IEM: Electricity Market II.

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Electricity market – current situation

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

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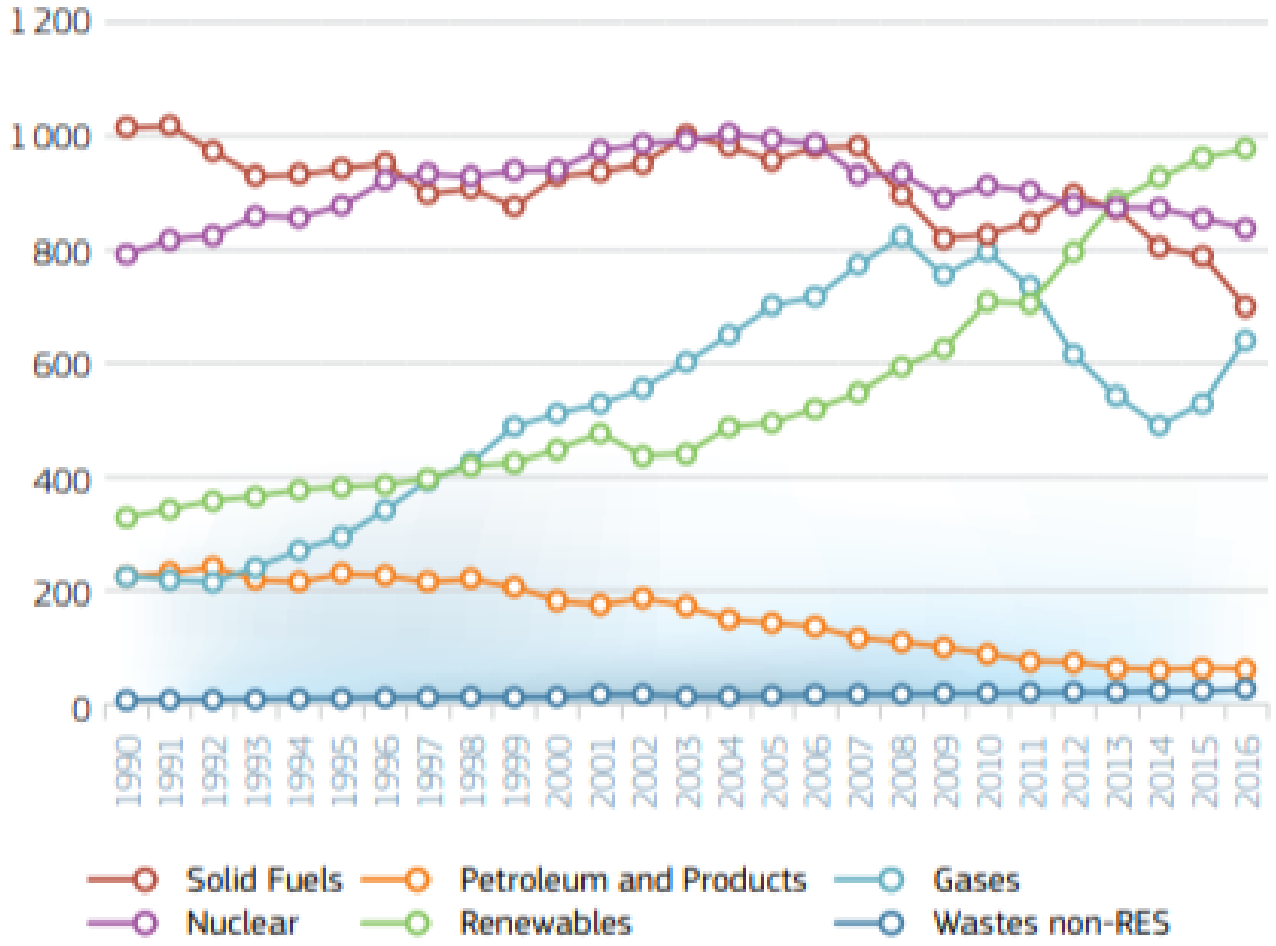
Renewables

- 13% in gross energy consumption. 29,9% of gross electricity generation (2015).
- Aim of having 27% of RES energy in the EU in 2030.
- Main drivers of development are a) goals of the EU b) that lead to national subsidy schemes c) plus increasing competitiveness of technology.

- RES significantly changes the way the electricity is produced and traded.

Gross Electricity Generation, EU28, TWh



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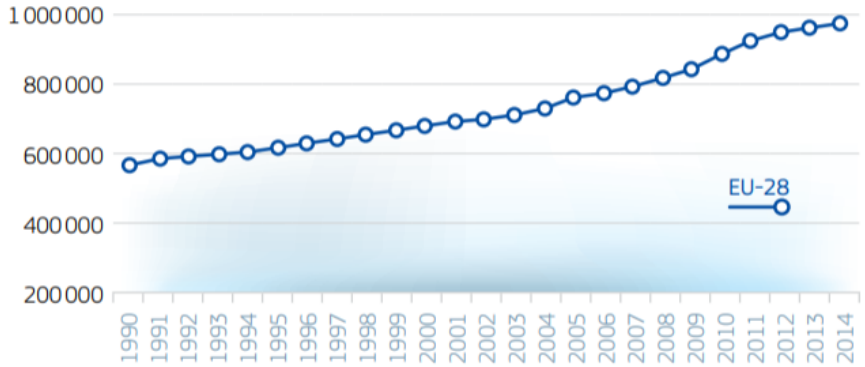
Problem No. 1 – Oversurplus of generating capacity



Installed electricity capacity (EU 28, MW) vs. electricity supplied (GWh)

