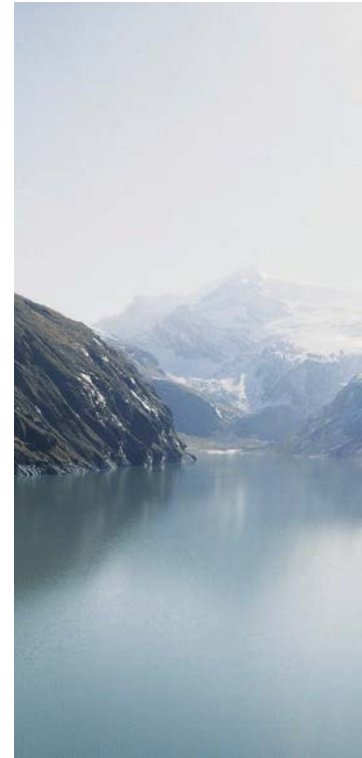


VERBUND Trading GmbH

Importance of national day-ahead markets

3.10.2019

Robert Spolwind
Head of Market Products and Business Solutions



Agenda

- VERBUND & VERBUND Trading
 - Company Presentation
 - Production Characteristics
- Relevant Markets
- Spot Markets – in Detail
- Conclusion

Verbund

VERBUND



VERBUND at a glance



Austria's leading electricity company
with headquarters in Vienna



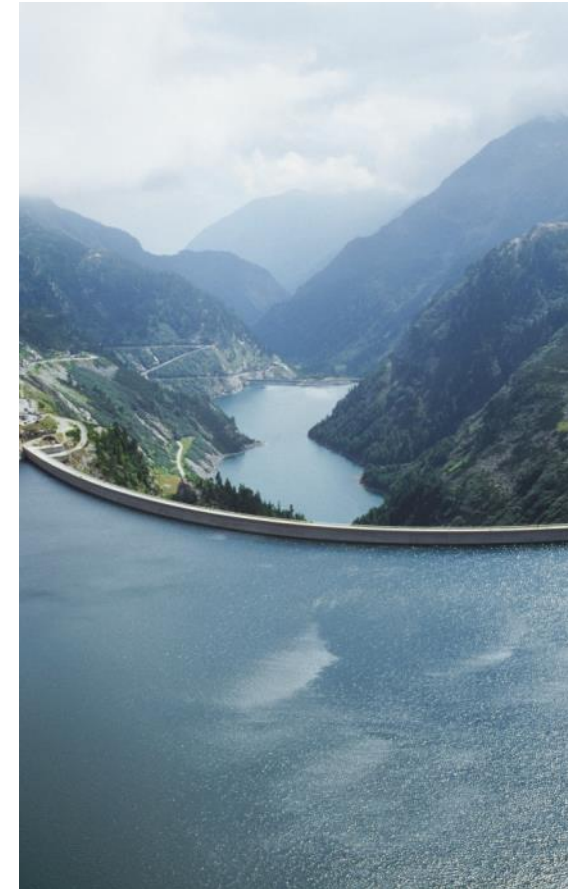
Approx. 30 TWh/a **carbon free power production based on hydro power** in Austria and Germany (production has been totally certified by the TÜV SÜD in different quality levels)



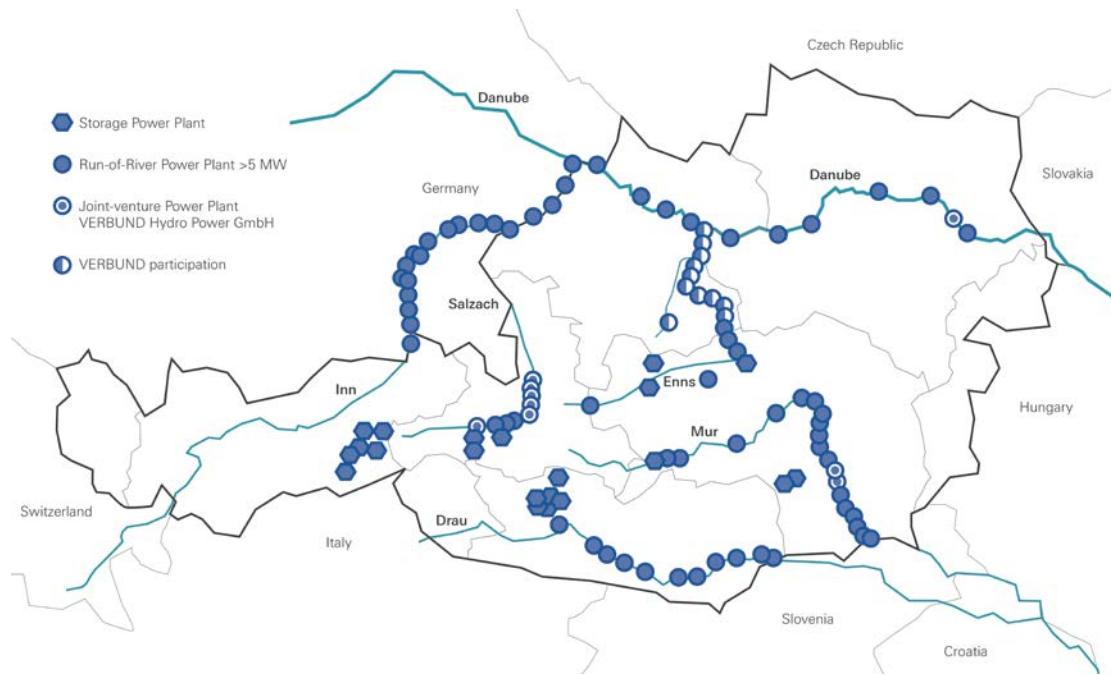
Experienced provider of **flexible and sustainable energy solutions** for industrials and municipalities (Sales offices in Vienna, Munich and Düsseldorf)



