04 Building the IEM in electricity

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Rapid decarbonization of the power sector

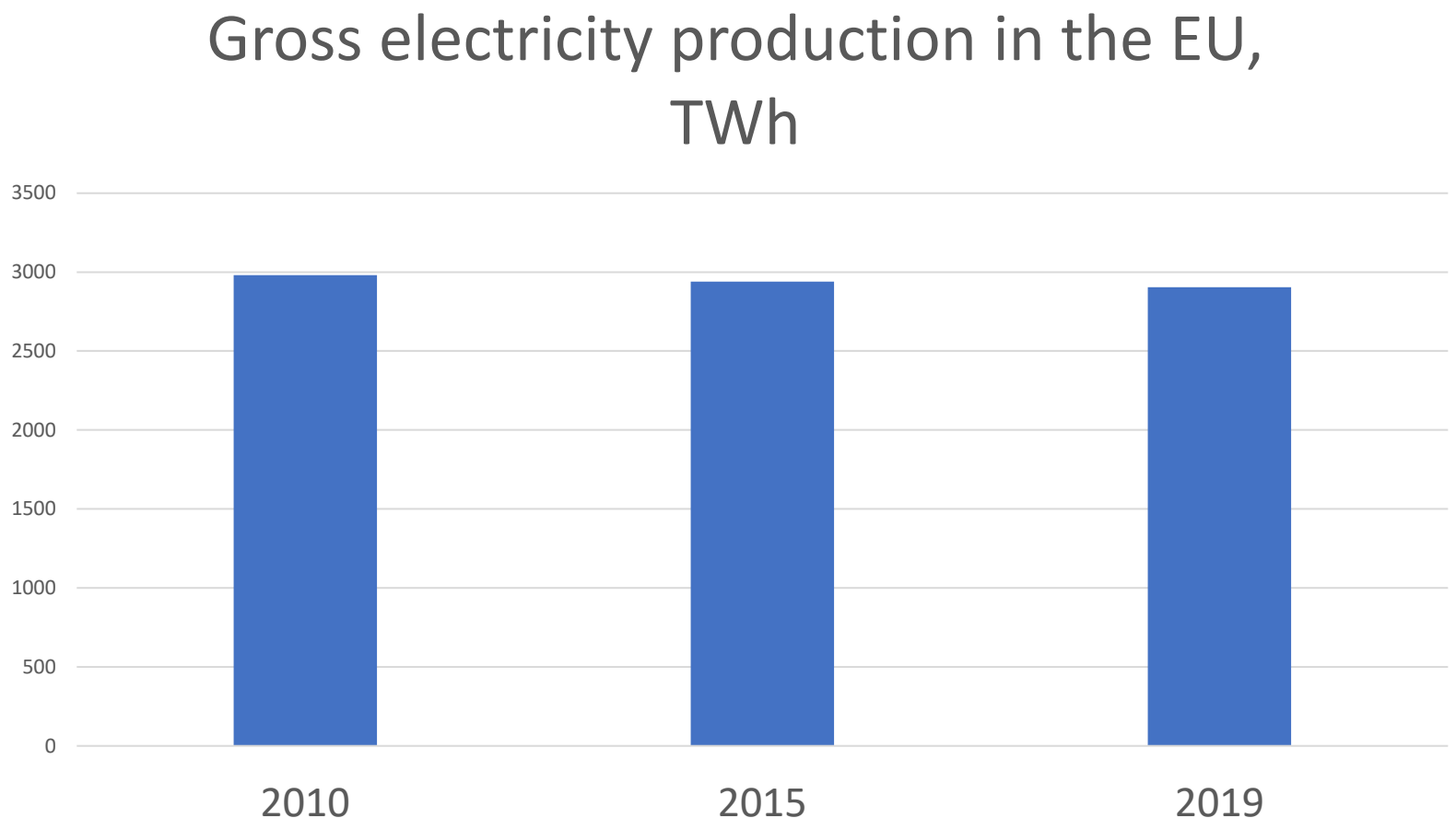
New sources (RES) are being added to the established electricity system.

Predictable, reliable and dispatchable sources are rapidly being replaced by less predictable, less reliable and non-dispatchable technologies.

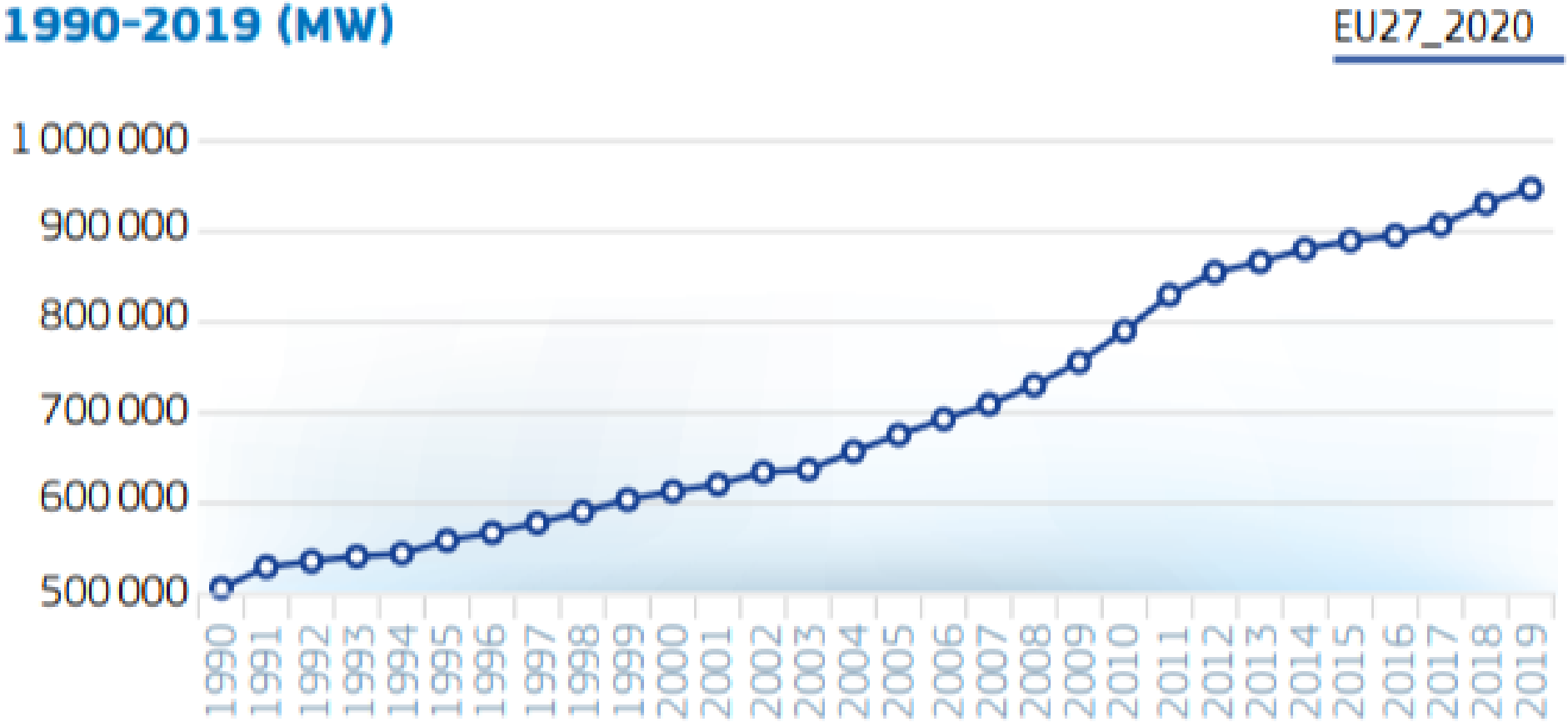
The existing system struggles to survive and there is no new one yet.