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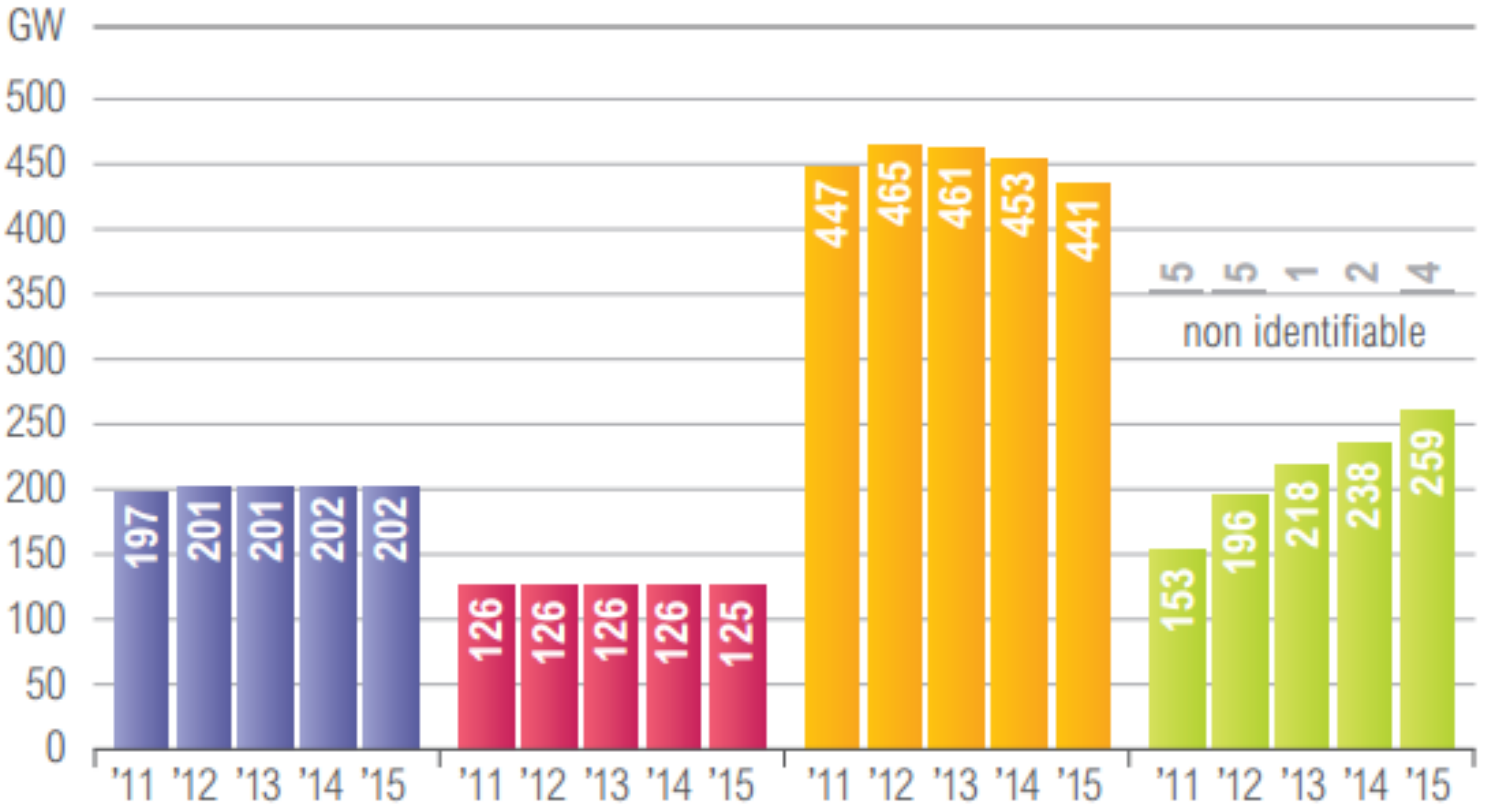
Net generating capacity, 2011-2015, GW



Blue – hydro, red -nuclear, orange – fossil fuels, green – renewable (excl. hydro)

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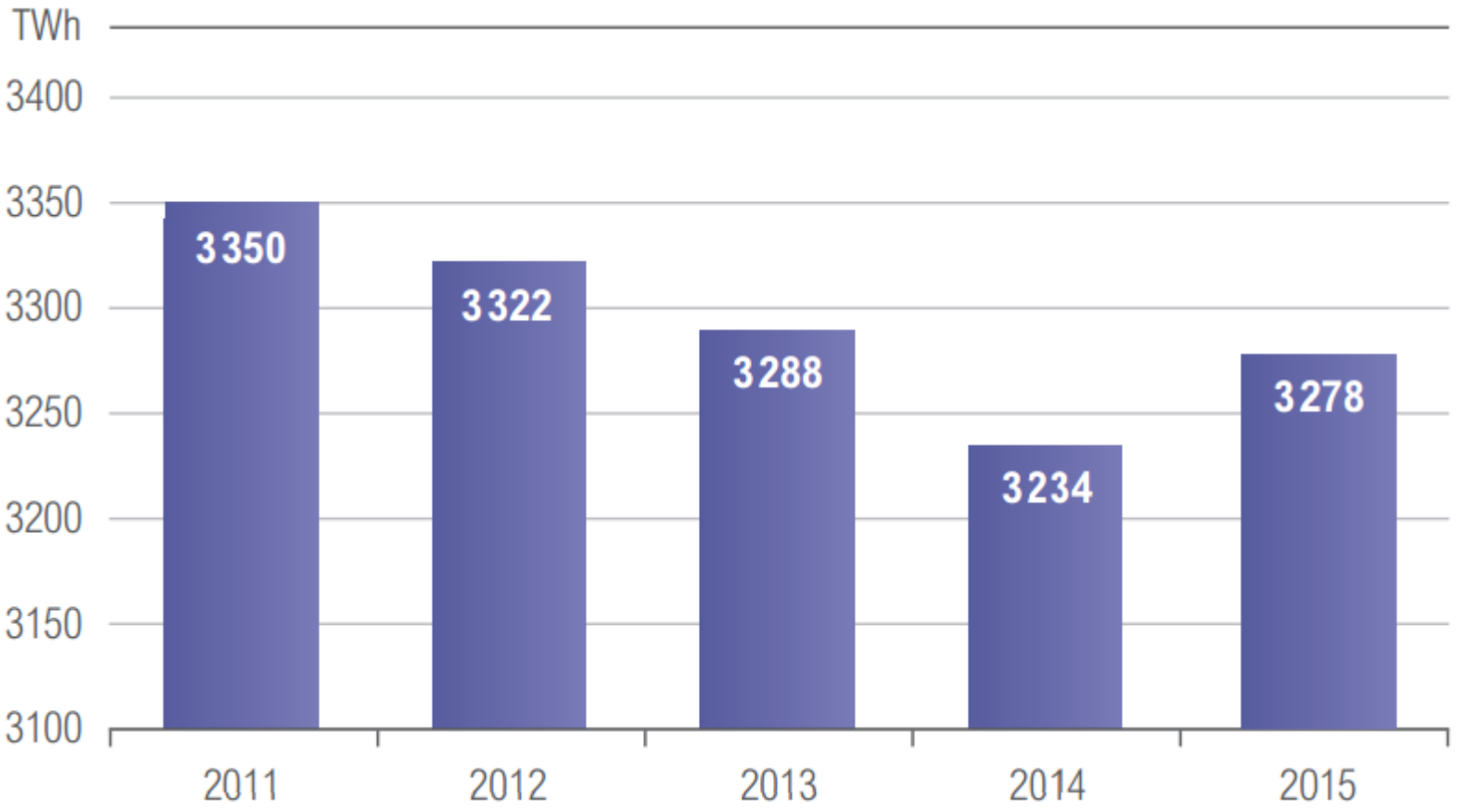
Yearly energy consumption, 2011 – 2015, TWh