Austria's transmission grid operator („APG“)



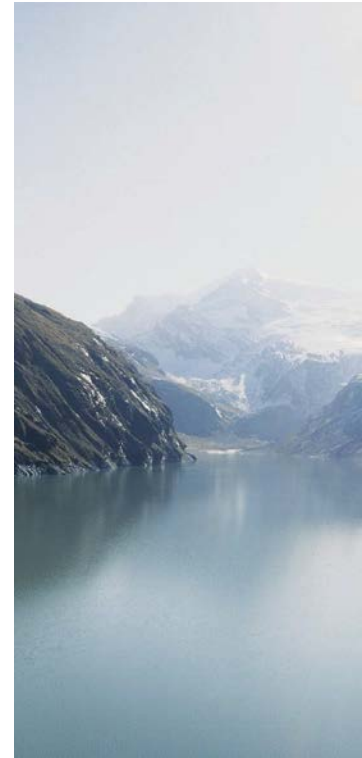
Leading hydro power company



VERBUND hydro power in Austria and Bavaria

- Austria's leading electricity company
- Leading in hydro power generation in Bavaria, no. 2 in Germany
- One of the largest hydro power companies in Europe
- 128 hydro power plants in Austria and Germany (Bavaria) – installed capacity: 8,215 MW

Production Characteristics



Hydro power plants in Austria

Top Hydro Producer in Europe



1

Storage



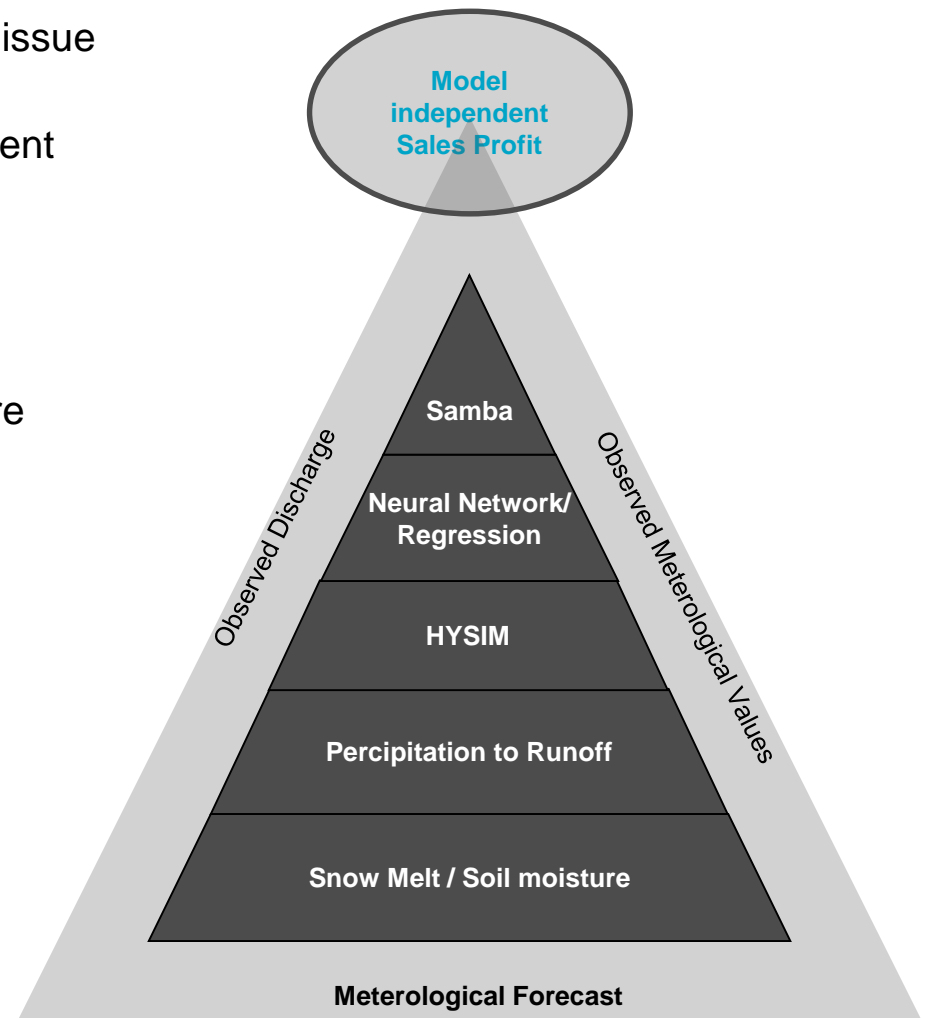
2

Run-of-River