Renewable electricity

- In 2020, renewables main power source (38% vs fossil fuels with 37%).
- Aim of having ~~32%~~ 40% of RES energy in the EU in 2030. (RED II directive -> Fit for 55 package).
- Main drivers of development are a) goals of the EU b) that lead to national subsidy schemes c) plus increasing competitiveness of technology.


Gross electricity production in the EU, TWh
3500
3000
2500
2000
1500
1000
500
0
2010
2015
2019

INSTALLED ELECTRICITY CAPACITY – TOTAL – 1990-2019 (MW)

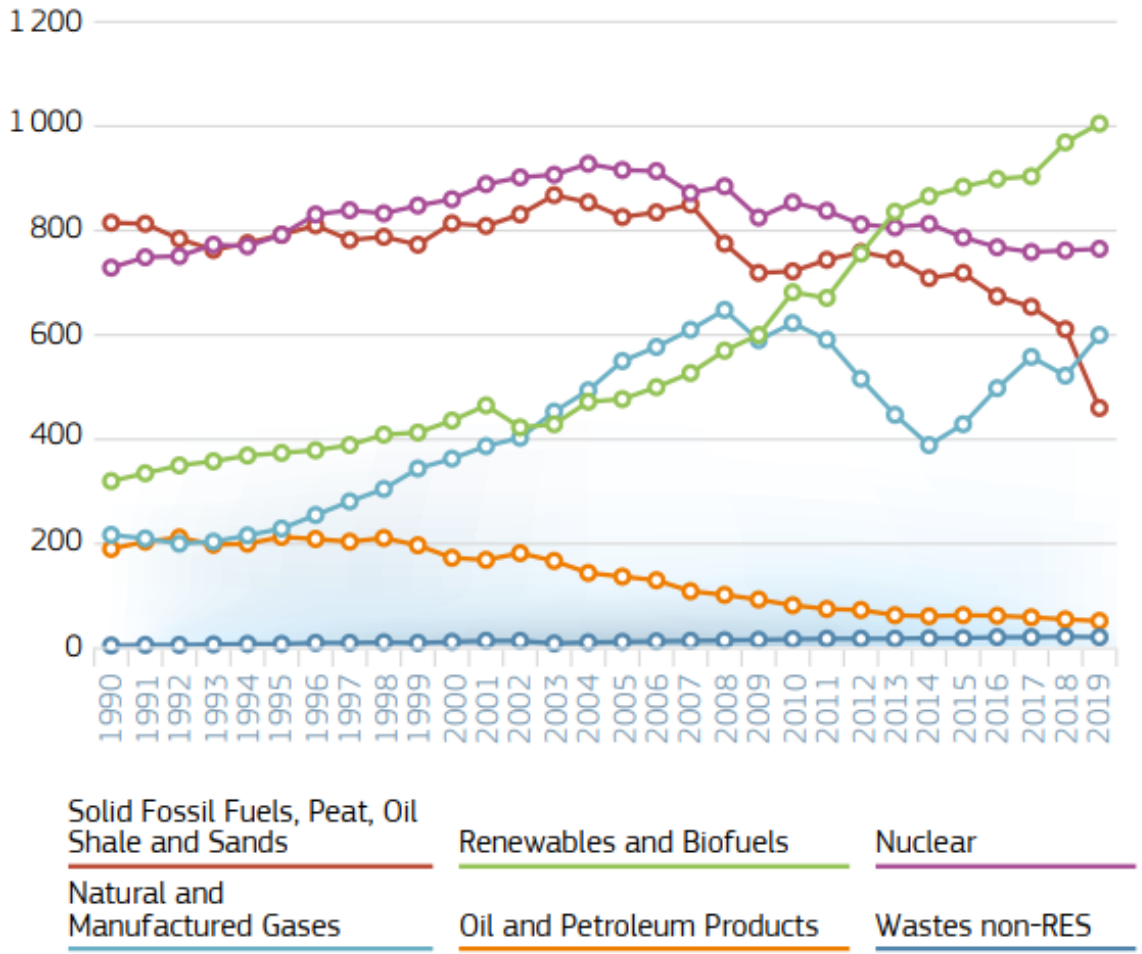


* No complete EU-27 data available for 1990-2004.

Source: Eurostat April 2021

2.6.2 Gross Electricity Generation

EU27_2020 – BY FUEL – ALL FUELS – 1990-2019 (TWh)

