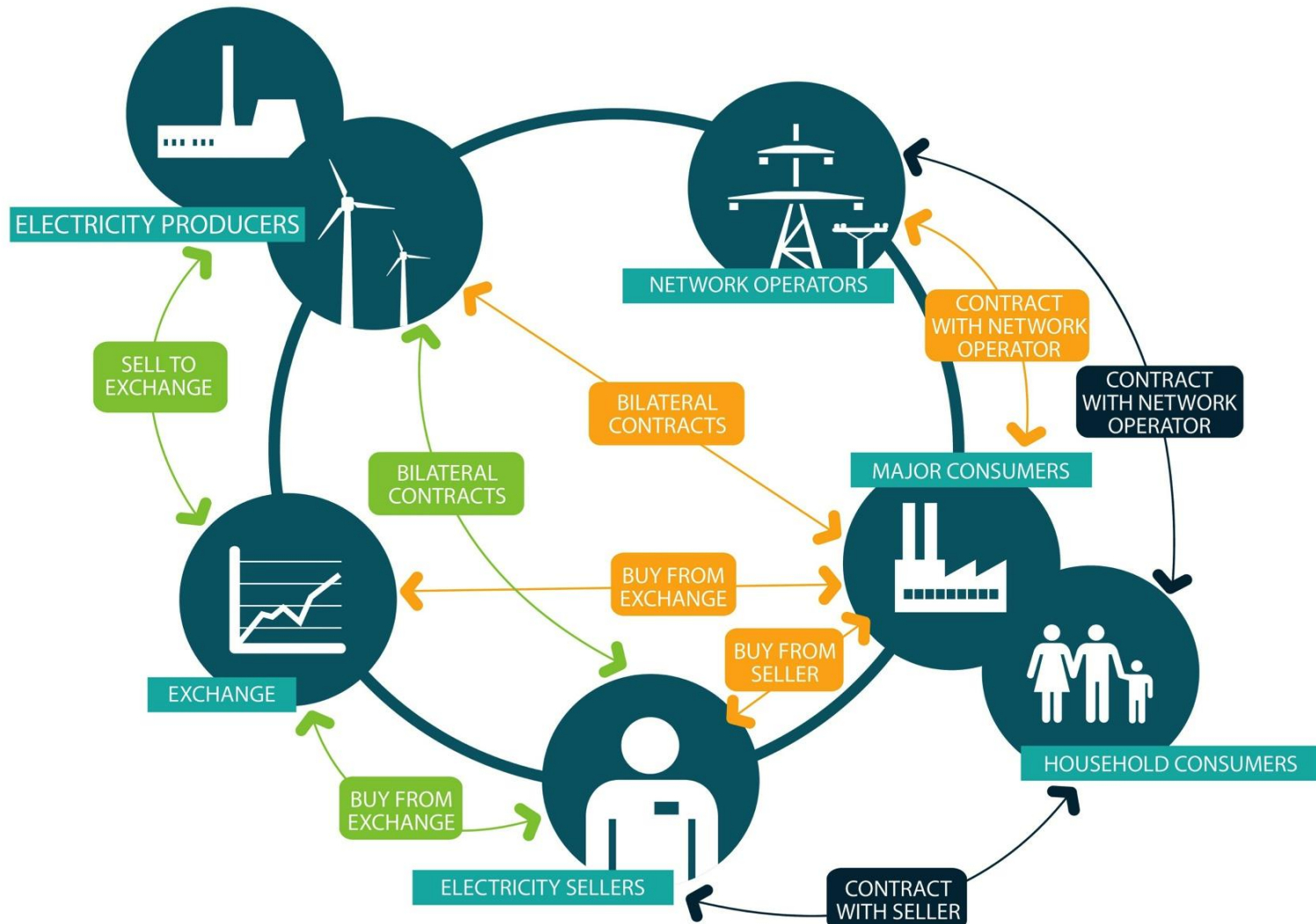


Increase flexibility in coal-fired electricity generation

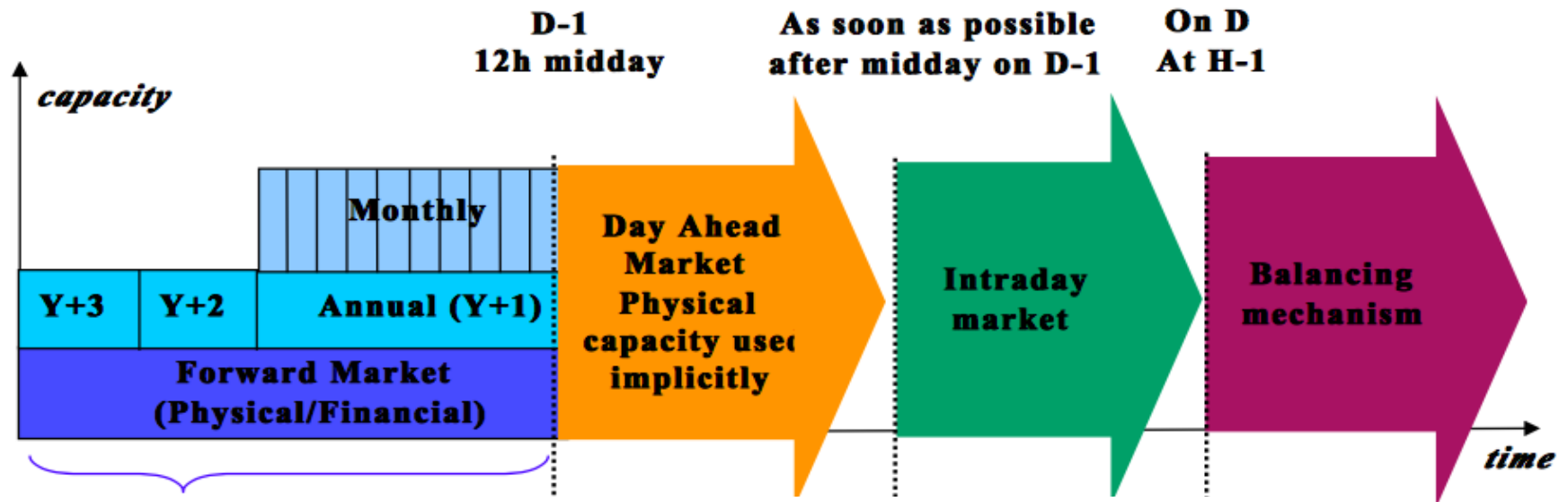
Vladimir Budinsky

Vice-chairman Group of Experts
Cleaner Electricity Systems UN ECE