Forecasting in Hydropower Industry

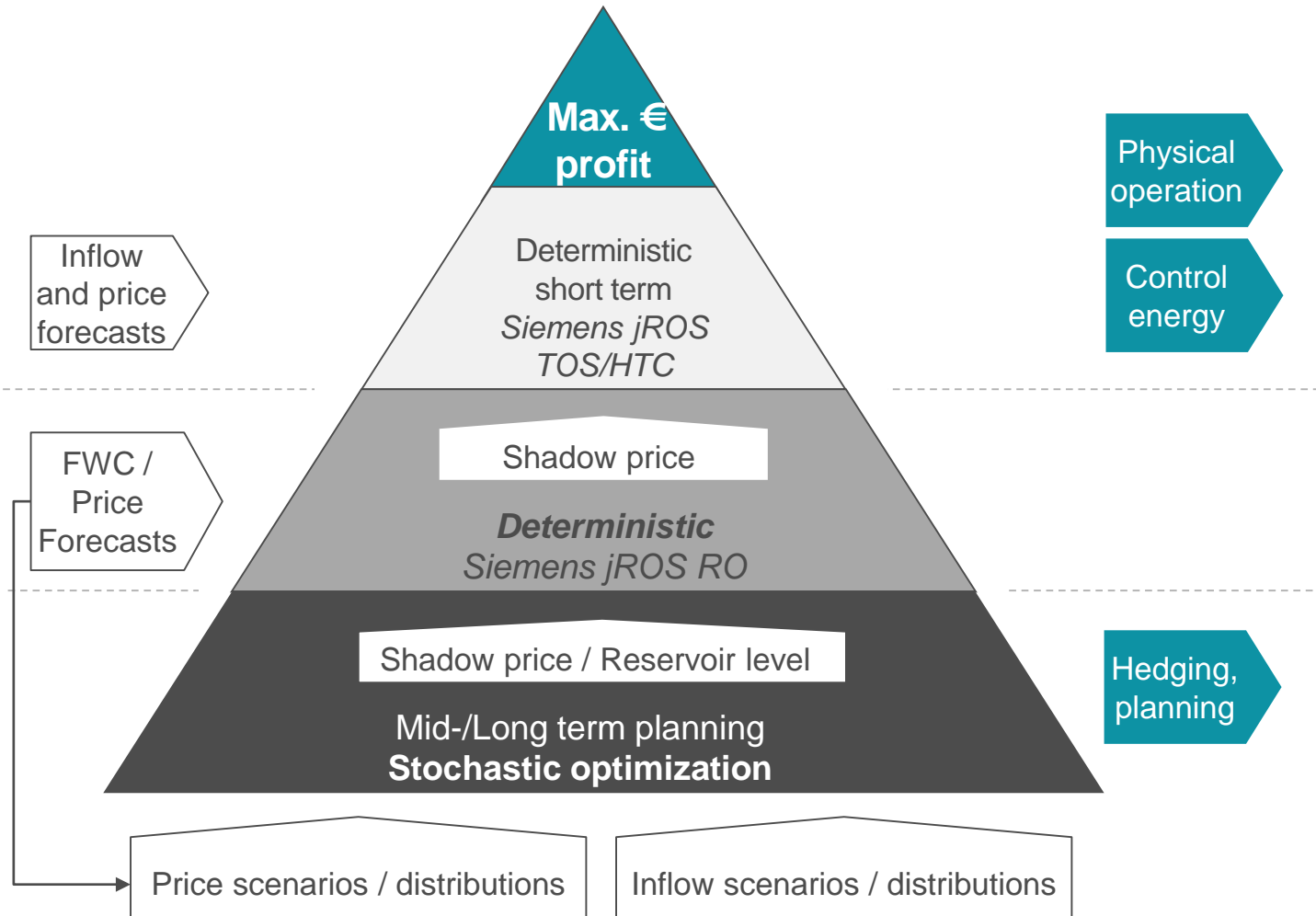
- Forecasting run of river production significant issue
- VERBUND`s forecast system integrates different approaches
- The system is under permanent monitoring
- New insights in hydrology and meteorology are included



Storage – our Flexibility



Pyramid of optimisation

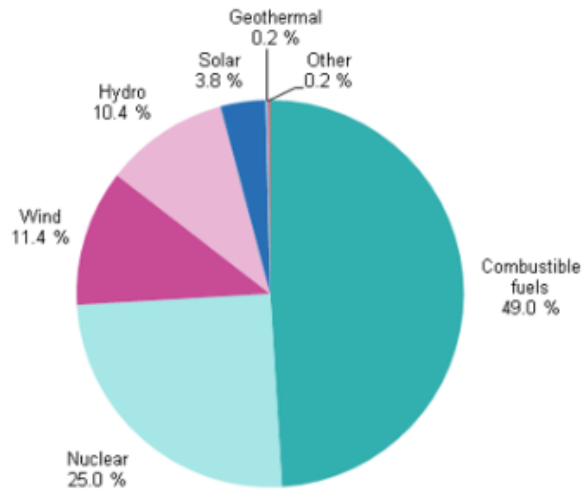


Markets in General

Electricity generation in Europe

Net electricity generation, EU-28, 2017

(% of total, based on GWh)



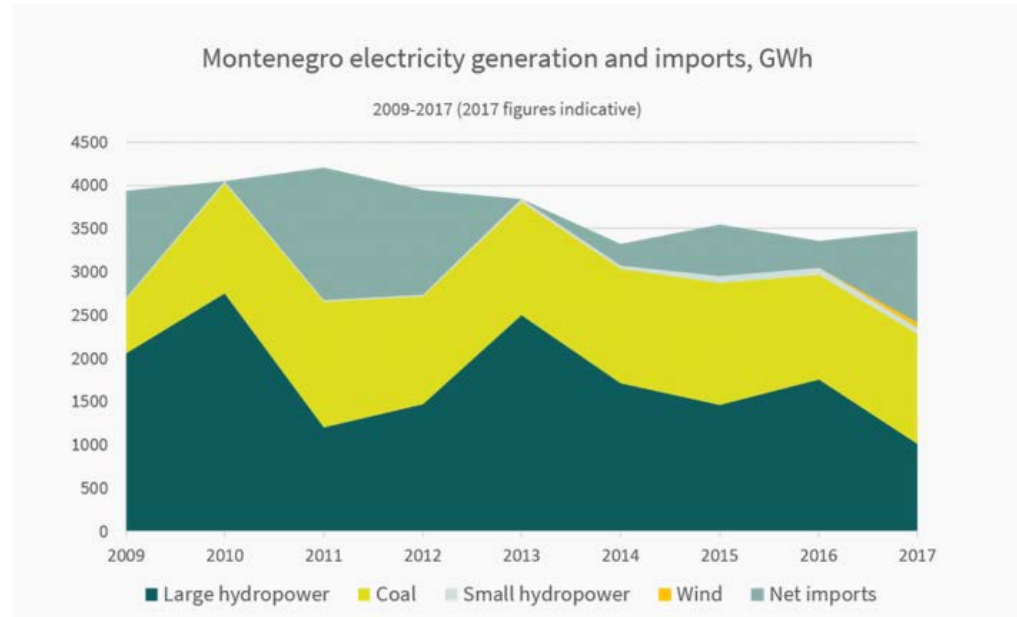
Source: Eurostat (online data code: nrg_ind_peh)