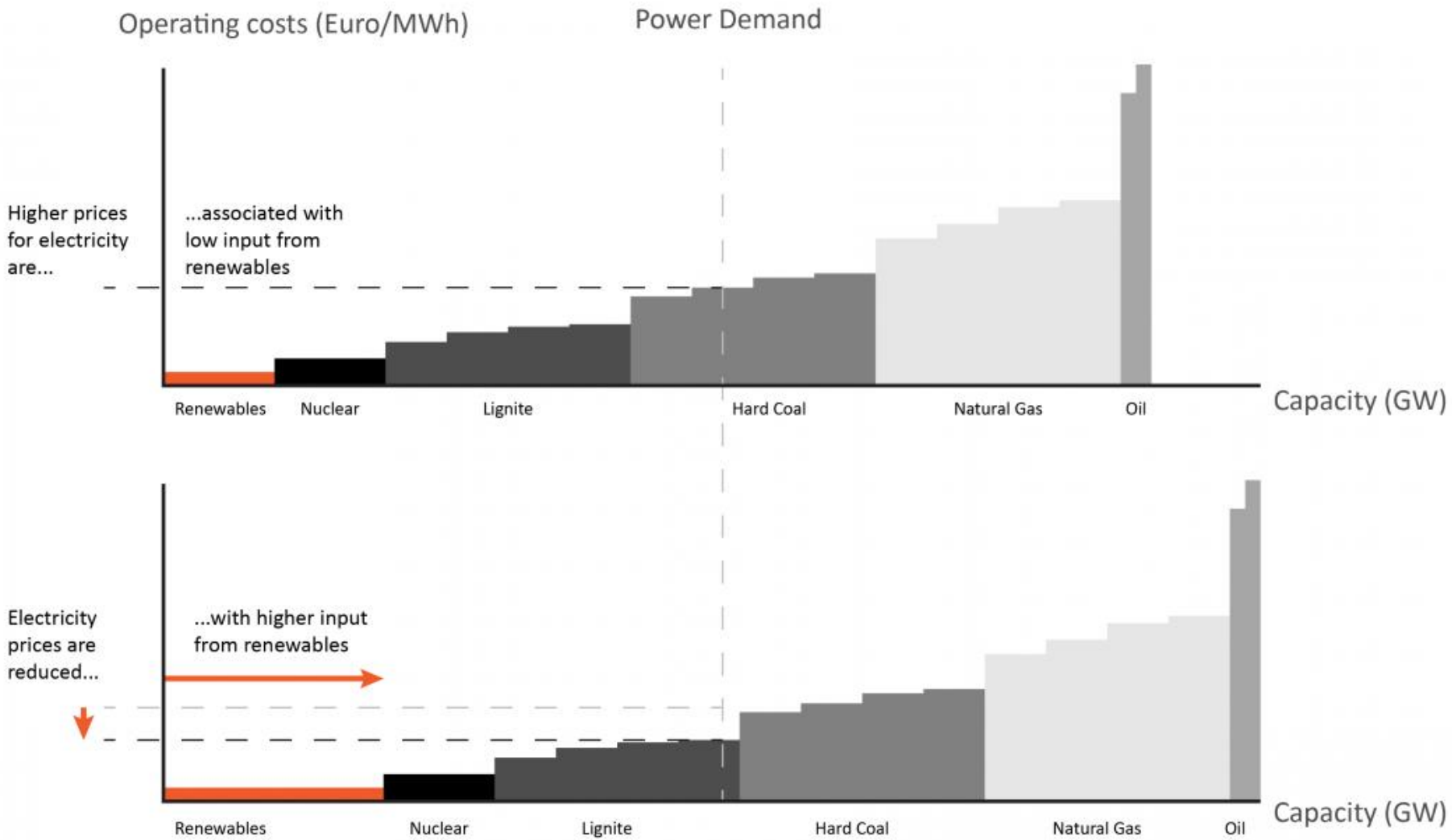


RES impact on elecricity price

Simple explanation: Subsidized RES eletricity is pushing the price down.

Elaborated explanation: Merit order effect.

Illustrating electricity price fluctuations due to the Merit Order Effect



RES impact profitability of traditional sources

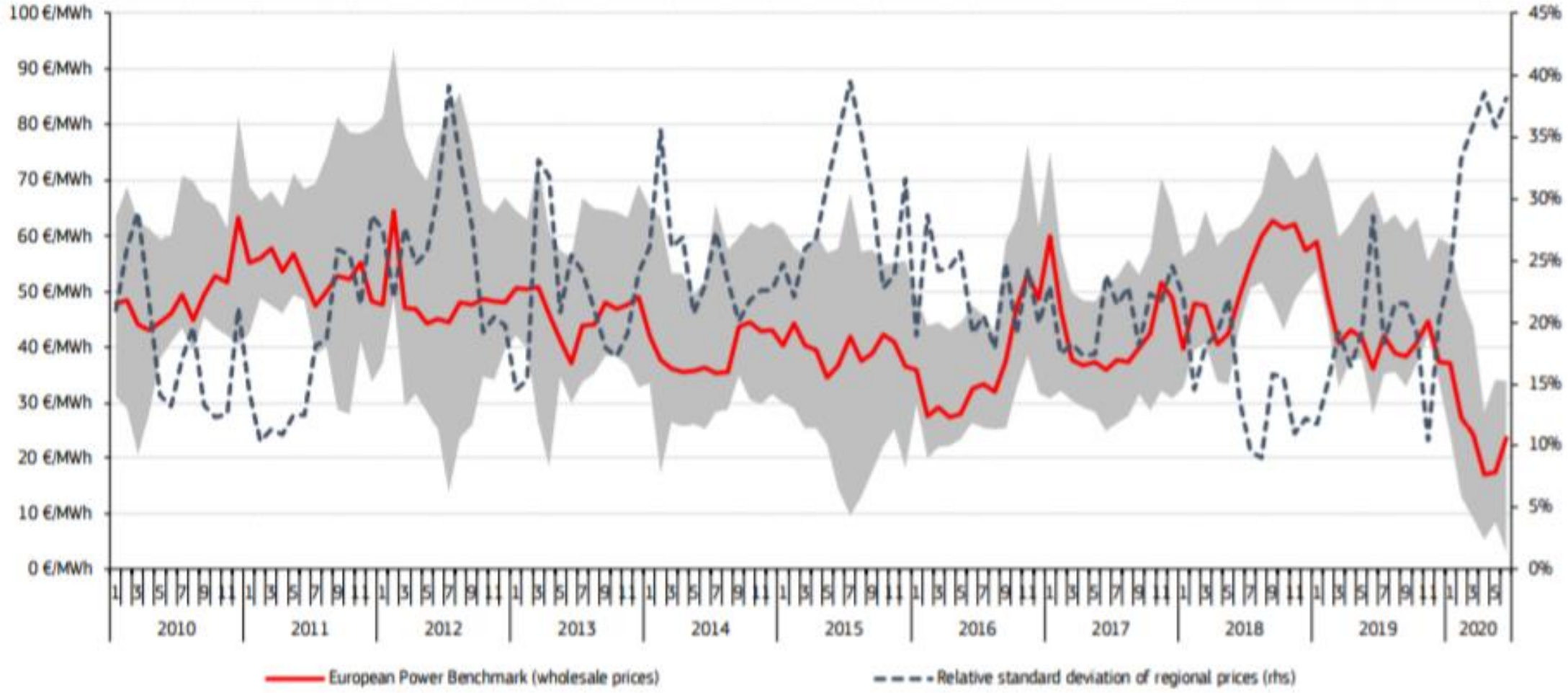
= They drive the prices down.

= They limit the time when other generators can make money.