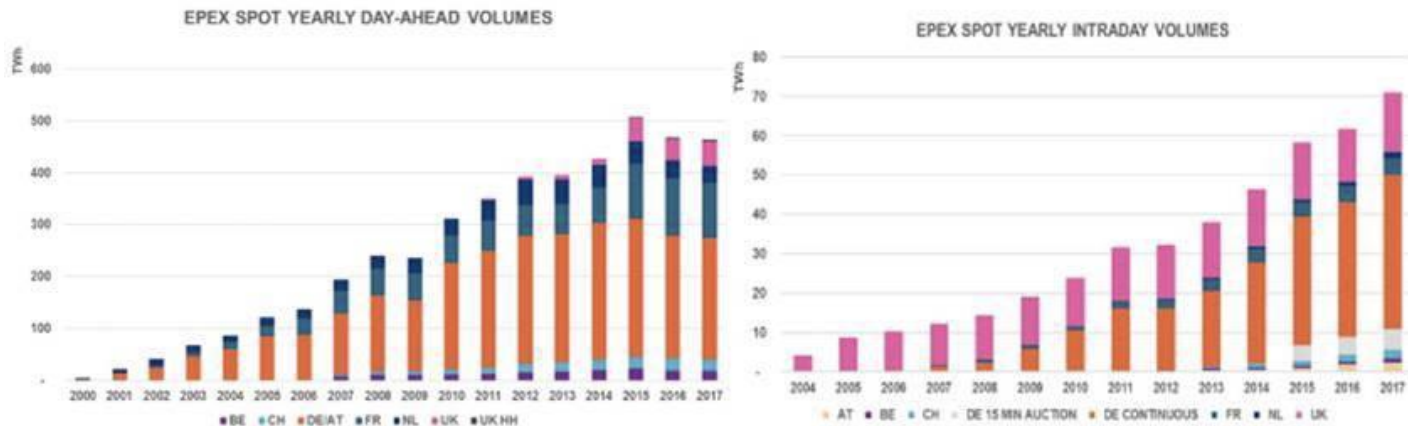
Electricity Systems become complex



Electricity trade changes rapidly



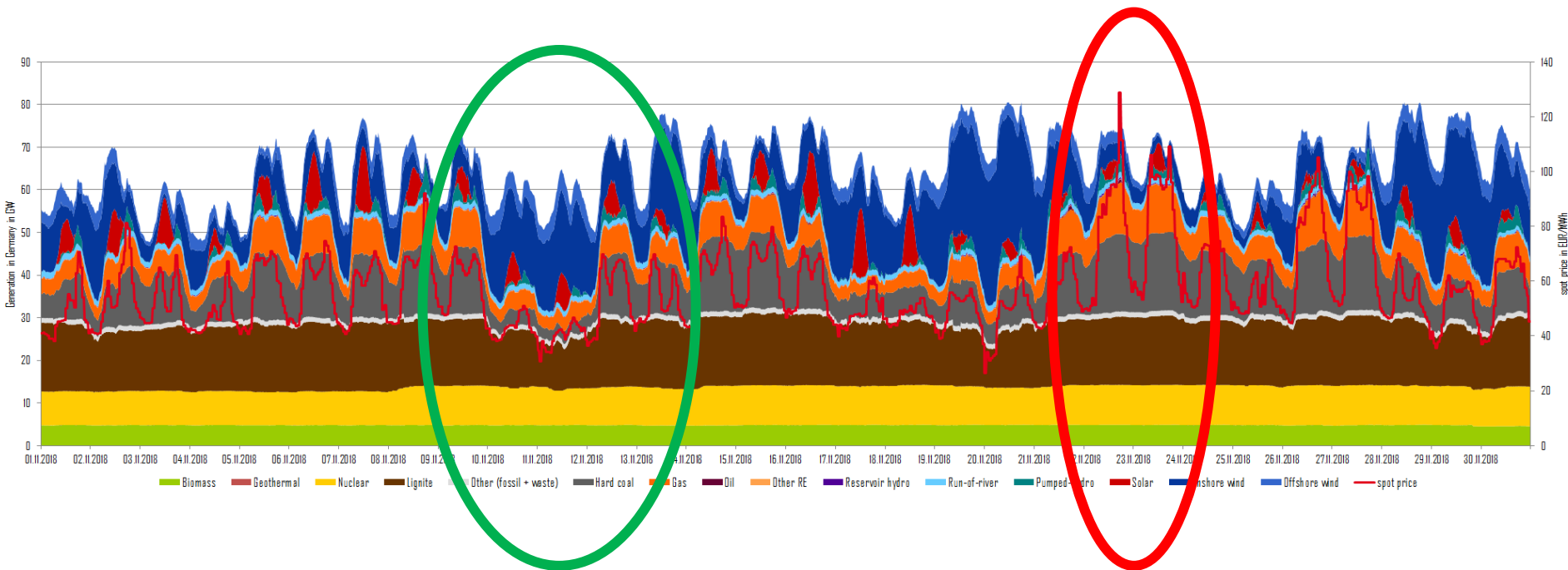
The undeniable trend: growing DA and ID volumes