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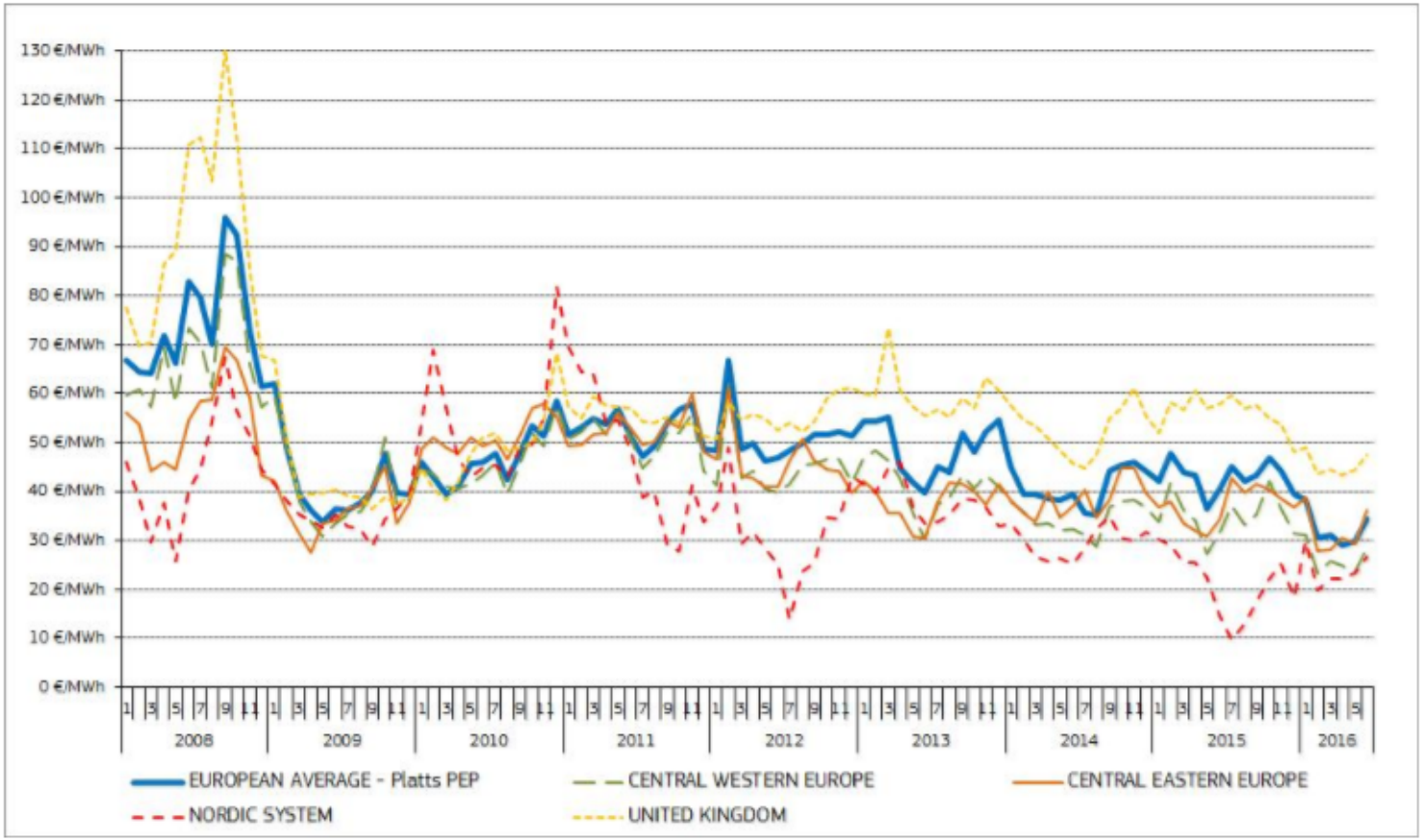
EU wholesale electricity prices



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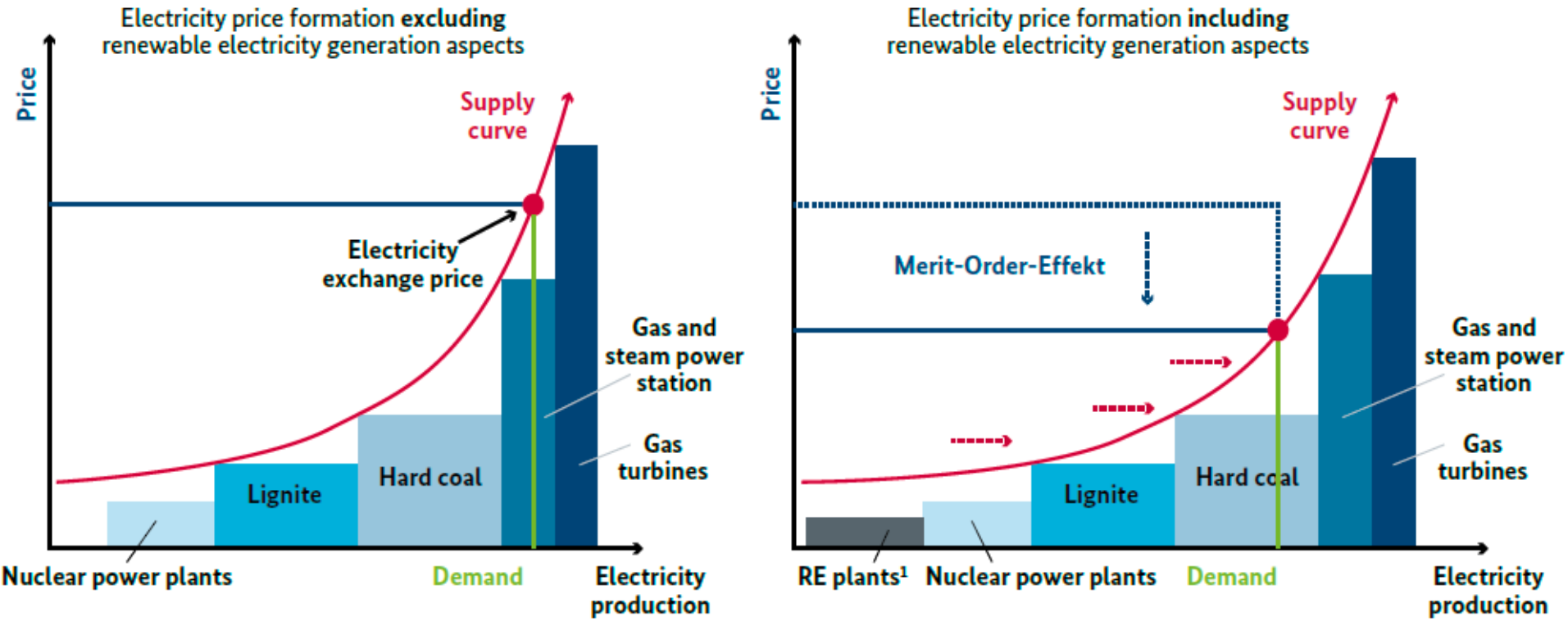
Merit-order effect