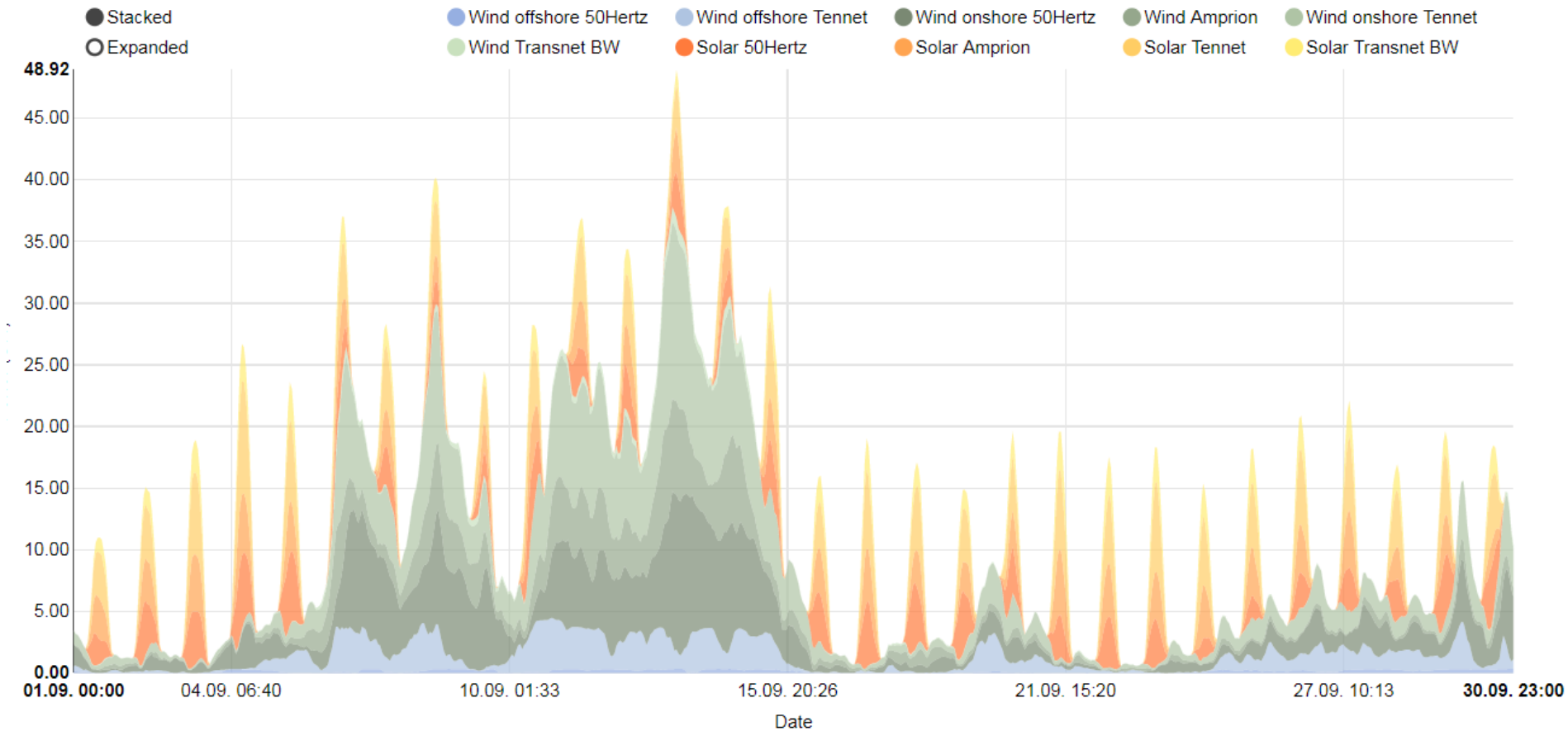
= They force the traditional sources to retire.

= They prevent new (dipatchable) sources to be built.

