Local Flexibility Markets: Beyond the Status-quo

GSM Symposium
Luzern, 7th of July 2019
Ways of commercializing power on the European market

- Power commercialization
  - Wholesale Market
    - Organized Market: Exchange
      - Derivatives Market
        - Futures/Options
        - Mainly financial fulfillment
      - Day-Ahead market
        - Auction
      - Spot Market
        - Physical fulfillment
    - Intraday Market
      - Continuous trading
      - Auction
  - Over-The-Counter (OTC)
    - Derivatives Market
      - Forwards/Options/Structured Products
      - Financial and physical fulfillment
    - Spot Market
      - Balancing
      - Other system services (e.g. primary reserves, restoration reserves)
  - System Services
    - Balancing
    - Other system services (e.g. primary reserves, restoration reserves)
Skyrocketing intermittent RES installed capacity in Germany and other European countries

Installed RES capacity (GW) in Germany (2002 – 2018)

Datasource: ACEE, BMWi, Bundesnetzagentur
Last update: 02 May 2018 21:38
Decentralization creates a need for vertical coordination

Transmission grid ➔ Management of large-scale flexibility

Distribution grid ➔ Decentralization towards digitalized, active system management and usage of flexibility

Coordination between TSOs

Coordination across voltage levels TSO-DSO

Demand response

Battery storage, IoT, smart metering…

Intermittent renewables

Important questions:
- How to foster the coordination between voltage levels?
- What new role for the DSOs?
Congestions are slowly appearing in Europe

Study on congestion run by the RWTH Aachen University in 2018

Redispatch costs in the TenneT control area, spreading from the North-West to the South-East of Germany, between 2015 and 2017

Source: ENTSO-E Transparency platform

€1 billion
Roles on the local flexibility market

Main principle:

» Opening of “on-demand” locational order books in the intraday timeframe to solve congestion issues

Certified Flexibility Providers

- Submit flex offers

Flexibility Marketplace

- Market platform
- Standards
- Transparency
- Coordination
- Neutrality

- Defines market rules and product specifications
- Admits participants on the market
- Operates the markets by matching flexibility offers and demand from SOs continuously
- Monitors the markets

System Operators

- Procure flexibility

Flexibility offer from:

- Power plants
- Storage
- Renewables
- Aggregators
- VPPs

Flexibility demand from:

- TSO
- Mid-voltage DSO
- Low-voltage DSO
A complementary marketplace to alleviate congestions and value flexibility

The Flexibility Providers can bid the same asset on both the zonal Intraday market and a locational order book (when certified by the relevant SO for this local market area).

The Local Flexibility Market (LFM) is complementary to the zonal Intraday and the balancing markets.
The first local trade in Germany

First trade on enera happened on 04/02/2019 at 15h25 with a contract for delivery on the same day at 17h00-18h00 in the market area SOET1 (Sögel).

Certified Flexibility Providers

Audi
- Disposes of a **Power-to-Gas asset** whose flexibility is marketed
- Sees the flexibility demand at an acceptable price from a system operator in the area where their plant is located
- Submits a matching flexibility offer order via the same interface

Flexibility Marketplace

Market platform
- Standards
- Transparency
- Coordination
- Neutrality

EWE NETZ
- **Forecasts a congestion** in a few hours due to high feed-in and therefore needs downwards flexibility to alleviate it
- Sends a flexibility demand order for 2 MW downward flexibility at – 45.50 €/MWh in the market area SOET1 for delivery from 17h00 to 18h00

System Operators

Procure flexibility

2 MW have been traded at **-45.50€/MWh**. The orders are matched in the trading system and the transaction is executed. Audi now has the obligation to deliver the flexibility according to the contract specifications. These specifications are part of characteristics of the traded product and have been pre-determined. Based on this trade, Audi will increase their consumption at a given time and at the chosen location. The resulting BRP imbalance has to be closed on the intraday. This localized physical impact allows EWE NETZ to alleviate a congestion before it occurs in a safe and competitive way.
Enera 1.0

which members are participating?