Figure 3: Net electricity generation, EU-28, 2017

(% of total, based on GWh)

Source: Eurostat ([nrg_ind_peh](#))



Liberalisation of the Central European Electricity Market

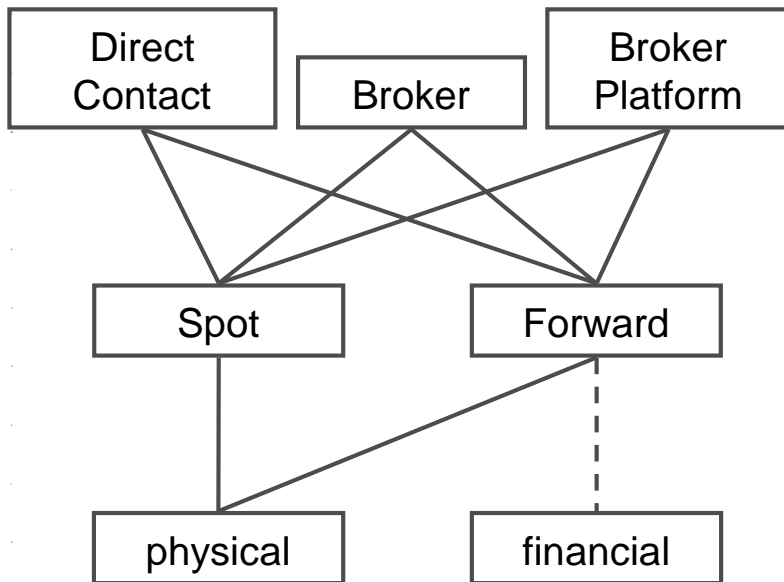
- Historically: Natural Monopolies
- Starting in 1996: first EU directive for liberalization of the electricity market
- 1998: Liberalisation of the German electricity market
- 2001: Liberalisation of the Austrian electricity market

Target:

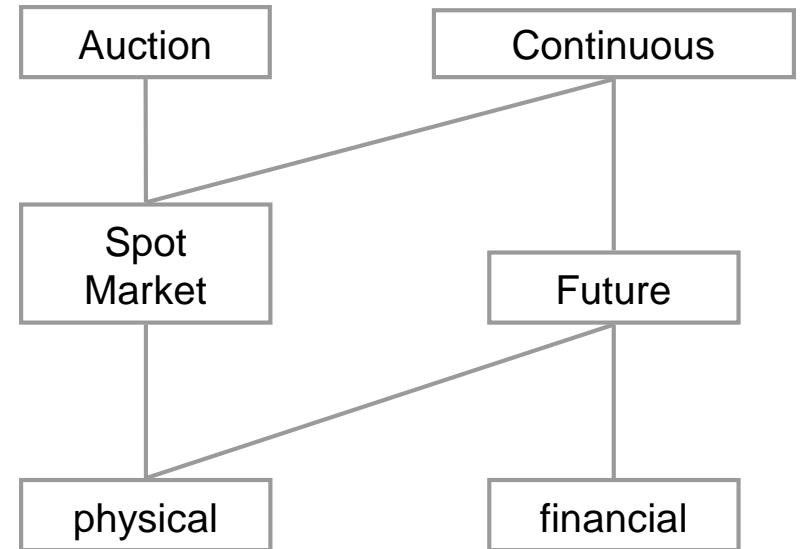
- Transparency
- Uniformity
- Efficiency, lower prices for end consumer
- Security of supply

Trading Activities – What happens on the market?

