Power Trading – ¼ h products

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Agenda

1. Introduction

2. Market fundamentals

3. Market design and trading

4. Impact on the grid

5. Case study: solar eclipse

6. Summary and outlook
Introduction
## Motivation – a changing energy system in Germany

### Attribute
- Number #: 500
- Installed capacity $P$: 100 GW
- Gradient $\Delta P/\Delta t$: $\sim +/\pm 50$ GW/h (flexibility)

### Conventional power plants
- Number #: 500
- Installed capacity $P$: 100 GW
- Gradient $\Delta P/\Delta t$: $\sim +/\pm 50$ GW/h (flexibility)

### Renewable energy sources
- Number #: 1.3 Mio
- Installed capacity $P$: 93 GW
- Gradient $\Delta P/\Delta t$: $\sim +/\pm 10$ GW/h (to be compensated)

**Weather-dependent power plants imply need for flexibility**
Market fundamentals
1/4h-products: an instrument for flexibility

Who are the market players in Germany?

<table>
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<tr>
<th>Player</th>
<th>Need for 1/4h-products</th>
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<tr>
<td>TSOs</td>
<td>Solar (and wind) ramps</td>
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<td>Direct marketers</td>
<td>Wind (and solar) ramps</td>
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<td>Utilities</td>
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<tr>
<td>Electric supply companies</td>
<td>Profile of consumers</td>
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</table>

Different needs meet at the market
PV-ramps and market design lead to a need for 1/4h-products
Market design and trading
A typical day for $\frac{1}{4}$ h products

3 possibilities per day to trade $\frac{1}{4}$h products in Germany
Market design and volumes

Volumes driven by market design

1/4h-Volumes (2011-2016)

- EPEX ID-DE-Continuous DeliveryDay
- EPEX ID-DE-Continuous D-1
- EPEX ID-CH-Continuous DeliveryDay
- EPEX ID-CH-Continuous D-1
- EPEX-ID-Auction
- EXAA

Start, Market opens 2 hours before delivery*  
Market opens at 4 pm, D-1  
Start 1/4h Switzerland ID-continuous  
Start EPEX 1/4h-Auction

Start EXAA 1/4h-Auction  
Lead time reduction from 45 to 30 mn to delivery  
Start 1/4h Austria ID-continuous
Evolution of the trading time (ID-continuous)

Product 09Q1-Trading Time History

Hours before Delivery

Each point is a trade

Trading time driven by market design
Market design: what comes next?

- **Nordpool**: trading until delivery, since 02.2016 within each German control area
  Better forecast for renewable energy sources: more volumes?

- **EPEX Spot**: 30-mn contracts for FR, DE, CH: around Q4 2016/Q1 2017
  Implicit access to interconnection capacity and launch of these contracts on EPEX SPOT organised markets: planning under finalization

- **XBID Project**: pan European Intraday-Market: around Q3/Q4 2017
  Cross border trading until one hour before delivery

Probable impact on volume and prices
Impact on the grid
Impact on the grid – Imbalance power

Netzregelverbund („NRV“-Value): imbalance power in Germany

Significant improvement
Impact on the grid - Frequency

Mean daily evolution of the frequency in the 50Hertz control area January – Mai 2012

Significant impact on the frequency
Case study: solar eclipse
Solar eclipse on March 20th, 2015

Historical Value (Wind+PV) on November 9th, 2013: 10.5 GW / 90 min
Market prices and volumes on March 20th, 2015

Prices for 1/4h products

- **11Q1**: 464 €/MWh
- **11Q4**: -149 €/MWh

Volumes for 1/4h products

- **11Q1**: ca. 8 GW
- **11Q4**: ca. 6 GW
To a significant extend, the eclipse was exported, and to some extend leveled out in Germany by hard coal and pumped hydro.
Summary and outlook
Summary

- ¼-h trading: an important flexibility product
- Volumes growth through market design
- Trading of ¼-h products impacts the grid
- Solar eclipse: a successful stress test for the market

Outlook

- Wish: 1/4h-Trading at 12:00 DA!
- More renewable installed capacity in the future
- Flexibility on the consumer side
  - Demand side management
  - Power-to-X
Many thanks for your attention!

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London, April 1st 2016
Prices and volumes

MCP: Market Clearing Price, Day-Ahead Epex Spot

Seasonal effects play a role for volumes and prices