Schematic description of the merit-order effect

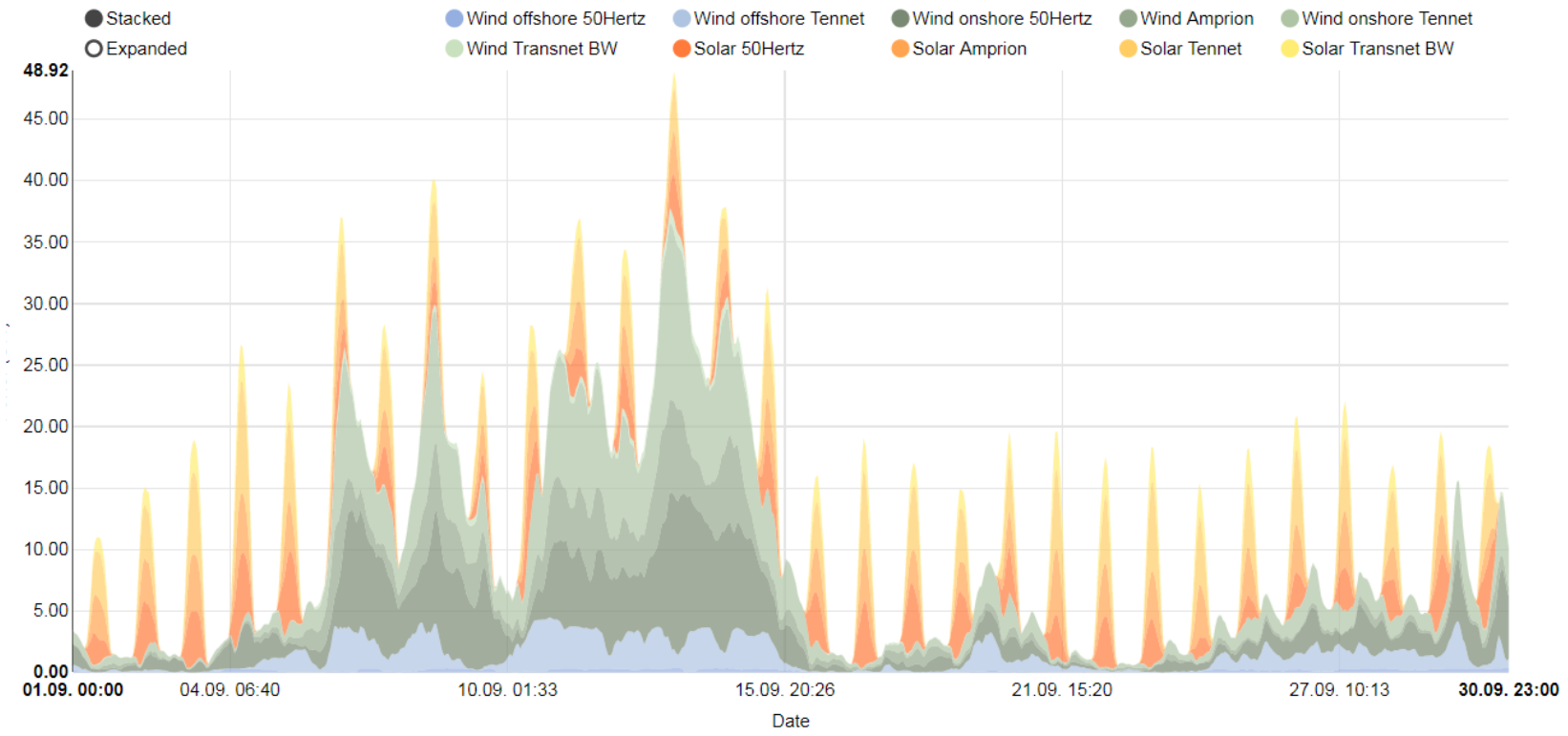


Note: The RE plants shift the supply curve in the right-hand diagram to the right. This lowers electricity prices at the exchange, assuming demand remains unchanged. The price difference is the merit-order effect.

1 electricity from fluctuating renewable energy sources (PV, wind): marginal costs = 0

Source: ZSW

Production from non-dispatchable RES, Sept 2017, Germany



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

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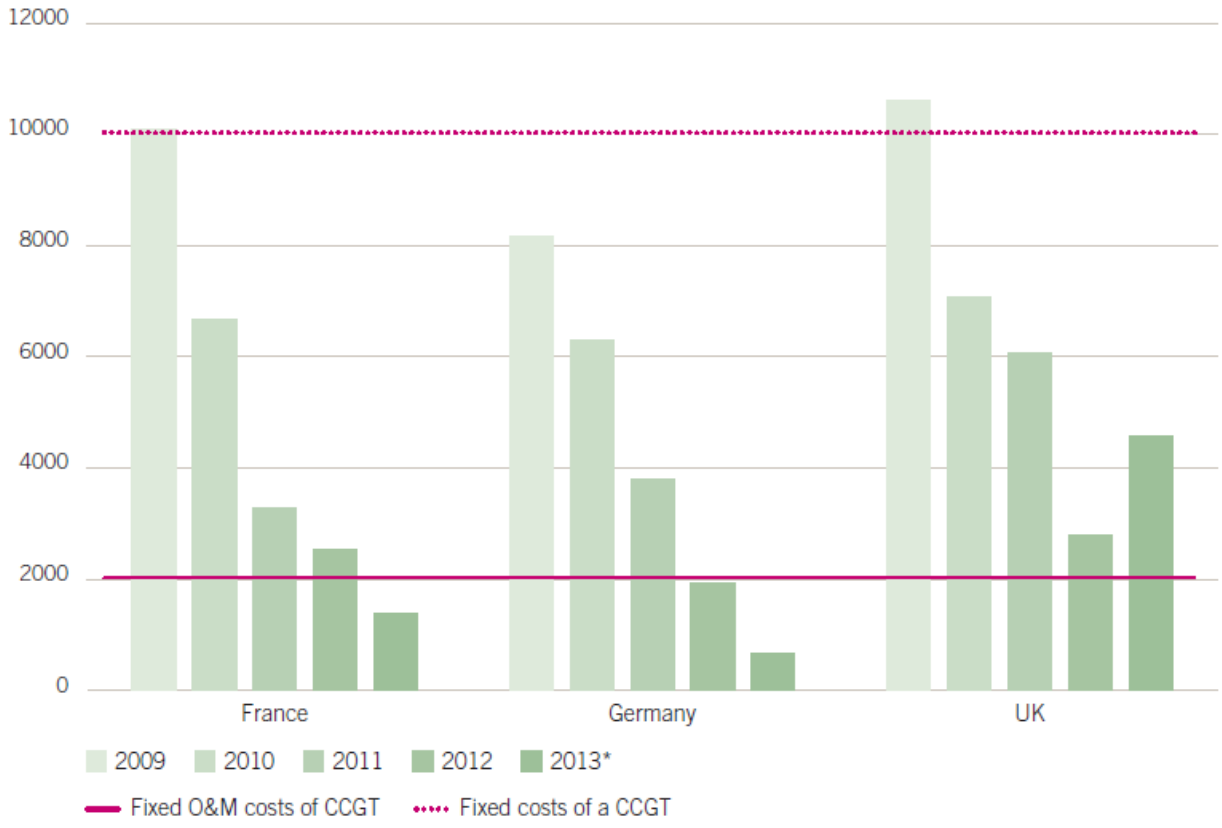
Decrease in revenue for CCGTs (€MW/month)