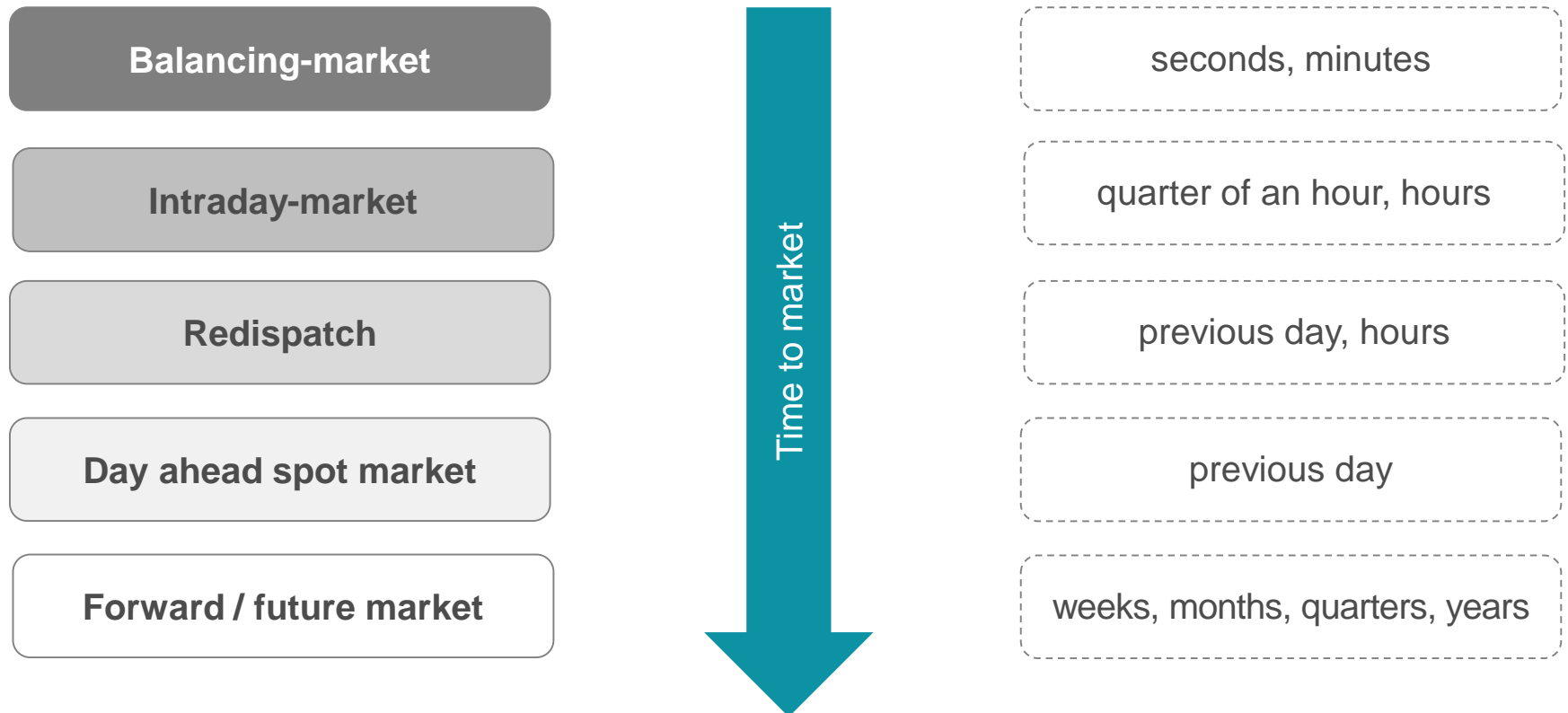
OTC



Exchange



Electricity markets – what are the Products?



Verbund

Commercialisation of eg. HPP's



Hydrology, Forecast



Optimisation, Water Value

Long term - Hedging

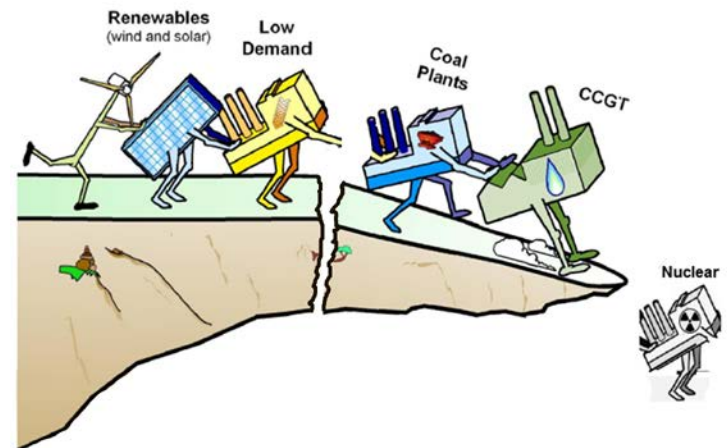
years,.....quarters,.....months.....hours, minutes

Timeline

Short term – physical framework

Profound changes in the European Energy Market

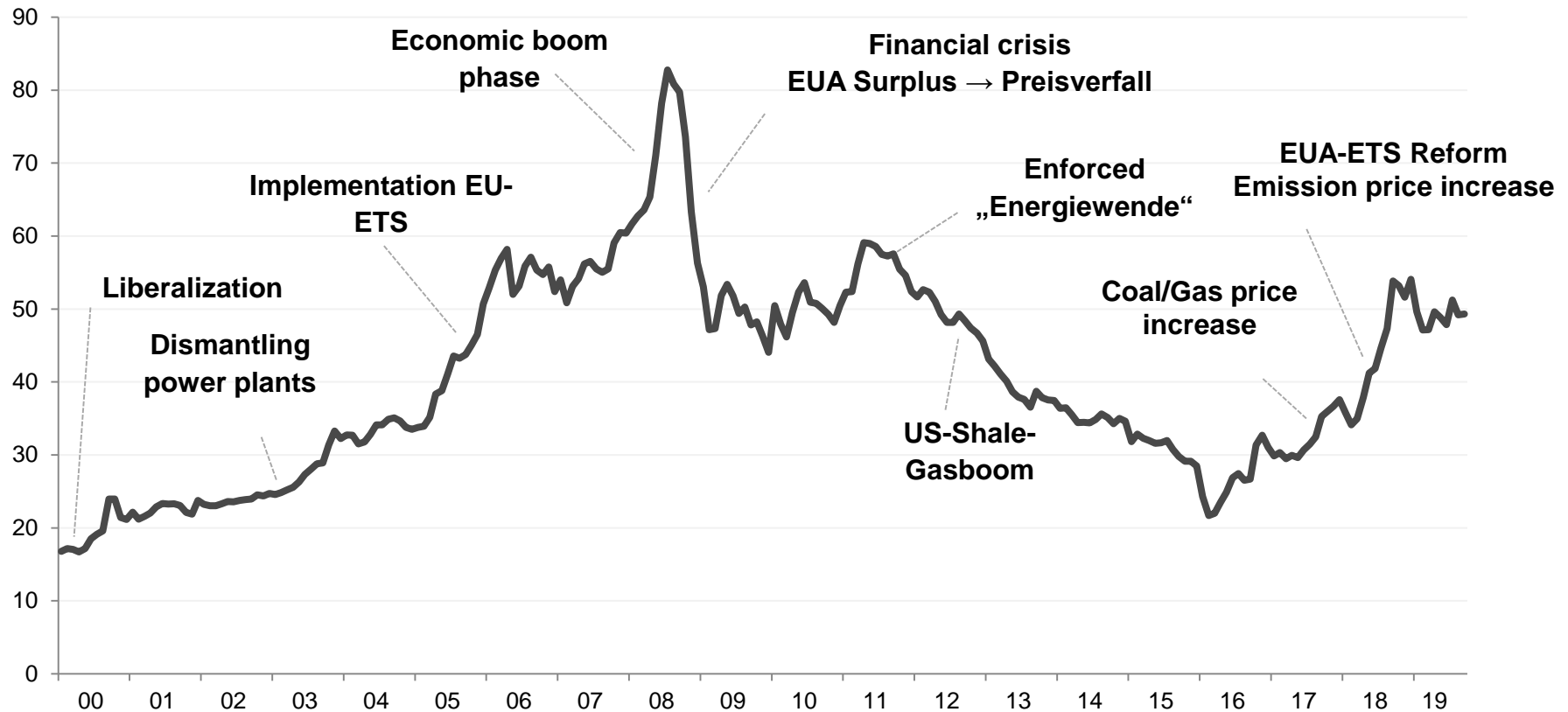
- Phasing out of nuclear energy in Germany and other European Countries
- One of the main goals: Reduction of CO₂ emissions
- Subsidised development of wind and photovoltaic plants
- Shutdown of thermal power plants (incl. gas)
- Market redesign in discussion