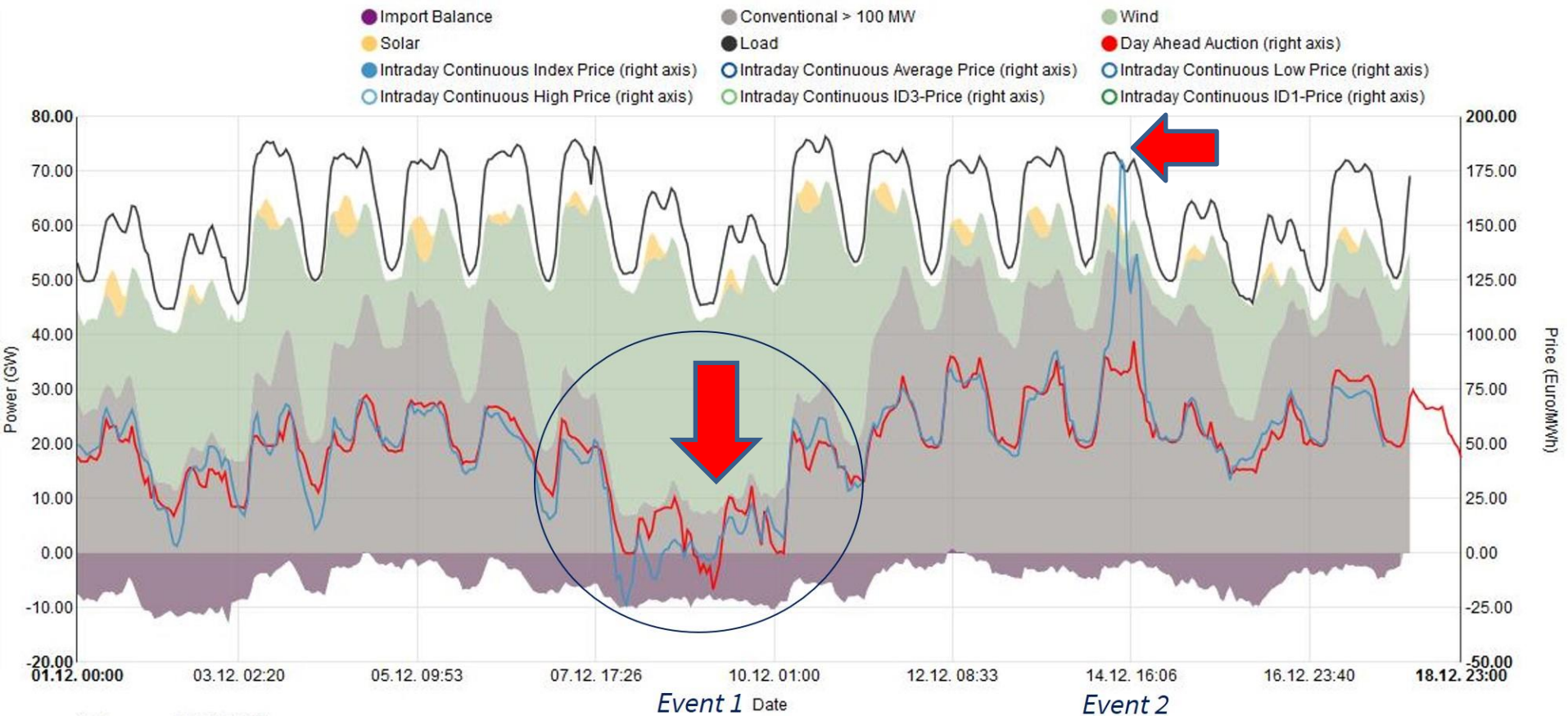
Renewables require flexibility

High RE deployment – Coal flexible, spot electricity price low, costs of flexible operation high, efficiency low, emissions high

Low RE deployment – Coal on full steam, electricity price high, highest efficiency and low emissions