Analysis: FTI-CL Energy – Revenues calculated from wholesale spot prices excluding estimated short-run marginal costs. Excludes combined heat and power revenues and revenues from ancillary services. Figures for Germany for 2013 are based on 11 months.

Sources: EPEX. APX. IHS CERA

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Solution 1: Energy-only market

- Generators paid solely on the basis of the volume of power that they produce.
- No remuneration for being available during peak hours when intermittent sources aren´t producing.
- Peak loading pricing theory = capacity adequacy is maintained because prices will rise if market players anticipate an impending shortage and invest accordingly.

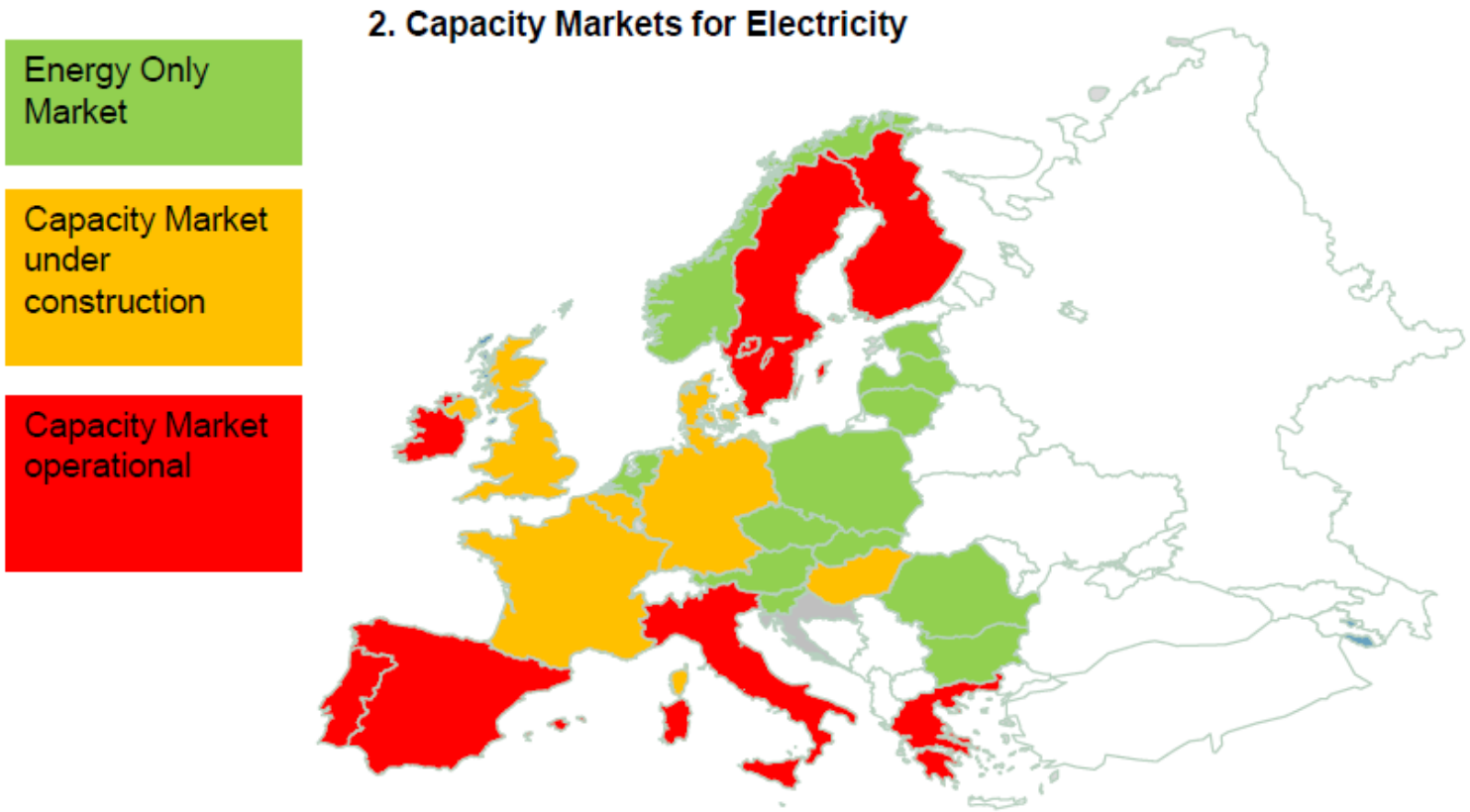
- New concept, little experience if any.
- Political constraints.
- Boom and bust cycle.
- Limited ability of the system to store electricity, supply and demand uncertainty, inelastic demand, steepness of the supply curve = high price volatility when reserve margins are low.

Solution 2. Capacity mechanisms

= capacity remuneration.

- To solve problem of weaken investment incentives.
- But they replace market-driven investment with central planning – considerable regulatory risk and cost for investors and consumers.