Influence on the wholesale electricity prices / Forward/Future

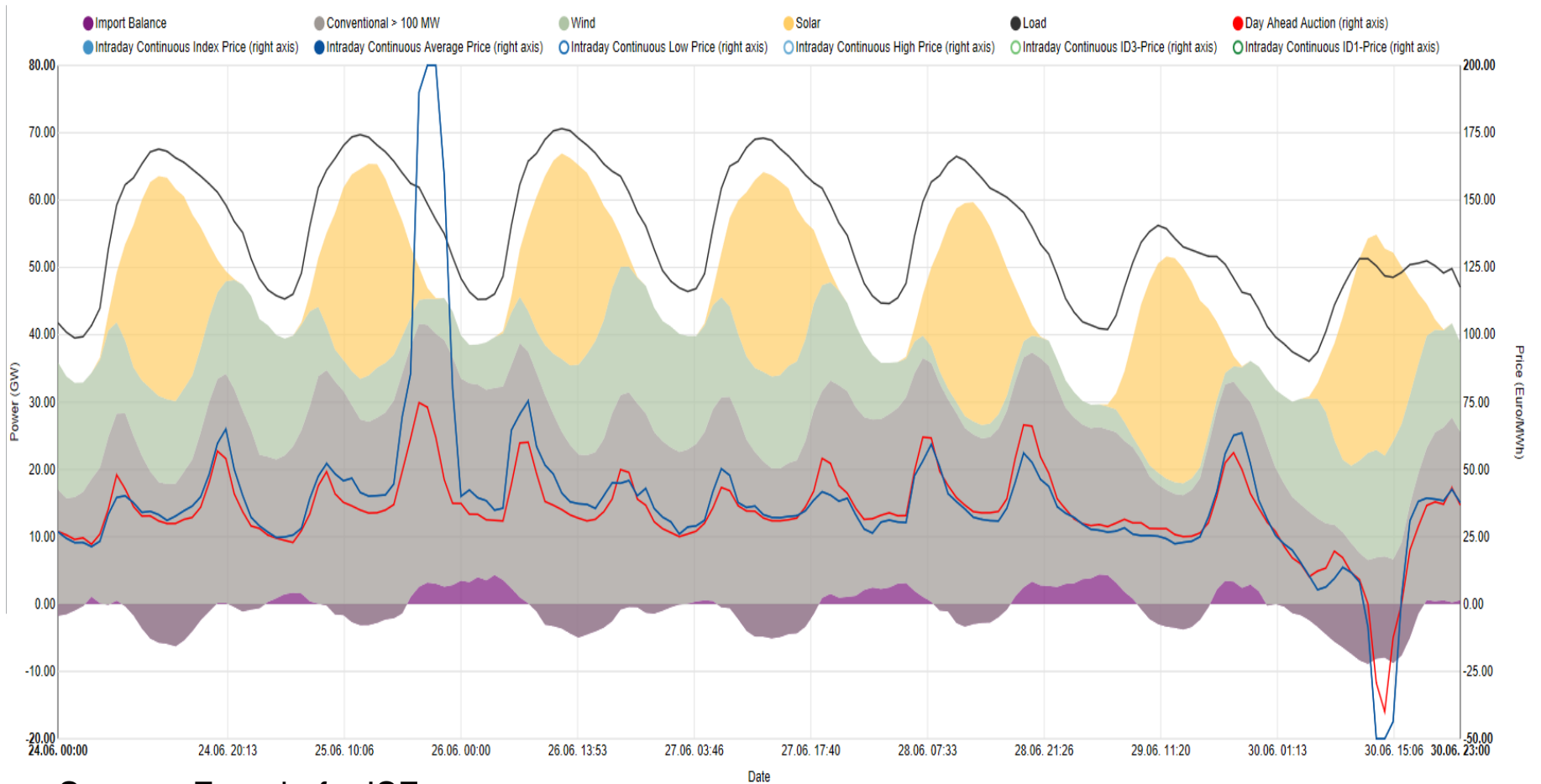
Wholesale electricity prices: Historic development

Front year Base, monthly average prices (€/MWh) DE/AT, the axis refers to the period of trading, delivery in the following year