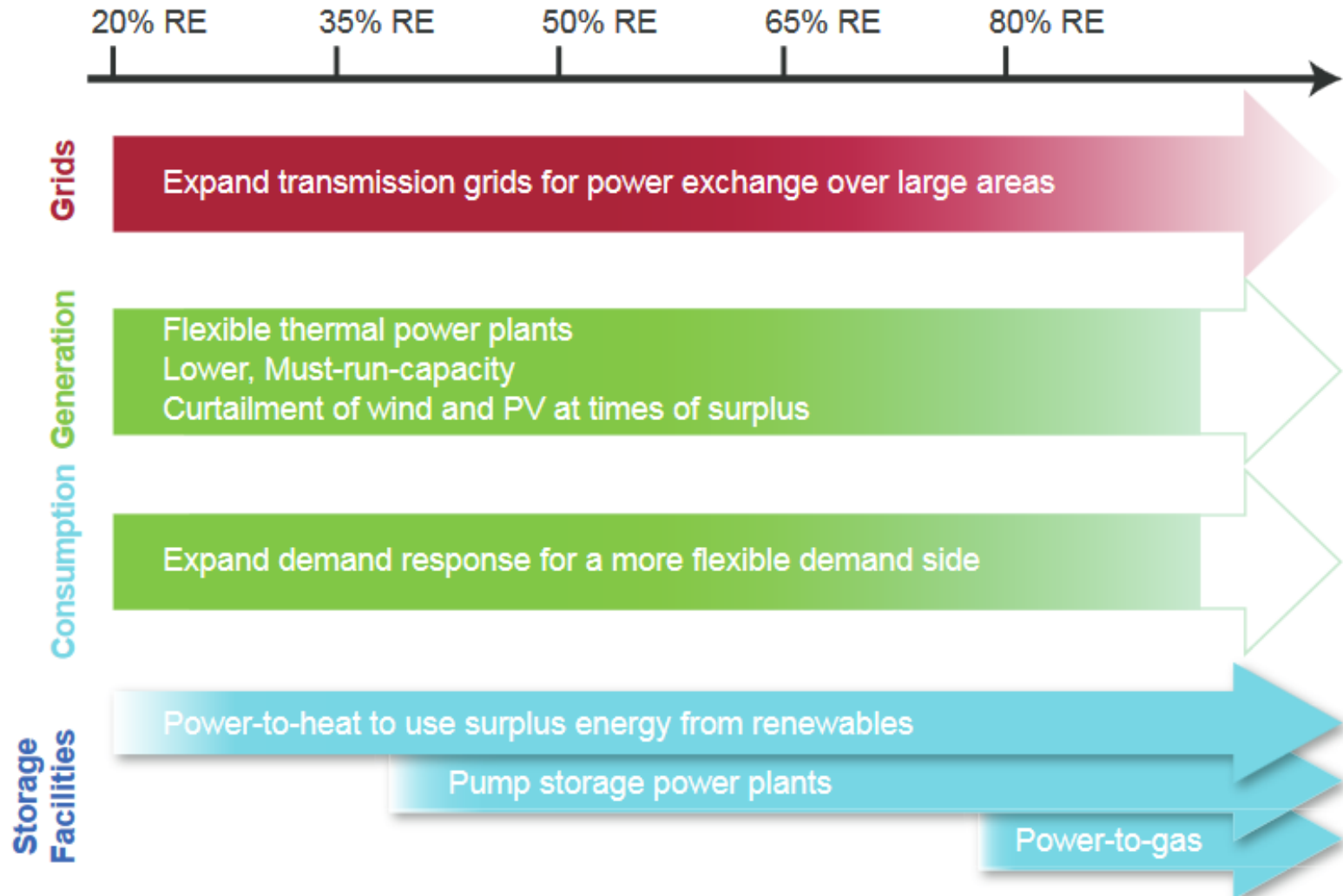


Intraday Electricity Prices fluctuate

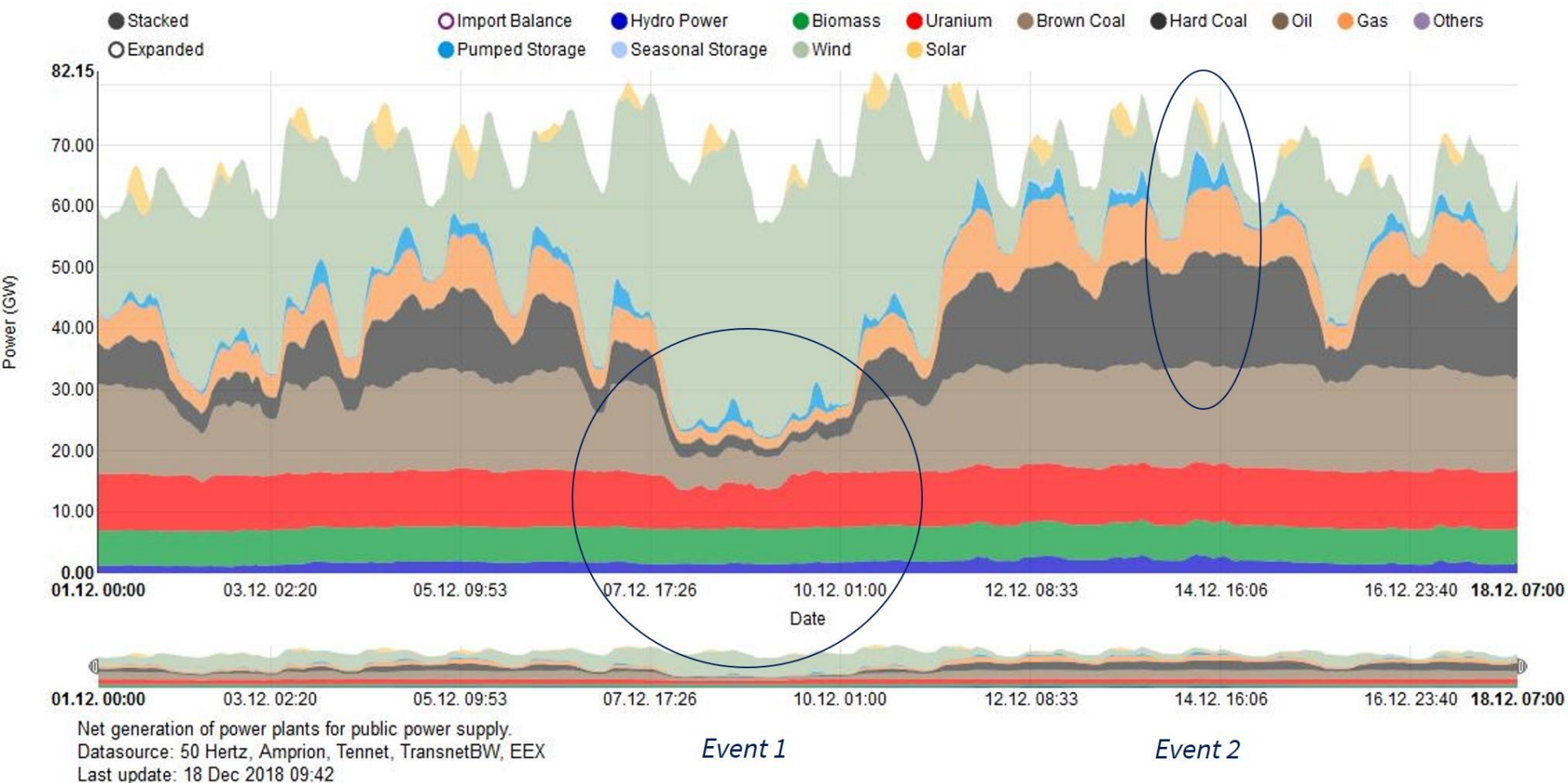


Datasource: EEX, EPEX
Last update: 18 Dec 2018 09:26

RE share above 20% - flexibility required