Capacity mechanisms/payments



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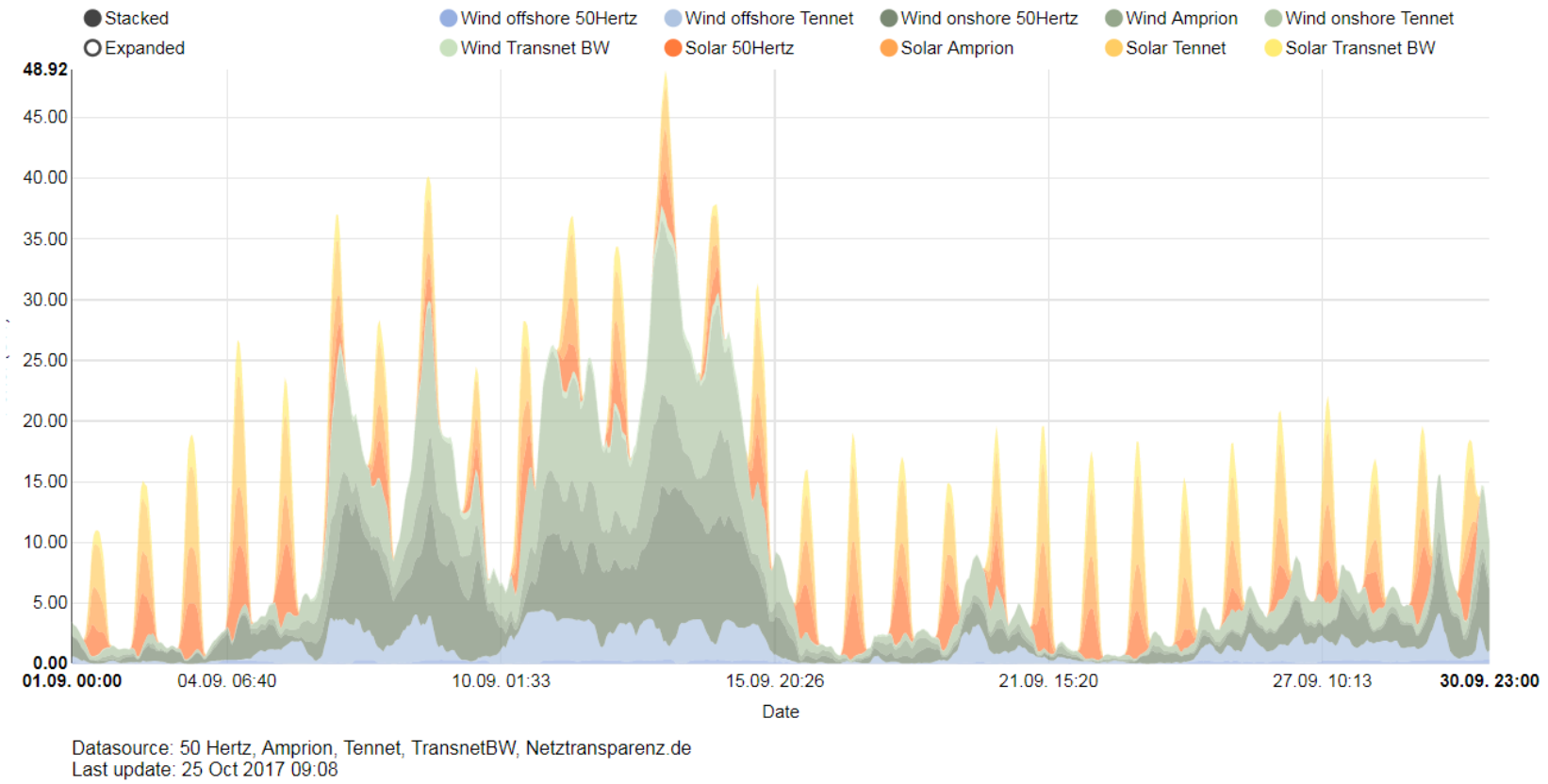
Problem No. 2 – impact of volatile sources on electricity trade



Electricity production from wind and solar in Germany in September 2017

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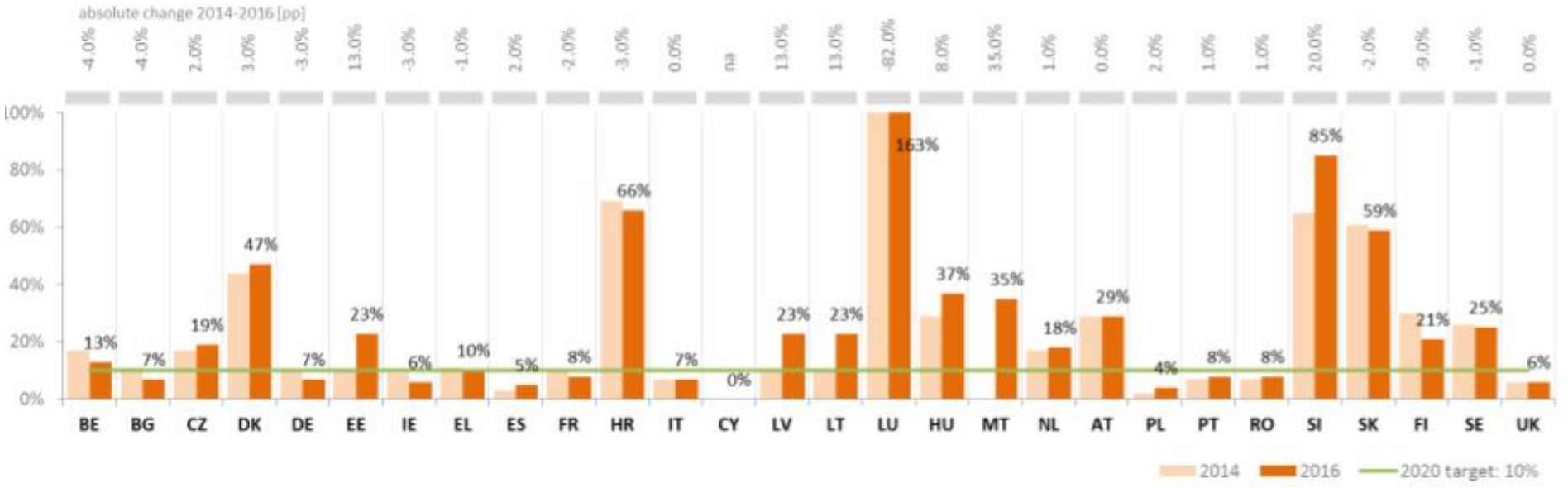
IM1 - Electricity interconnection (10% target 2020)