EU wholesale electricity prices

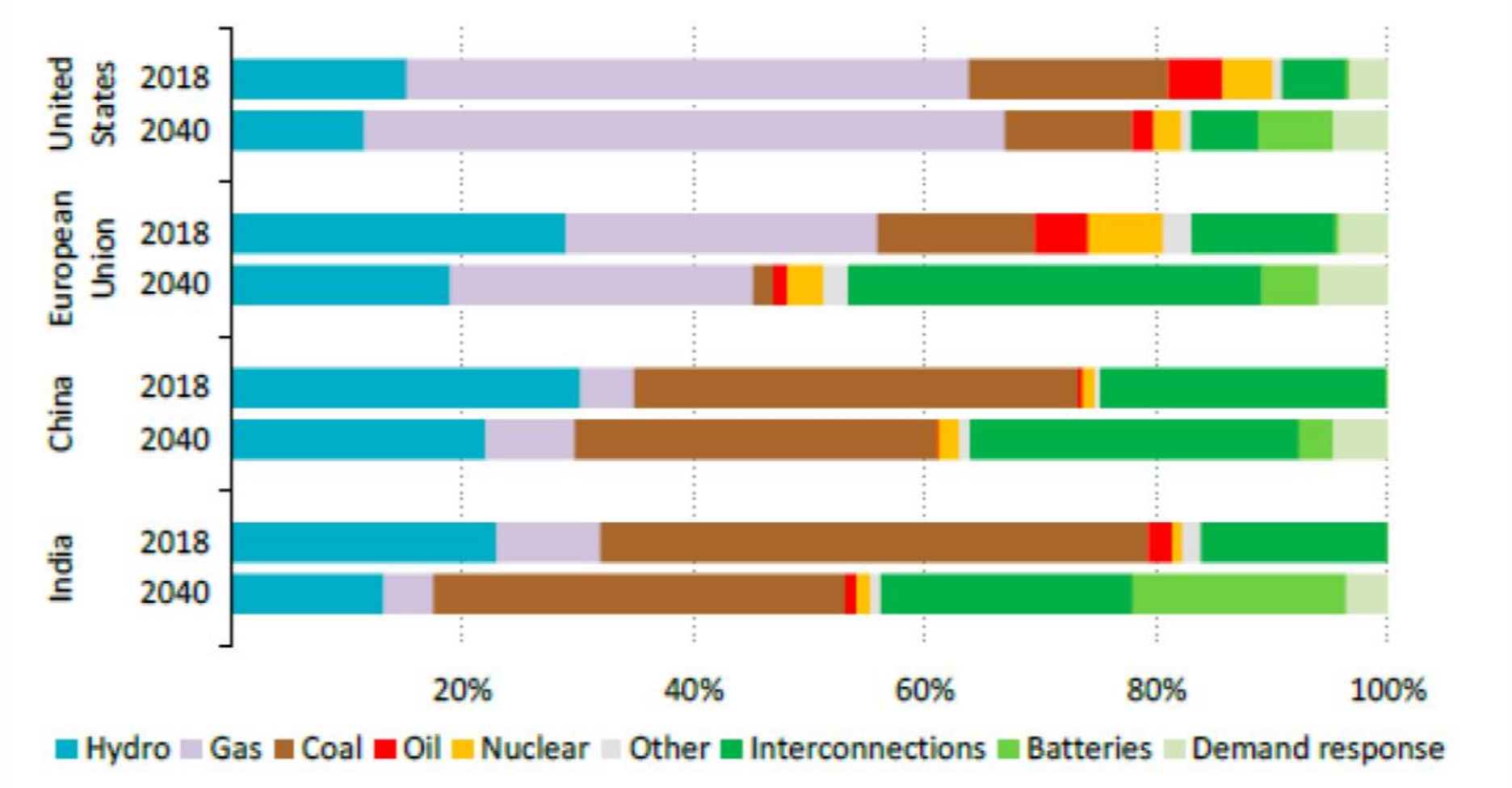


Production from non-dispatchable RES, Sept 2017, Germany



Datasource: 50 Hertz, Amprion, Tennet, TransnetBW, Netztransparenz.de
Last update: 25 Oct 2017 09:08

Sources of flexibility in the EU and other regions



Solution 1. Energy-only market

- Generators paid solely on the basis of the volume of power they produce.
- Peak loading pricing theory = capacity adequacy is maintained because prices will rise if market players anticipate an impending shortage and invest accordingly.

- New concept, little experience if any.
- Political constraints.
- Boom and bust cycle.
- Limited ability of the system to store electricity, supply and demand uncertainty, inelastic demand, steepness of the supply curve = high price volatility when reserve margins are low.

Solution 2. Capacity mechanism

= capacity remuneration.

- To solve the problem of weaken investment incentives.
- But they replace market-driven investment with central planning – considerable regulatory risk and cost for investors and consumers.
- They are only reluctantly opened for the cross-border participation.

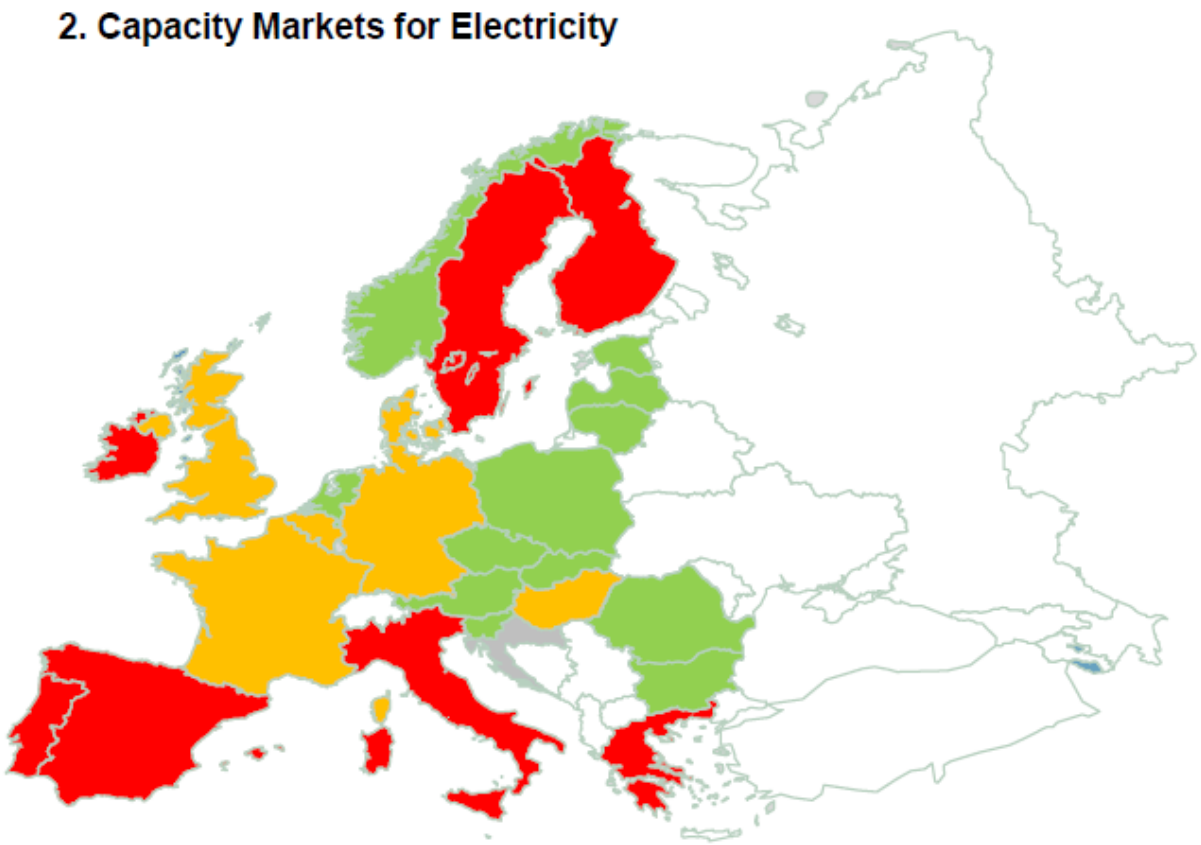
- Strategic reserves – not participating on the market, only in case of emergency.