Coal, Gas and even Nuclear - flexible

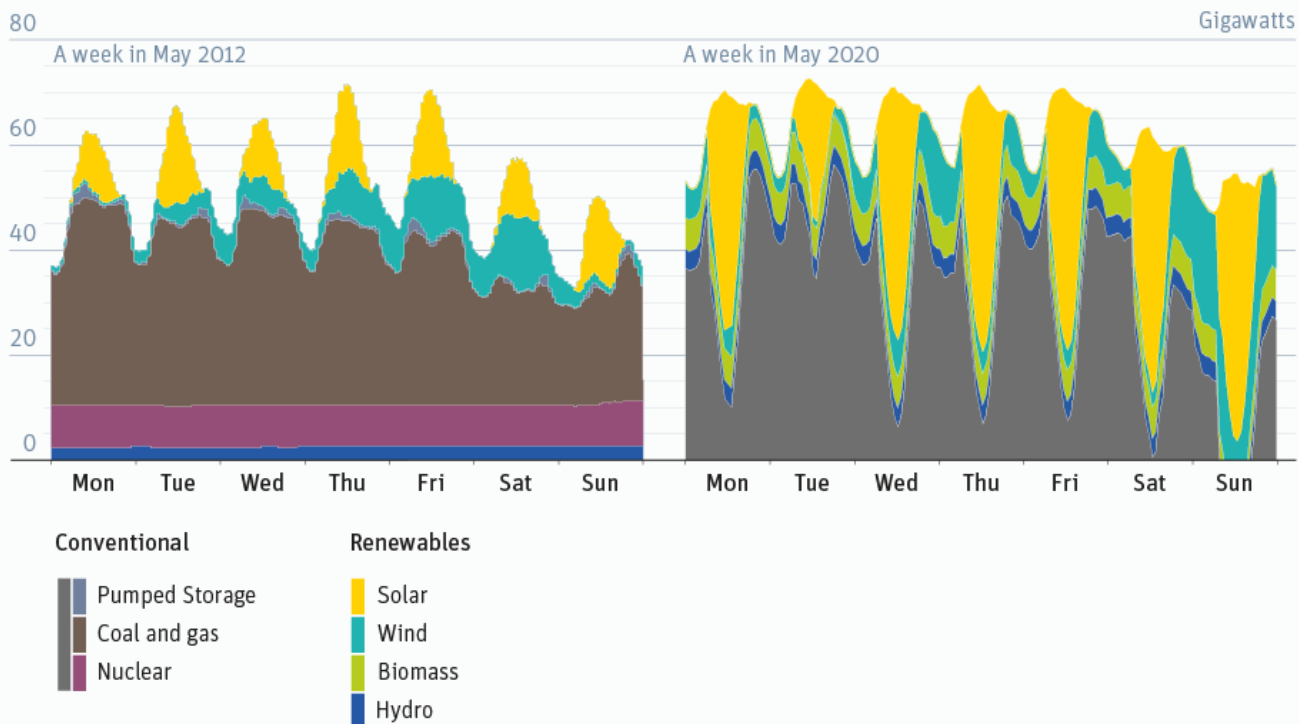


Electricity Systems change is very fast

Renewables need flexible backup, not baseload

Estimated power demand over a week in 2012 and 2020, Germany

