price of electricity down (retail price up)
- Price accepted by the neighbouring countries



Market signals – volatile prices

- *Electricity production in Germany in week 19 2019 (wind + solar)*



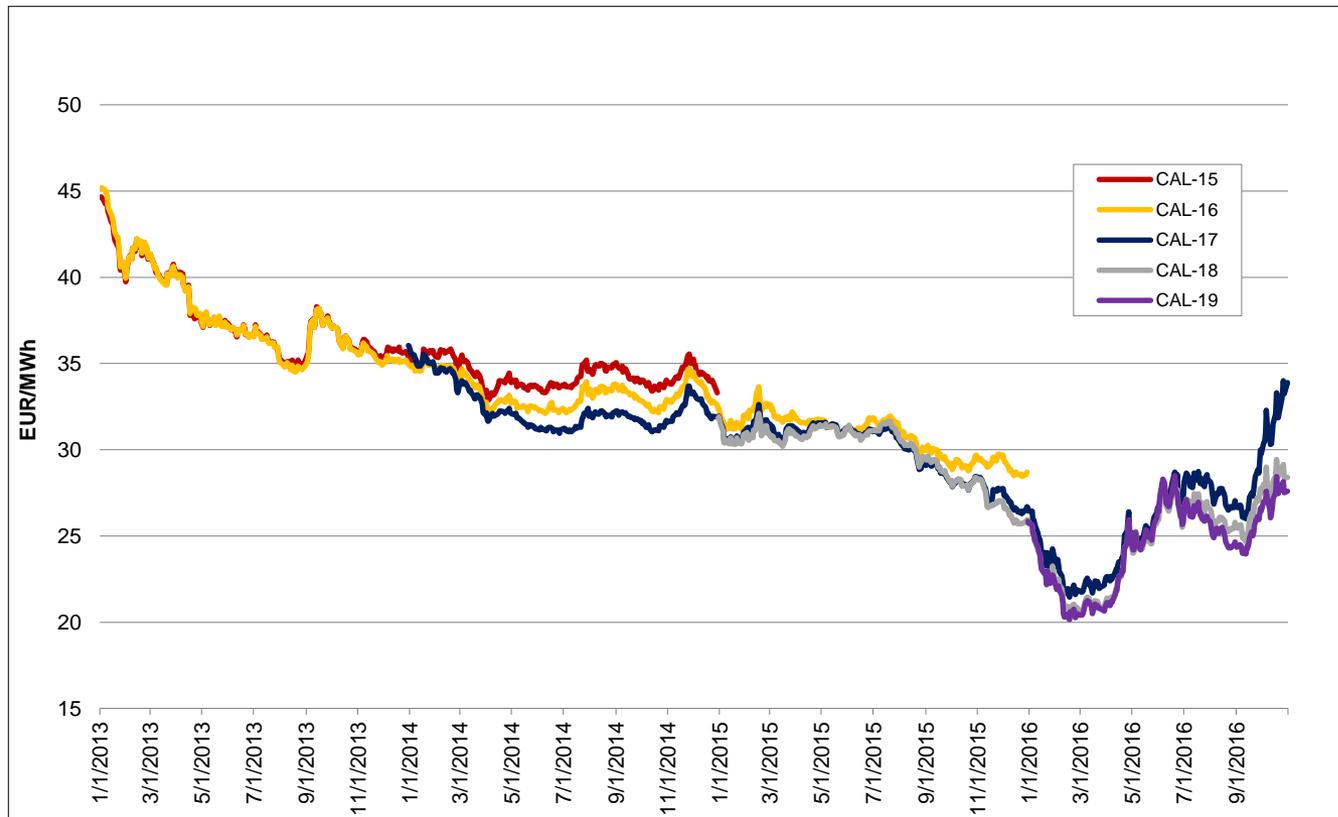
Impact on Czech producers

- Producers face reduced revenues. (EBITDA of ČEZ decreased from €3,5 bn. in 2009 to €2,5 bn. in 2015, EW one of the reasons)
- Low variable cost generation portfolio (nuclear, hydro) – still profitable company
- 88 % of electricity generated from low-merit or mid-merit sources (coal 50 %, nuclear 30 %, hydro 5,5 %)
- What should be the investment strategy in this scenario?