➡ Within a short period of time significant changes in the energy landscape

Influence on the wholesale electricity prices / Spot



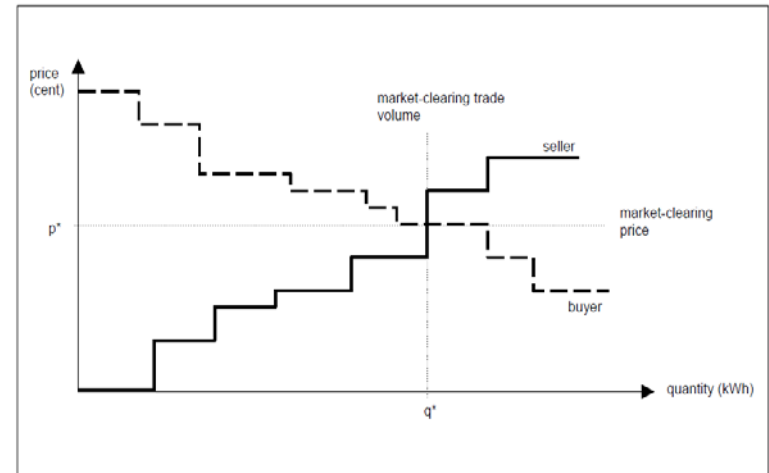
Source : Fraunhofer ISE

Spot Markets -in Detail

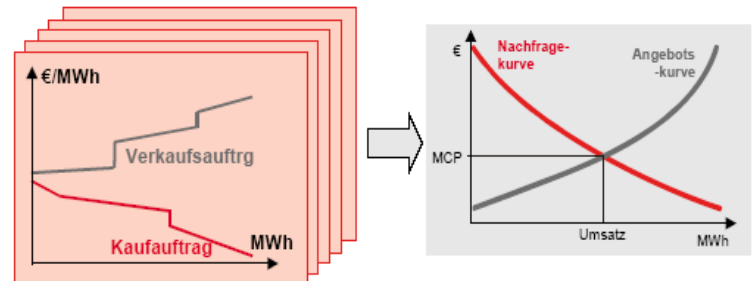
Agenda of Today

The Day Ahead Spot Auction – EPEX as an Example

- physical auction-based market (operates every day of the year)
- 24 single hourly products
- auction result (hourly prices) based on aggregated supply and demand curves
- auction result = MCP (market clearing price)
- MCP is the intersection of supply and demand curves (for each hour)



http://www.epexspot.com/en/extras/download-center/technical_documentation



Spot Markets, e.g. EPEX SPOT

- **EPEX SPOT**
- Core markets: Germany, Austria, France, The Netherlands, Belgium, Luxemburg, Switzerland and the United Kingdom
- Covers approximately 50% of the European electricity consumption
- Provides various trading products and mechanisms
- Day-ahead auction (hourly optimisation)
- Intraday auction (quarter-hourly optimisation)
- Continuous intraday-trading (hourly and quarter-hourly optimisation)

Markets on EPEX SPOT – more Details

Day-ahead auction (spot market)

- physical auction-based market
 - closed order book – offers not visible for other participants
 - prices and amounts are based on supply and demand
 - traded products: single hours or block products for the next day
 - areas covered: DE/LUX, AT, FR, NL, CH, BE, UK
 - Price range from -500 EUR/MWh to +3.000 EUR/MWh
 - Constraints: min. volume per bid 0,1 MW; min. tick size for price 0,1 EUR/MWh
-
- **Quarter-hourly auction (Germany)**
 - physical auction-based market
 - closed order
 - traded products: quarter-hourly products (15-minutes intervals)
 - optimisation on a quarter-/semi-hourly level
 - Price range from -3.000 EUR/MWh to +3.000 EUR/MWh
 - Same constraints as DA

Markets on EPEX SPOT – more Details II

The intraday market:

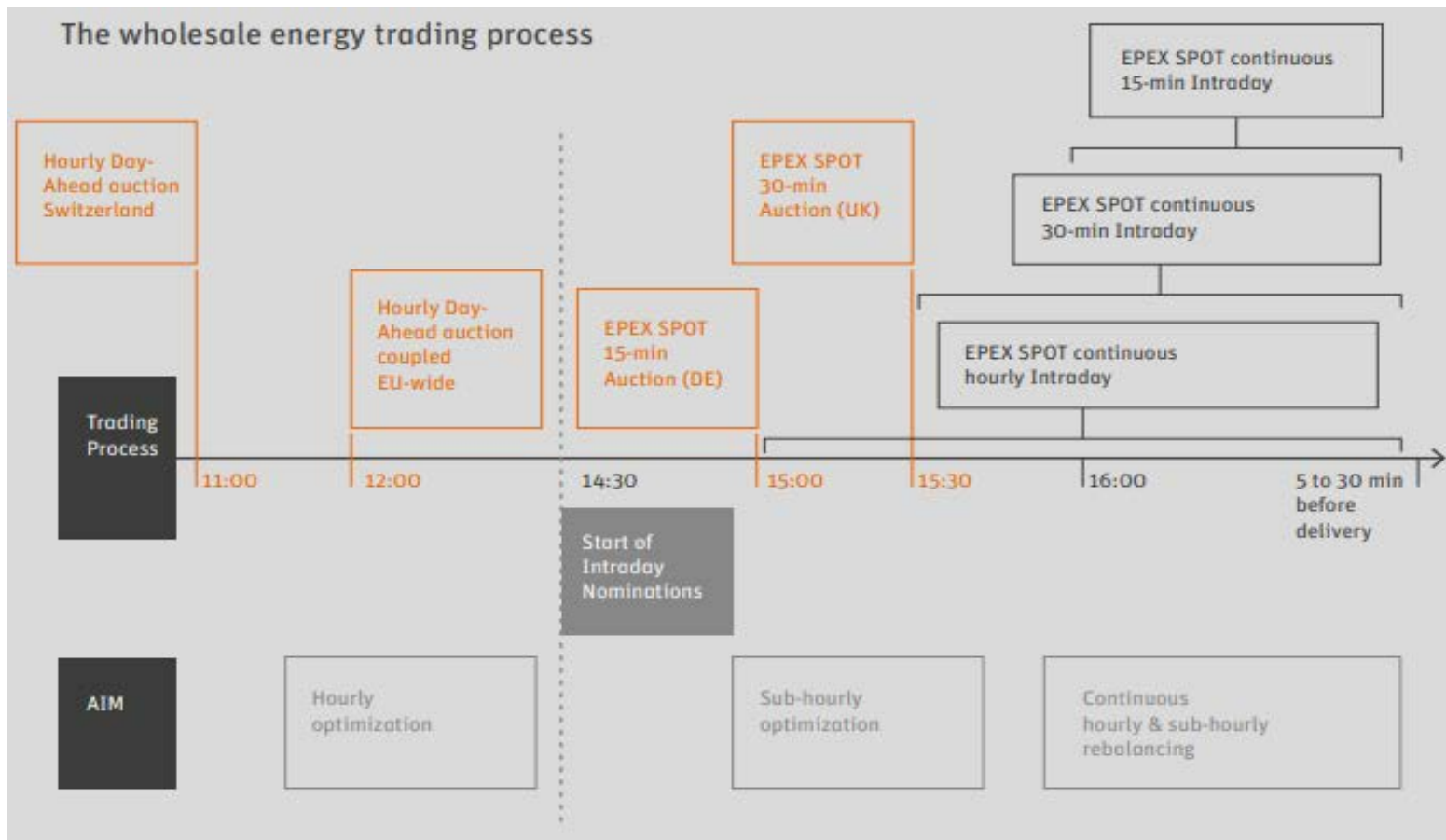
- real-time trading, continuous market
- open order book - buy and sell offers visible for all market participants
- traded products: hourly and quarter-hourly products
- Areas: DE, AT, FR, CH, NL, BE, UK
- Price range from -9.999 EUR/MWh to +9.999 EUR/MWh