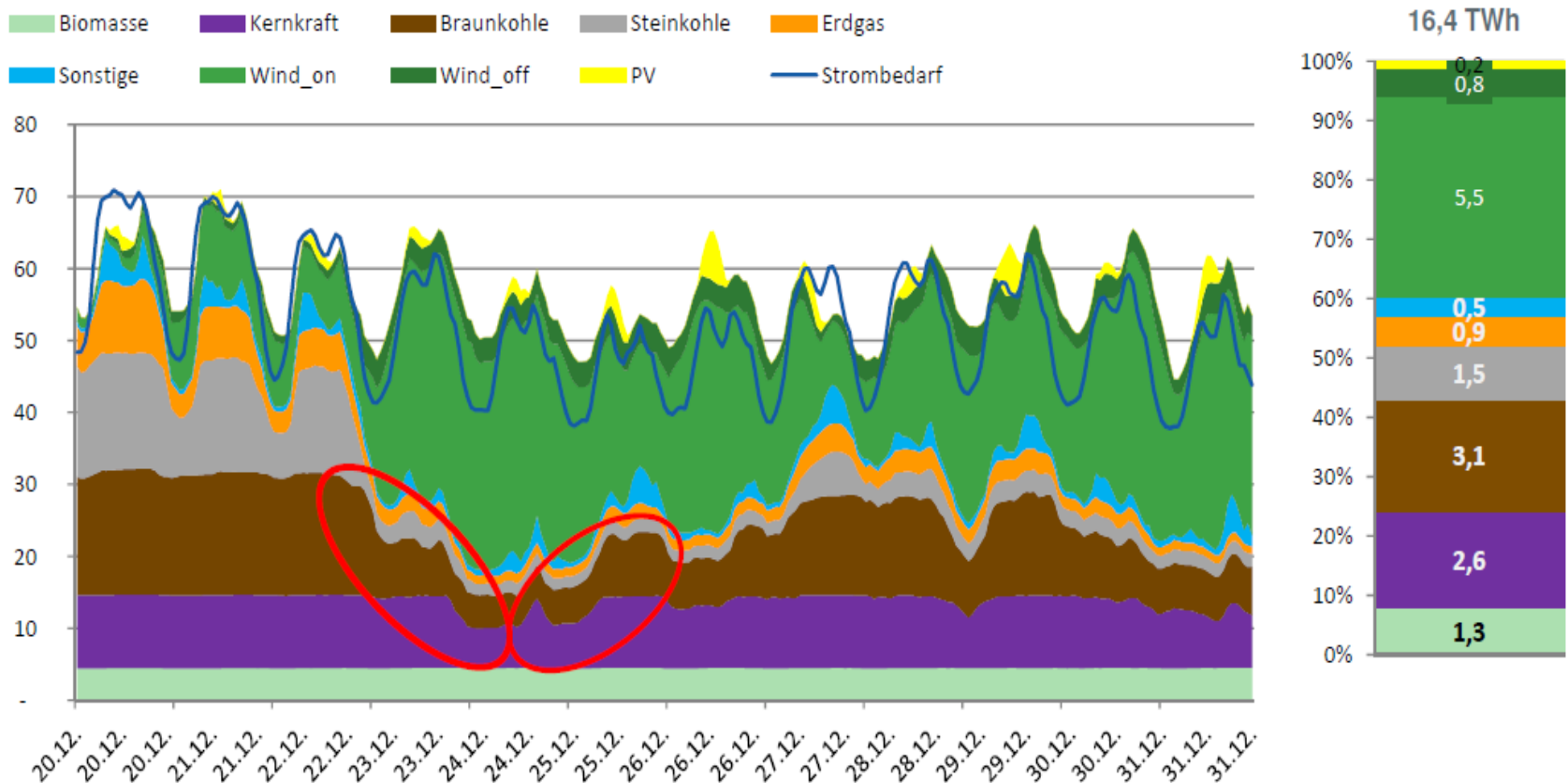
Source: Volker Quaschnig, HTW Berlin



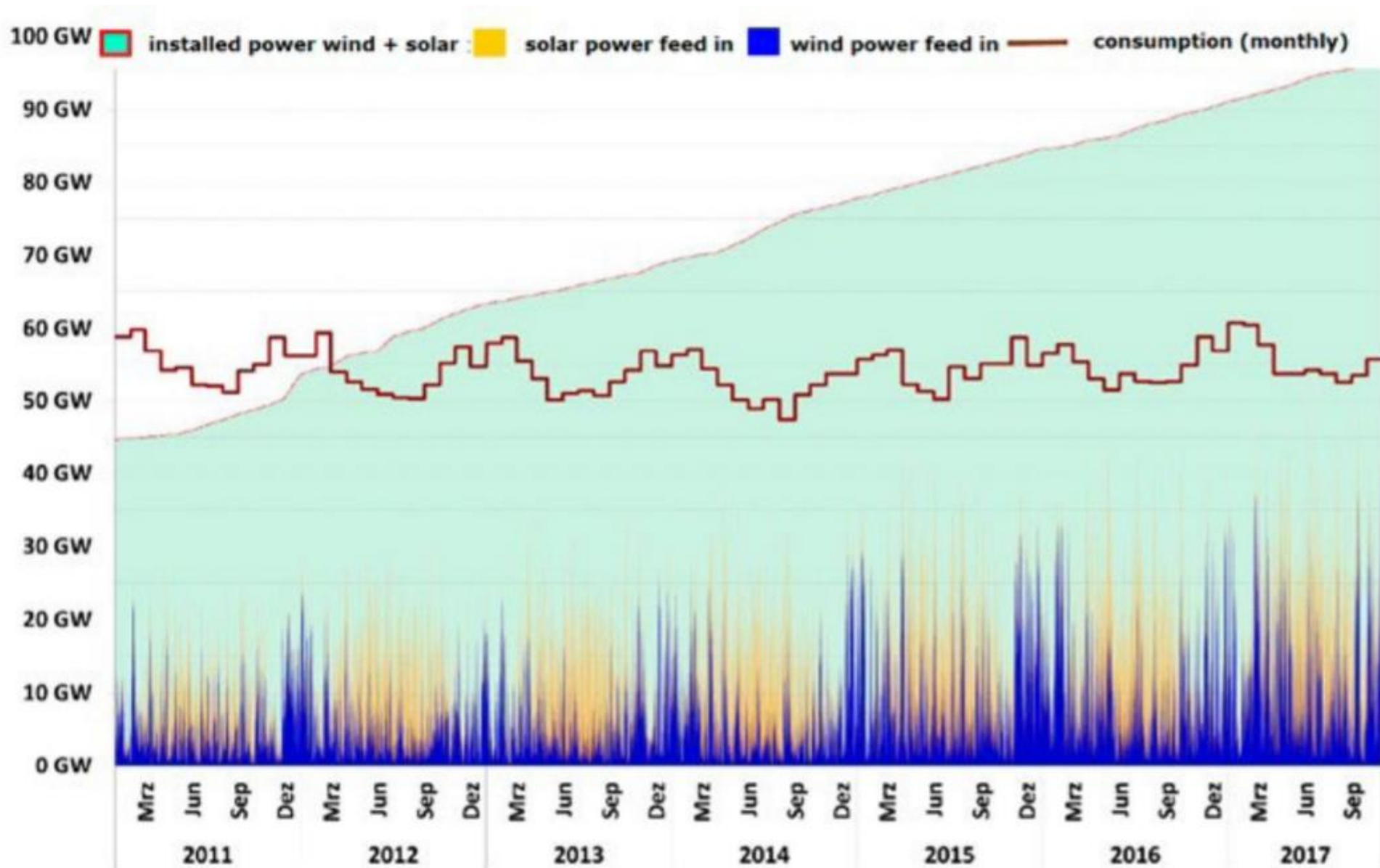
Coal will continue to be indispensable over the long term to provide secured capacity