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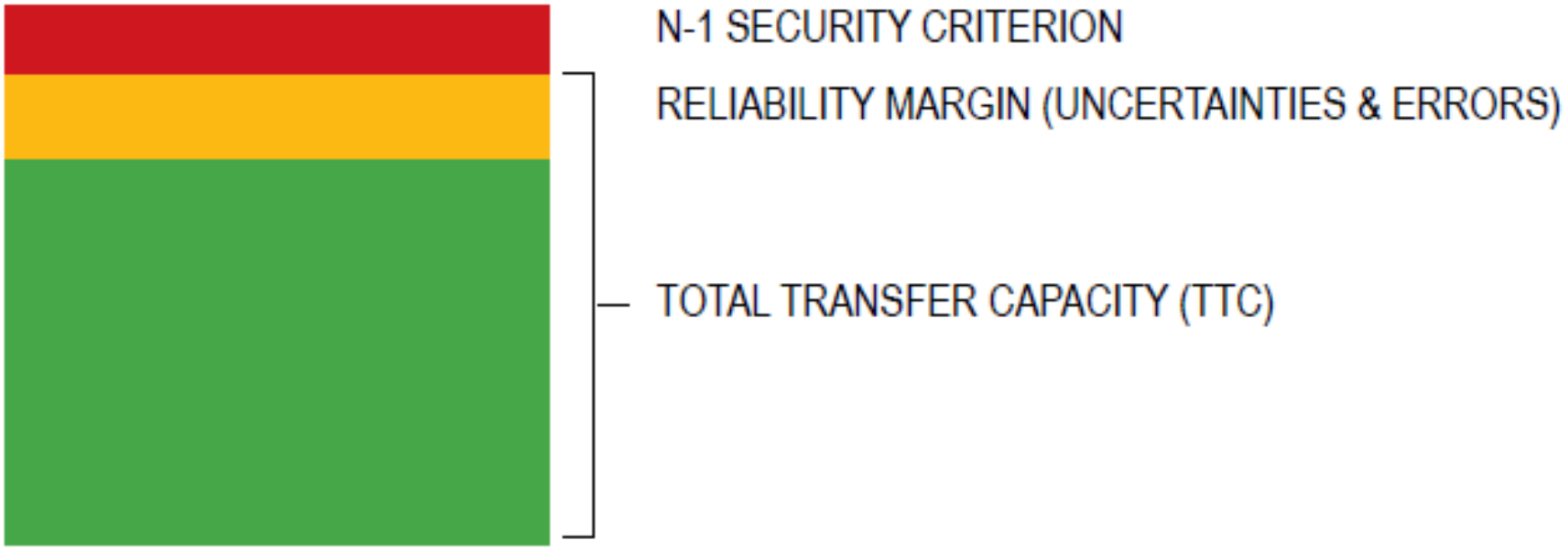
Thermal capacity of interconnectors



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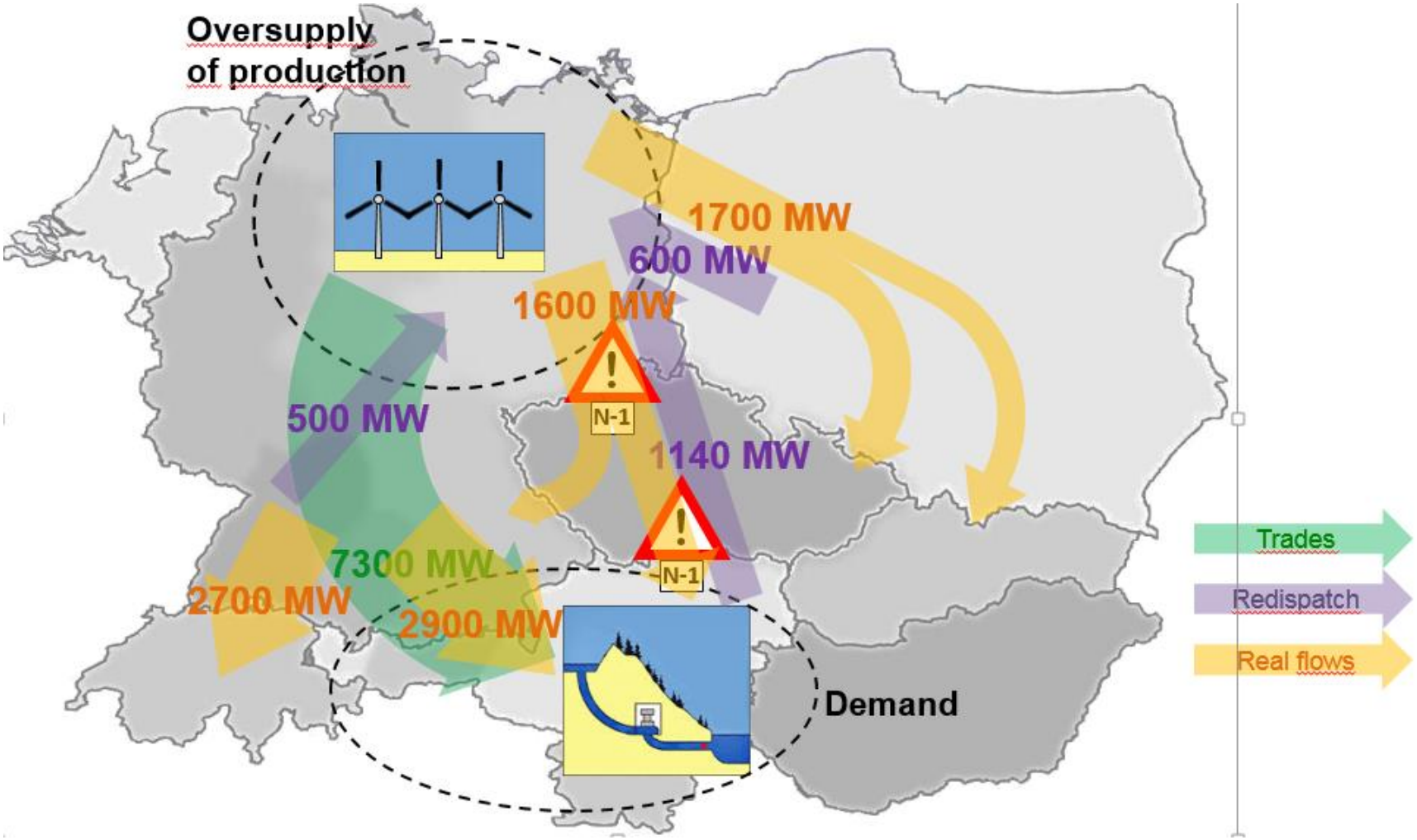
Trades and flow of electricity 2014/2015