Capacity mechanism/payments

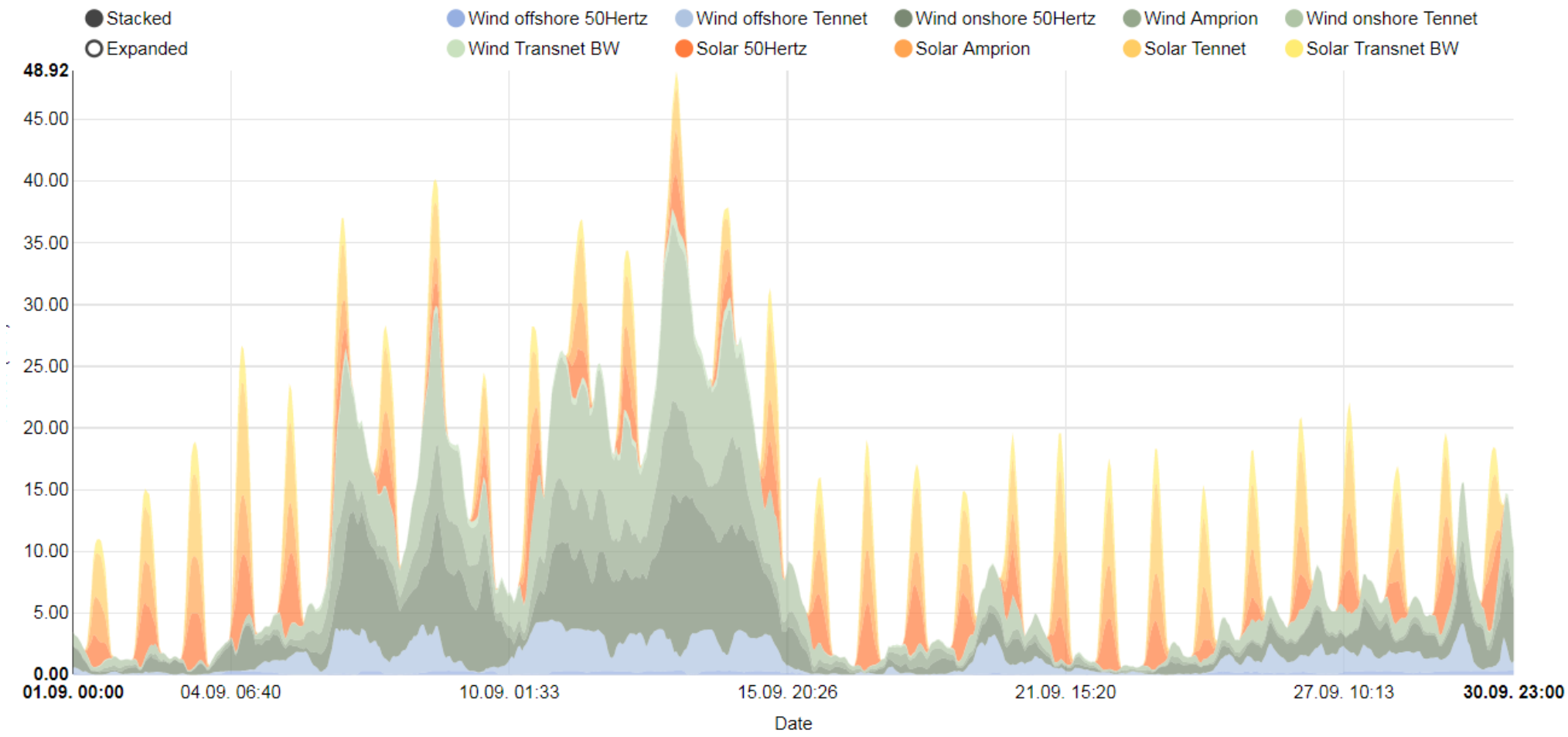
Energy Only Market

Capacity Market under construction

Capacity Market operational



Impact of volatile sources on electricity trade



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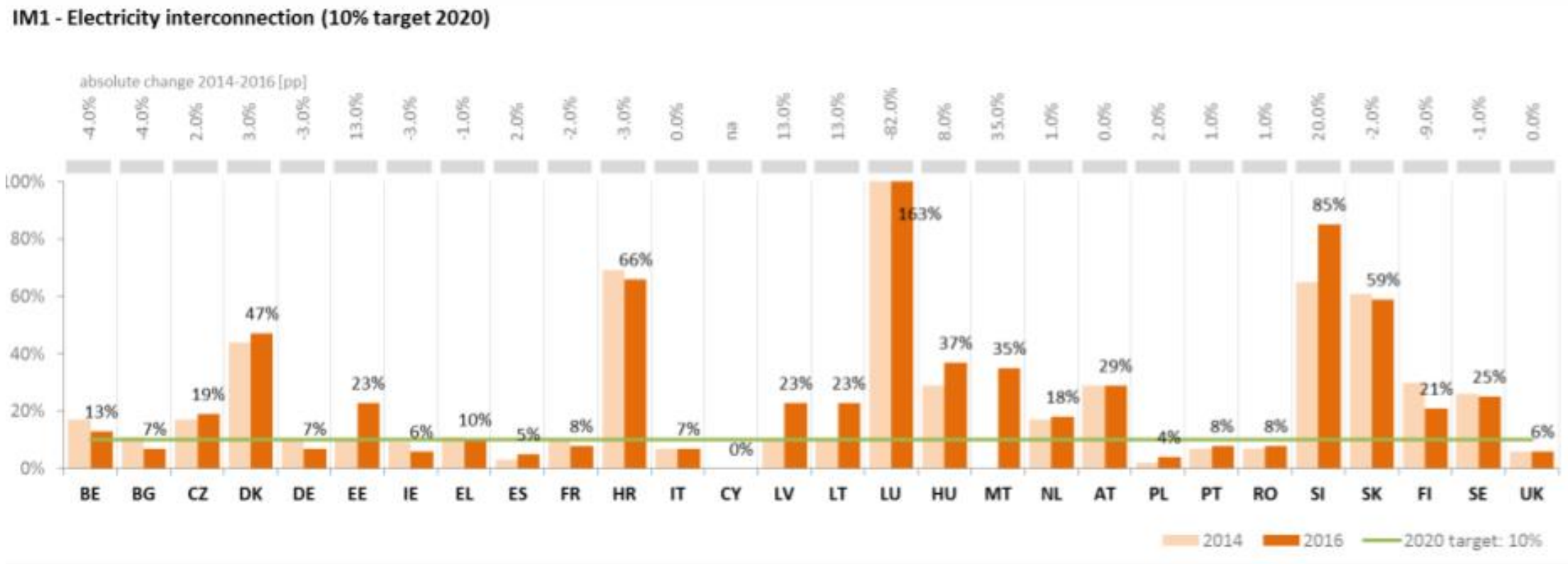
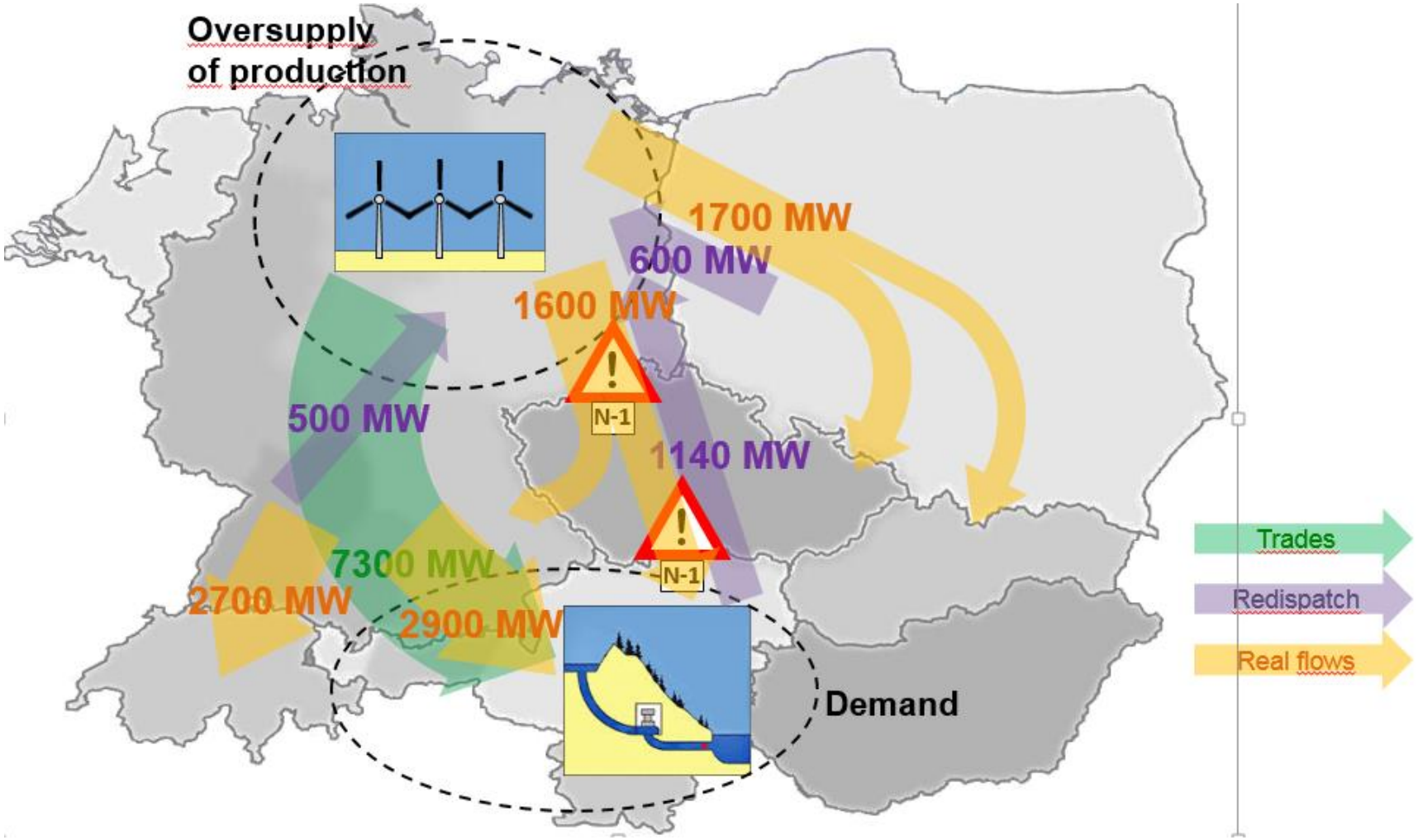
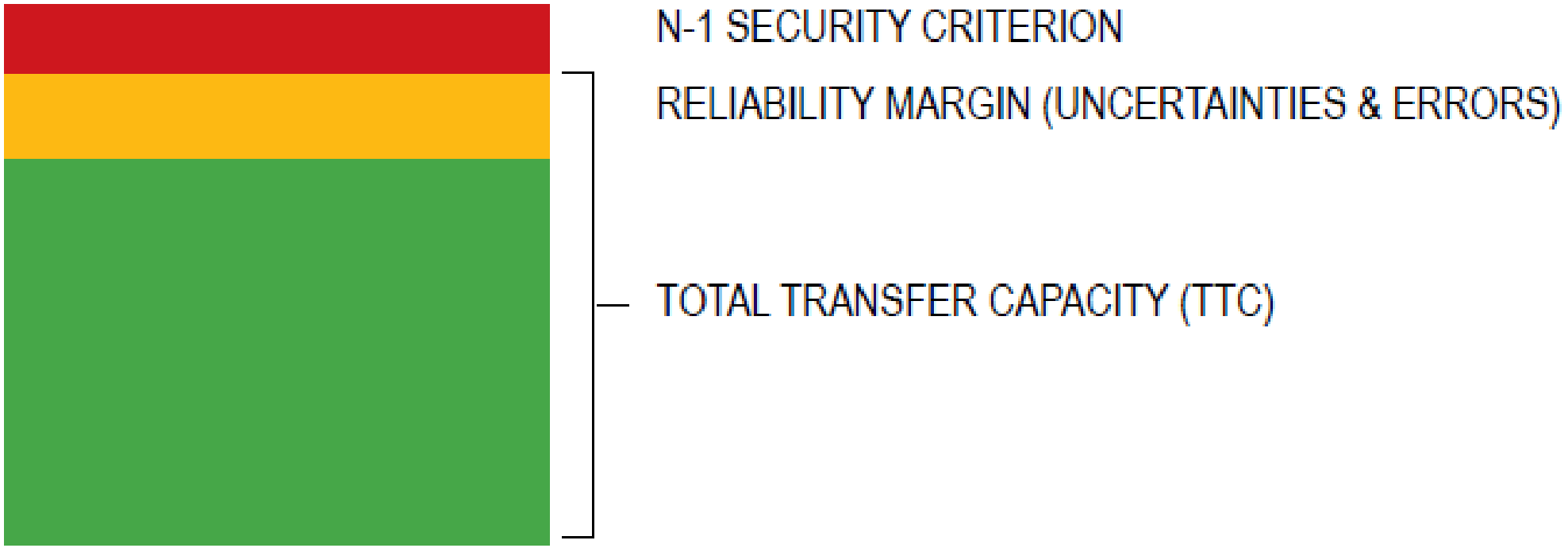


Trades and flows of elektricity in CEE, 2014/2015



Capacity of interconnectors



Remedial measures

Unscheduled flows reduce the amount of tradable cross-zonal capacity and affect the social welfare distribution.

Structural solutions:

Improvement of the capacity calculation methodology.

Improving bidding zone configuration.

Investments in the transmission network.

Short term emergency solutions:

Changing the grid topology.