Electricity generation mix in Germany on 20th – 31st December 2017:

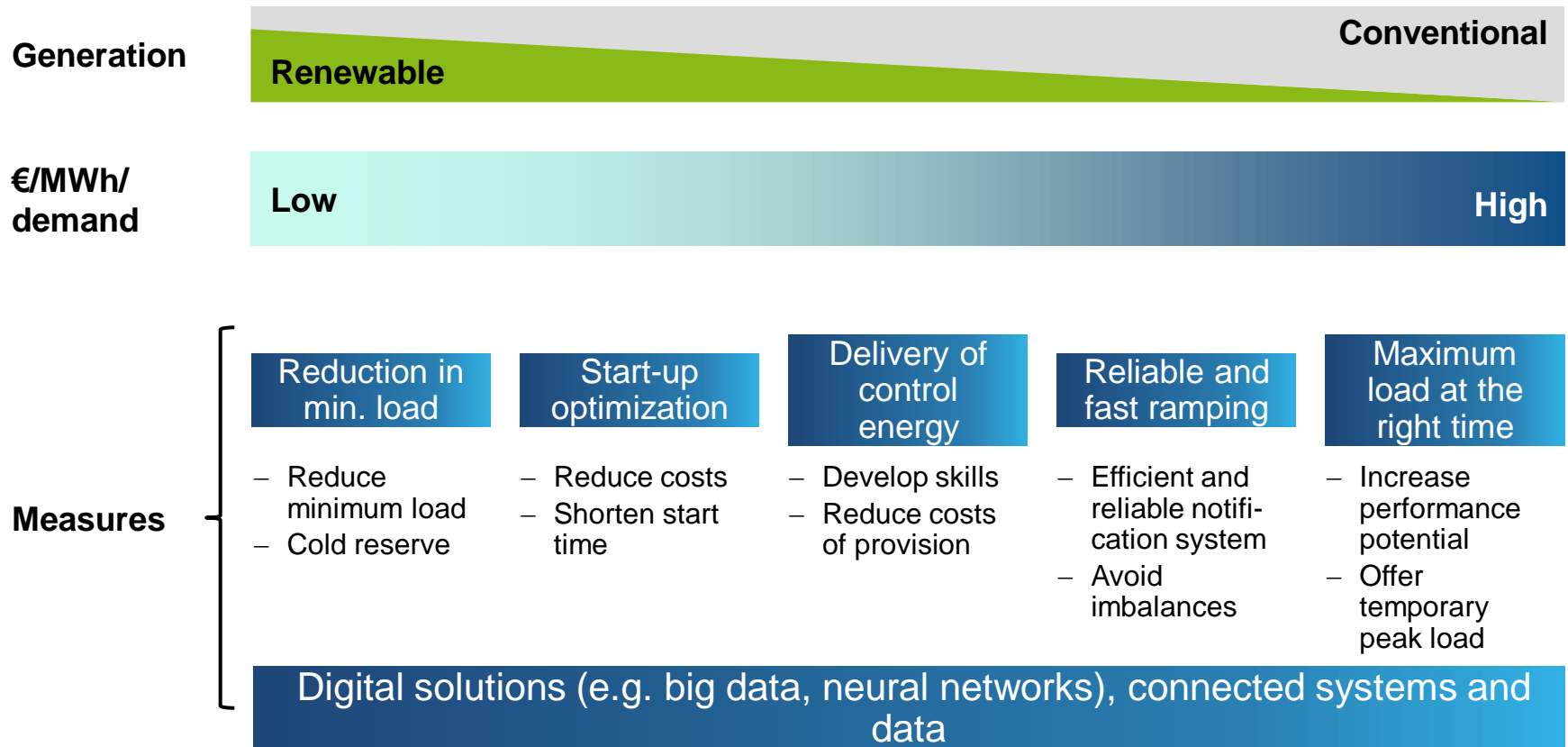
Lignite and Nuclear delivers reliable and flexible, Hard coal and Gas due low prices switched off