Impact on Czech consumers

- Impacted by the import of cheaper electricity

Historical Prices of CZ Base CALs (Delivery periods)



Impact on government

- Nuclear energy as a baseload source of energy questioned. (Price, construction time, volatility).
- Nuclear is planned to replace decommissioning of 14 GW (out of 24 GW total) of capacities in 2030.

SEPU 2015 – target structure of gross electricity production (2014 situation in brackets)

Nuclear-fueled	46-58% (29%)
Renewables and waste	18-25% (13%)
Natural gas	5-15% (9%)
Hard and brown coal	11-21% (55%)

Operational flexibility of sources

Technology	Minimum power (% of rated power)	Ramp rate (% of rated power per minute)	Hot start-up time (h)
Nuclear	50%	2%	24
Coal	30%	6%	3
Natural gas – CCGT	30%	8%	2
Natural gas – OCGT	20%	20%	0.16

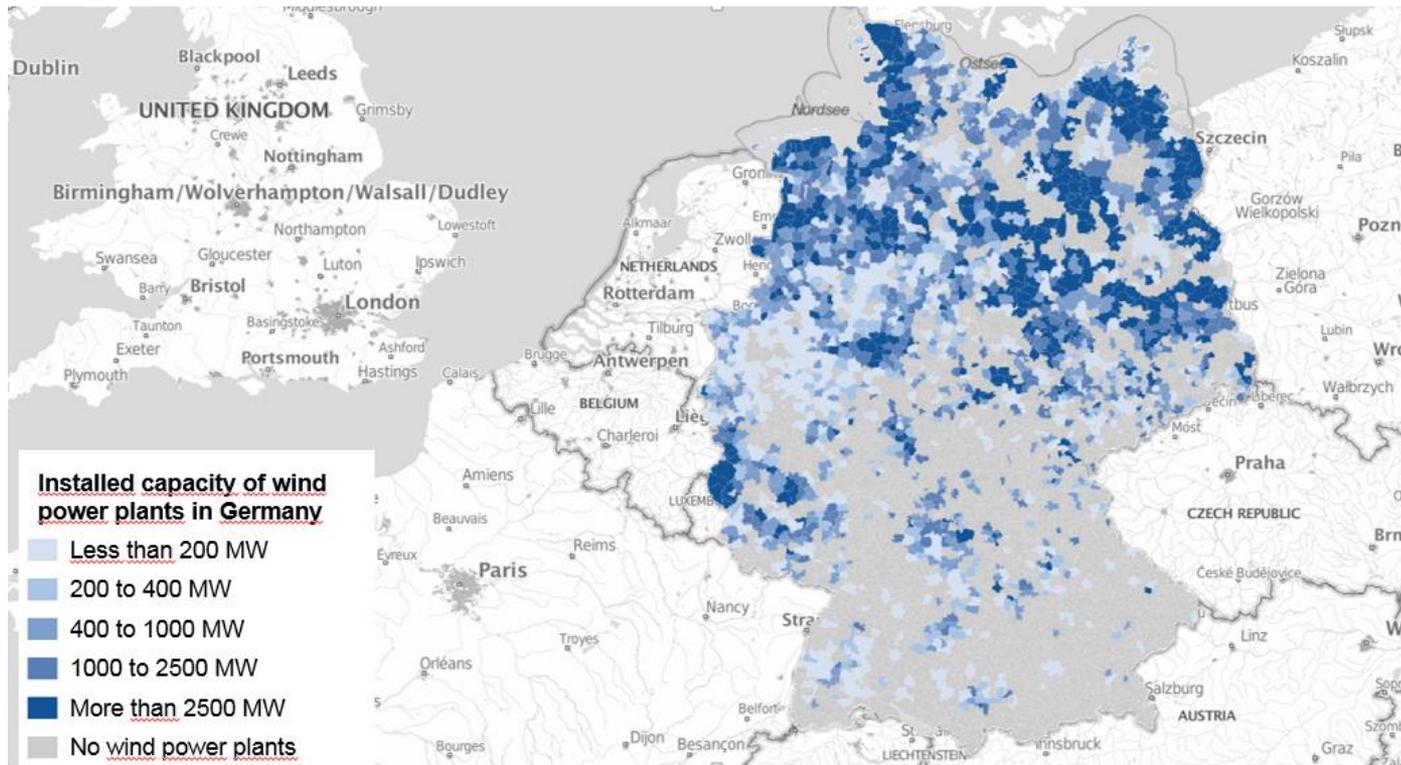
Unscheduled flows



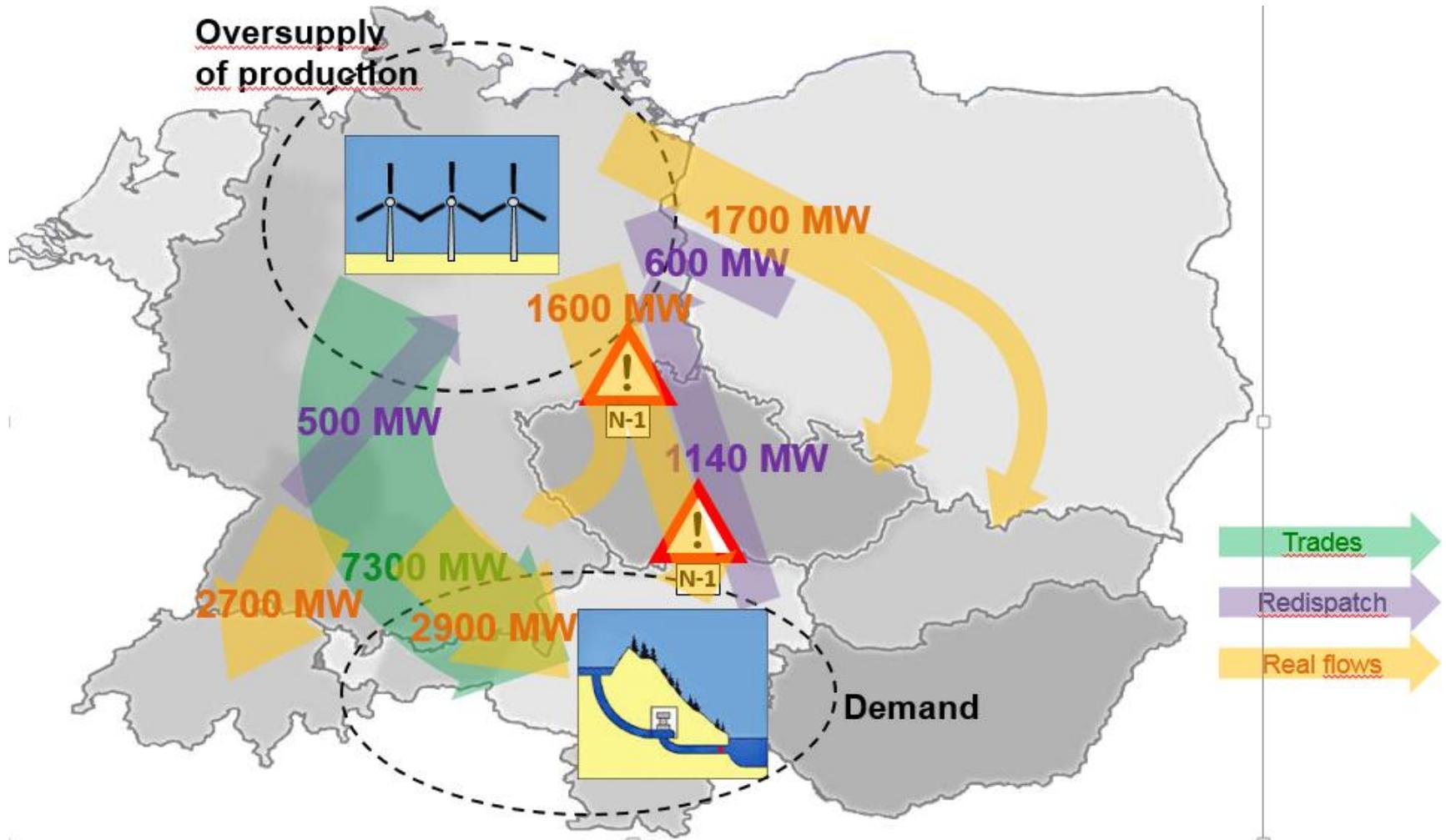
What about coal power plants?

Unscheduled flows

Grid is not fit to accommodate 1 500 000 PV units and 23 000 wind turbines



Trades and flow of electricity 2014/2015



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