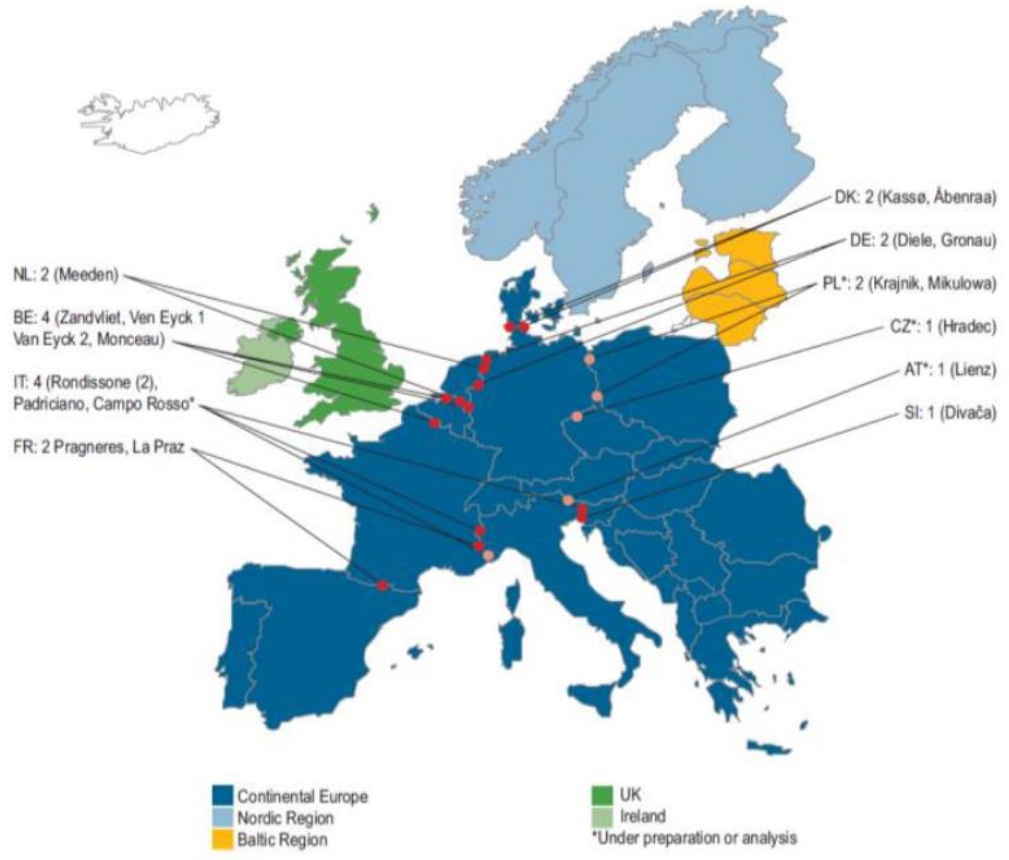
Re-dispatching.

Counter-trading.

Curtailment of allocated capacities.

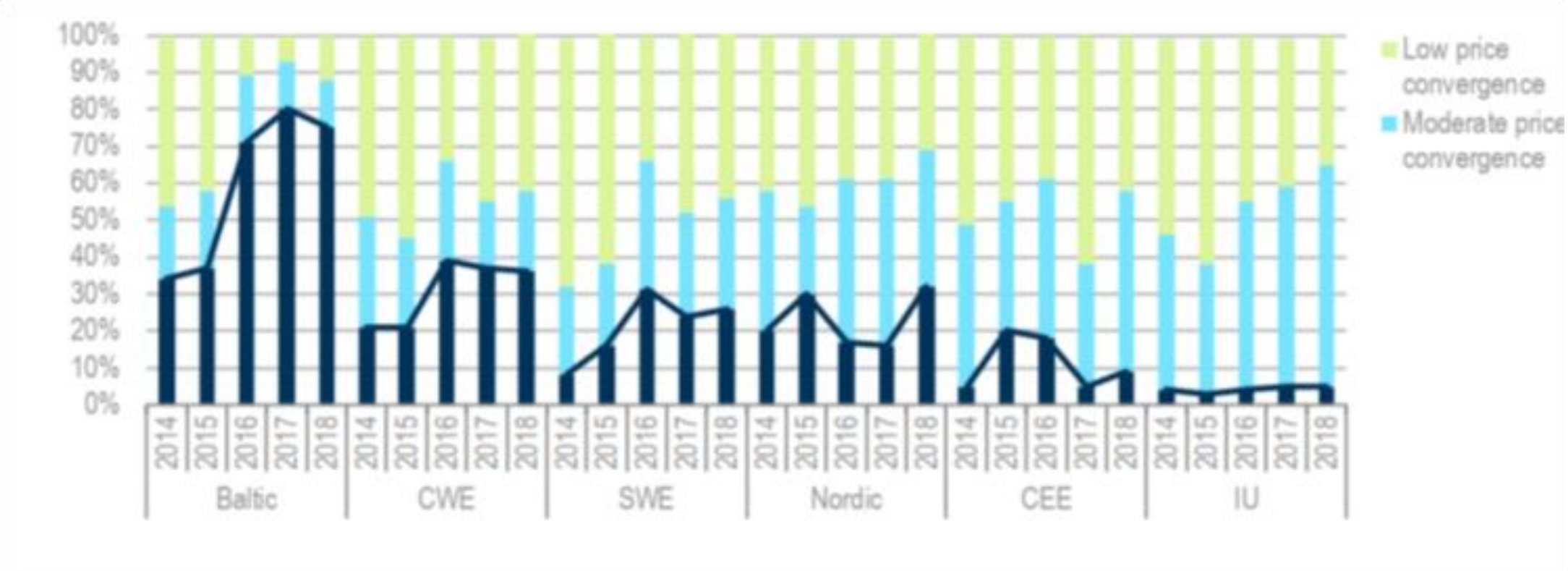
Phase-shifters.

Remedial measures



Source: ACER/CEER (2012).

Price convergence



Evaluation of the current situation (EC)

= Electricity markets impacted by national energy and climate policy decisions (RES, capacity mechanisms, retail market regulation, carbon prices…).

Necessary seems to be:

- to improve functioning of the national markets by limiting state intervention (RES, capacity mechanisms, regulated tariffs).
- to improve cross-border capacity (infrastructure investment, balancing and intra-day markets).
- to optimize cross-border flows.

Clean energy for all citizens, 2019 (electricity market desing part)

- 30.11.2016, about 3500 pages. Significant rebuilding of the EU power market. The implementation just started in 2020.
- To facilitate clean energy transition, cut CO_2 emission by at least 40% by 2030, incentivize cross-border trade, to increase the efficiency target from indicative 27% to mandatory 30%.
- To remove price caps and price regulations; harmonization of network tariffs setting rules, removing priority dispatch for bigger RES capacities (over 0,5 MW).
- Reinvesting congestion rents to network investments.

Clean energy for all citizens, 2019 (electricity market desing part)

- Regional operational centers (regionally integrated TSOs) to coordinate capacity calculations, regional sizing of reserve capacities, facilitate regional procurement of balancing, outage planning…
- Capacity mechanisms acknowledged but restricted – non-discrimitinatory, consulted with neighbours, open to non-domestic capacities, no fossil plants with emission over 550 gCO2/kWh (no coal without CCS).
- Powers to the consumers on retail markets.
- New powers to ENTSO-E, ACER, regional centers, DSOs…

= RES are assumed to be fully competitive, unsubsidized sources of electricity with standard rights and obligations on the power market.

Renewable electricity and existing system

Tension between the EU aim of a) freely operating single market and b) ambition to secure (by regulatory means) low-carbon energy system.

Sources

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