Installed Capacity is high, Power Production is still low



Flexible Coal power plants remain vital part of the foreseeable energy transition



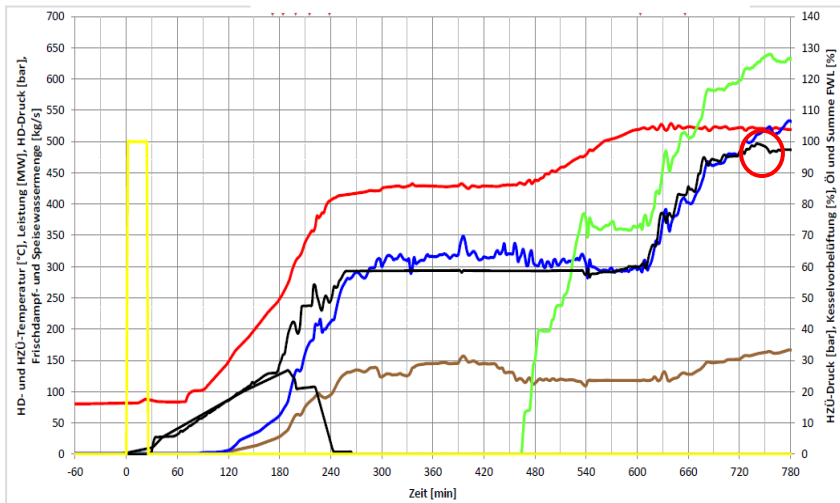
Start-up optimization

Goals:

- Minimizing the costs and duration of start-up
- Increasing reliability for dispatch

Cold start 2010:

- Max. load after > 10h
- High consumption of ignition-oil

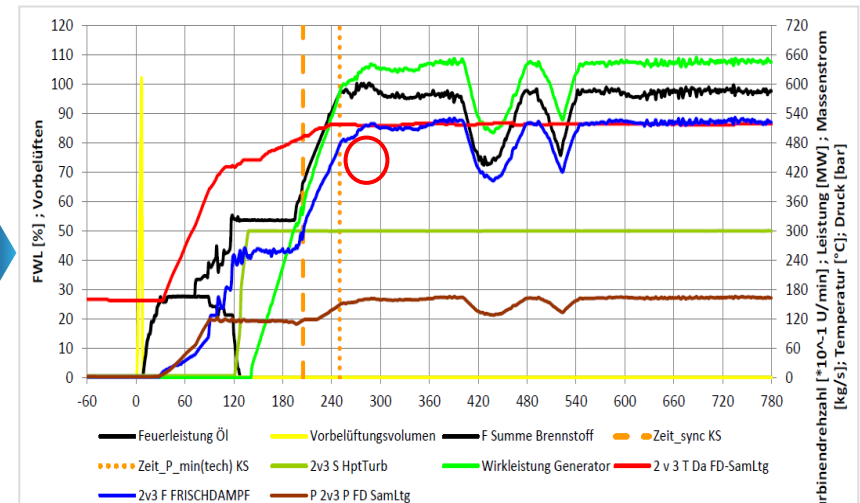


Approach:

- Detailed, systematic process analyses
- Identification of action priorities
- Ensuring sustainability

Cold start 2017:

- Max. load after < 5h
- Ignition oil ~ 50%



Time and ignition fuels for start-up reduced by 50%.

Conclusions

The Coal electricity combine industrial value creation and security of supply with climate protection.

- Coal provide mostly a base-load power producer and guarantor of electricity supply for industry and citizens at competitive prices.
- Lignite-based electricity generation complies with the EU's climate protection targets, particularly the ambitious EU ETS cap. Additional measures such as EPS, CO2 taxes or any exclusion from possible capacity markets are neither necessary nor useful.
- Already, all fossil fuels power plants are flexible partners of the renewable energy sources. The energy transition and lignite, hard coal and gas are not at odds with each other.