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Remedial measures

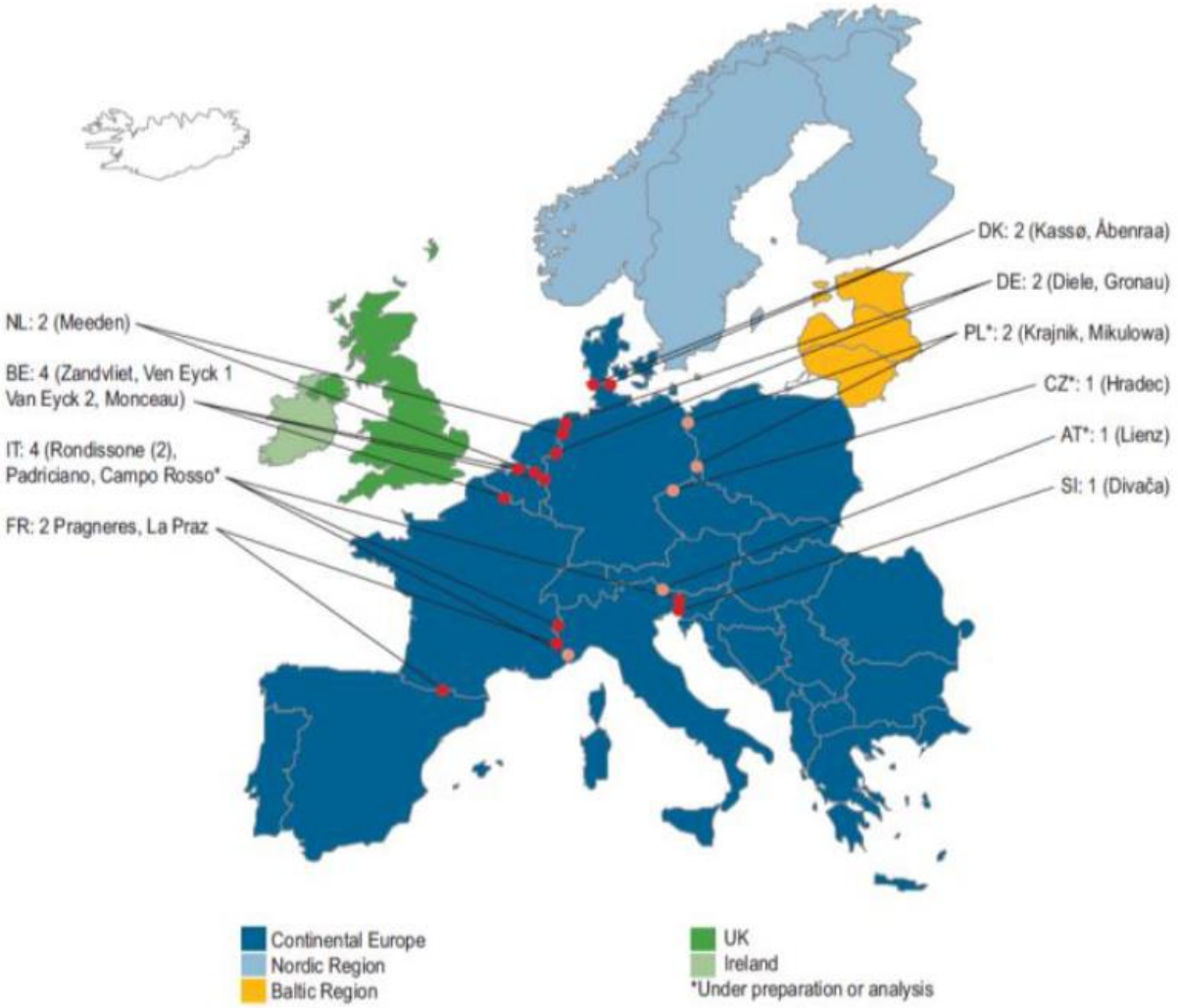
Unscheduled flows reduce the amount of tradable cross-zonal capacity and affect the social welfare distribution.

Structural solutions:

- Improvement the capacity calculation methodology.
- Improving bidding zone configuration.
- Investments in the transmission network.

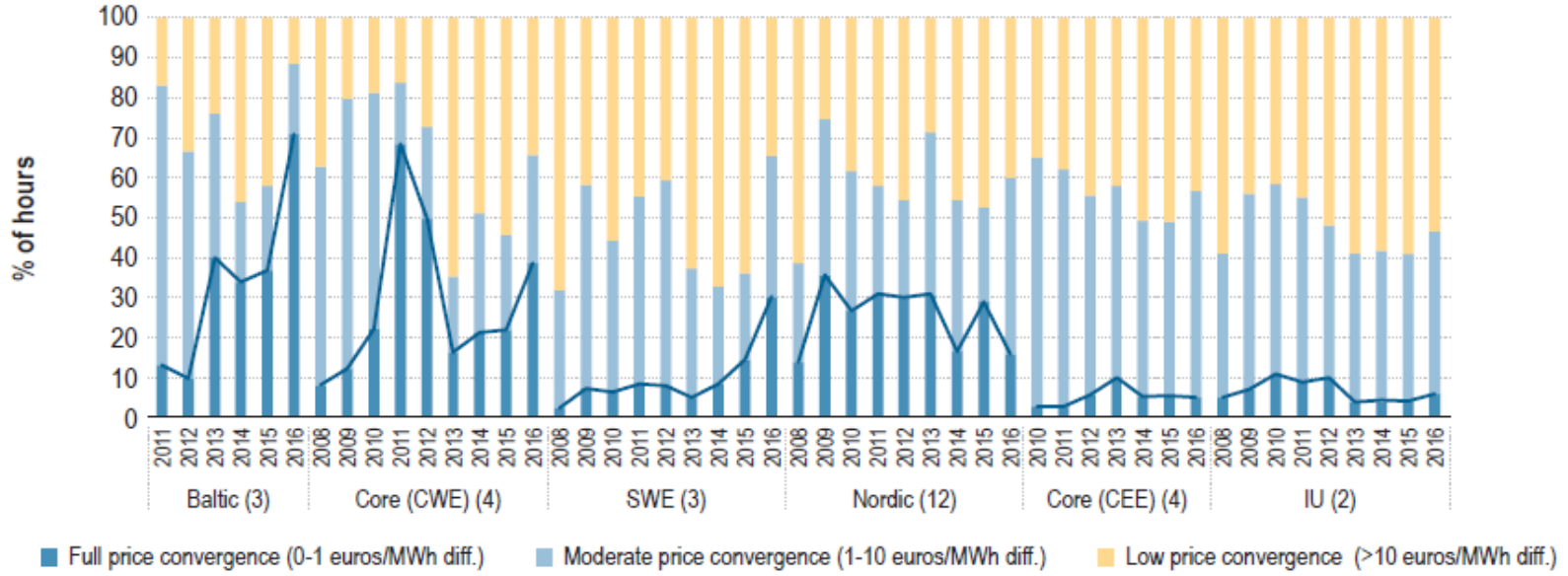
Short term emergency sollutions:

- Changing the grid topology.
- Re-dispatching.
- Counter-trading.
- Curtailment of allocated capacities.
- Phase-shifters.



Source: ACER/CEER (2012).

Figure 5: DA price convergence in Europe by region (ranked) – 2008–2016 (% of hours)



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Electricity market – current situation

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

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

Winter Package (electricity market design part)

- 30.11.2016 – to facilitate clean energy transition, cut CO_2 emission by at least 40% by 2030, incentivize cross-border trade.
- With goals of emphasizing energy efficiency, renewables and empowering consumers on electricity markets
- To remove price caps and price regulations, harmonisation of network tariff setting rules, removing priority dispatch for bigger RES capacities (over 0,5 MW) – they are to be responsible for their imbalances.
- Reinvesting congestion rents to network investments.

Winter Package (electricity market design part)

- Regional operational centres (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 centres, DSOs…

= stakeholders struggle to deal with the complexity of the legislation proposals.

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