- Constraints:
 - Minimum volume per bid 0,1 MW
 - Minimum tick size for price 0,1 EUR/MWh

- Cross border trading AT <> DE
 - Decoupling of XBID product: 60min before delivery.
 - Decoupled product traded within each control area (no cross border)

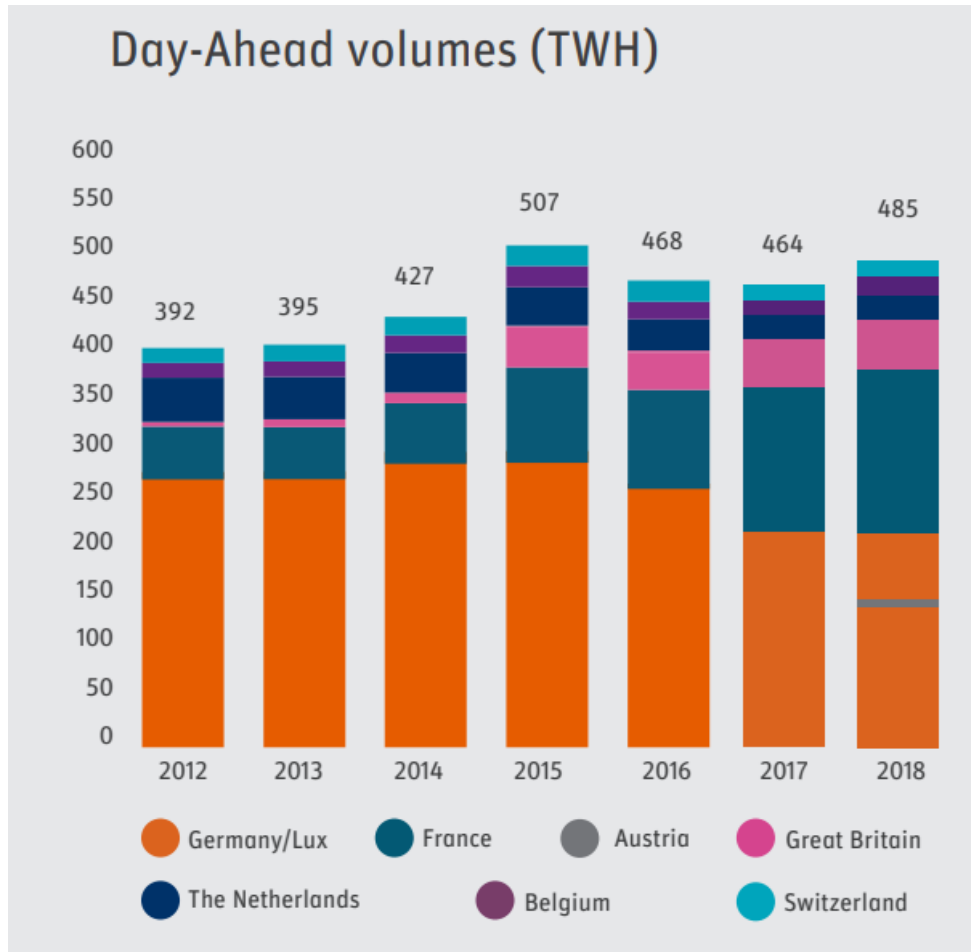
Trading process on EPEX SPOT

Standardised procedure 365 d/y



Source: EPEX SPOT

Traded volume on EPEX SPOT



Market areas of DAM:

- Germany/Luxemburg
 - France
 - Austria (as of 1.10.2018)
 - The Netherlands
 - Belgium
 - Switzerland
 - Great Britain
-
- 2012: 392 TWh
 - 2013: 395 TWh
 - 2014: 427 TWh
 - 2015: 507 TWh
 - 2016: 468 TWh
 - 2017: 464 TWh
 - 2018: 585 TWh

Source: EPEX SPOT

Main advantages for trading on an energy exchange

- No credit risk
- High liquidity for market-compliant prices
- Transparency - all market results and indices are public
- Scheduling of physical energy
- Standardised procedures and products

Conclusion

- Liberalised Markets in Europe are success stories
- Especially the German / Austrian Market, they provided essential market depth
- Markets need
 - Liquidity
 - Transparency
 - Availability
 - Reliability
- Efficient wholesale markets are an advantage for the final consumer.
- The larger the supply and demand, the more relevant and competitive the prices.
- Increasing the liquidity of the European market place is a means to maximise social welfare. That's a great advantage for all of us.