- **Already admitted**
  - EWE Netz (SO)
  - EWE Trading (CFP)
  - Volkswagen (CFP)
  - Statkraft (CFP)
  - Baywa Re (CFP)
  - Tennet (SO)
  - Quadra Energy (CFP)
  - Alpiq (CFP)

- **Admission process on going**
  - Avacon (SO)

- + Other 2 other asset owners in the membership process
### Next steps: enera target model

- The areas of improvement can be organized in three categories, that will be studied by the Design WG:

<table>
<thead>
<tr>
<th>1. Direct enhancements to the trading platform</th>
<th>2. Coordination between System Operators</th>
<th>3. Grid constraints integration</th>
</tr>
</thead>
</table>
| The direct enhancements to the trading platform or associated systems correspond to changes or adaptations of the enera 1.0 Flex Trading Platform that do not require extensive conceptual design work. | The coordination between System Operators is key to the efficiency of the flexibility activations and usage. To implement it properly, an extensive design work will be needed to define the relevant processes, information and tools to be developed. Such a design work should be done in close collaboration with the different system operators with the organization of workshops. | Grid constraints and parameters that have so far been identified are twofold:  
- Capacities in line / transformers  
- Sensitivities  
These have different impacts and effects on the efficiency of the FTP and the coordination between System Operators. These effects need to be studied and analyzed deeply in order to design the right systems to take them into account in the FTP and the Coordination mechanisms. |

Feedback from UserGroup

High degree of interaction/dependency
Appendix
The enera project

The challenge

- The increasing share of installed renewable capacity is creating new challenges for system operators to manage the grid efficiently and economically.

The enera Project

- The German ministry of Economic Affairs and Energy is funding the enera project to explore new smart market mechanism to allow for more renewable energies in the future part of the SINTEG funding programme.
- The 3 pillars of the project are: Network, Market and Data

The partners

Pilot project involving EPEX SPOT as Marketplace for flexibility ➔ Real case application of Local Flexibility Market concept
enera region: A significant wind production

The Region

- Counties of Aurich, Friesland & Wittmund
- 390,000 inhabitants
- 200,000 households

80% renewables

32% renewables

235% renewables

Germany 2016

Germany 2050

enera 2016
The process

No congestion

Market-based congestion management

Controlled congestion management

Source: enera
Physical grid bottlenecks appear in the region on three SO grids
Enera 1.0

which contracts and products?

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trading procedure</td>
<td>Continuous trading</td>
</tr>
<tr>
<td>Trading period</td>
<td>24/7</td>
</tr>
<tr>
<td>Tradable products</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Product Name</strong></td>
</tr>
<tr>
<td>RES_Hour_Power</td>
<td></td>
</tr>
<tr>
<td>RES_Quarter_Hour_Power</td>
<td></td>
</tr>
<tr>
<td>Non_RES_Hour_Power</td>
<td></td>
</tr>
<tr>
<td>Non_RES_Quarter_Hour_Power</td>
<td></td>
</tr>
<tr>
<td>Gate opening</td>
<td>Trading will open on the day before delivery at 15:00</td>
</tr>
<tr>
<td>Gate closing</td>
<td>5 minutes before delivery start</td>
</tr>
<tr>
<td>Minimum price increment</td>
<td>0.1 €/MWh</td>
</tr>
<tr>
<td>Minimum price</td>
<td>RES products: - 9999.9 €/MWh</td>
</tr>
<tr>
<td></td>
<td>Non_RES products: -50 €/MWh</td>
</tr>
<tr>
<td>Maximum price</td>
<td>RES products: + 9999.9 €/MWh</td>
</tr>
<tr>
<td></td>
<td>Non_RES products: + 9999.9 €/MWh</td>
</tr>
<tr>
<td>Minimum volume increment</td>
<td>0.1 MW</td>
</tr>
<tr>
<td>Trading phase</td>
<td>During trading the market will be in Balancing Trading phase. During this phase regular orders can only match with balancing orders.</td>
</tr>
<tr>
<td>Available order types</td>
<td>Limit orders &amp; iceberg orders</td>
</tr>
<tr>
<td></td>
<td>Balancing orders</td>
</tr>
<tr>
<td>Available execution conditions</td>
<td>None, IOC (Immediate-or-cancel), FOK (Fill-or-kill)</td>
</tr>
<tr>
<td>Available validity restrictions</td>
<td>Good for session, Good till date</td>
</tr>
</tbody>
</table>