Design Changes to Better Integrate Demand Side Management and Flexibility into Electricity Markets

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01 Current Market Challenges
02 Potential for Flexibility
03 Developing Markets for Flexibility
Present Developments have a Deep Impact on the Swiss Electricity Market

- Decreasing CO₂-Prices
- Increasing Share of PV and Wind
- Collapse of Electricity Prices and Spread
- Merit-Order-Effect
- Increasing Need for Flexibility
- Increasing Instability

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The market design loses efficiency
System resilience is endangered
Note: A Possible Layout of Tomorrow’s Electricity System

Use potential of renewable energies and flexible generation and demand
» Counteract volatility were most efficient
» Market based on real cost
» Stimulate innovation
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Uncertain Demand Response Development in Switzerland

Estimation of potential in residential sector, inkl. smart meter installation

- Potential of DSR, taking account of RES and Smart Meter expansion
- More potential in winter: Heating
- But difference between progressive and conservative scenarios very large

Master Thesis of Emanuel Thoma, 2015
Based on data from BFE, 2012
What will be the Role of Demand Response in the Market?

Potential applications:

- Individual **grid tariff optimization**
- **Congestion management** in the distribution grid
- **Balancing** role with Ancillary Service Markets
- Provision of **Adequacy** to the energy system
- Marketing at **Spot Wholesale Market**
Swiss Pooling Concept – Ancillary Services

Concept allows
- the Balance Group simpler way to offer Ancillary Services to Swissgrid
- the pooling of technical units in the Grid Level 5 (50 kV) and Grid Level 7 (400 V)
Example: Demand-side Response Promote Adequacy

- Today’s merit order curve gives a **limited price signal**.
- Without capacity market, installed production capacity will eventually **hit** consumption.
- Extreme prices and **system collapse** are very close.

- Large capacities of demand-side response could lead to a **“liquid” market** with occasional high prices.
- High prices give a **price signal** to more demand-side and production investments ¹).
- A **stable and innovative** system could be reached.

Extreme prices not set by production cost, but customer value!

¹) This e.g. compares to regulation of the Texas ISO.
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Aspects of a Future Market for Flexibility

<table>
<thead>
<tr>
<th>Volatility</th>
<th>Adequacy</th>
<th>Capability</th>
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<tbody>
<tr>
<td>Renewable Energy Producers: need to balance out or hedge their volatility</td>
<td>Traders: optimise their portfolio diversifying flexibility and volatility</td>
<td>Flexible Producers: offer flexibility to counteract volatility</td>
</tr>
<tr>
<td>Volatile Consumers: supplier guarantee energy delivery</td>
<td>System Operator: creates the conditions for physical market</td>
<td>Flexible Consumers: offer flexible consumption to counteract volatility</td>
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Trading Process Today
Building Markets for Flexibility: Strengthening overall Price Signals

» Adapting the current Market Design to allow renewable integration

» Renewable producers are to correctly forecast their feed-in and hedge their volatility in order to improve system security and economic efficiency
Building Markets for Flexibility: Strengthening overall Price Signals

- Harmonizing TSO products on a new TSO marketplace
- Concentration of the procurement of tertiary, redispatch-energy as well as further internationally exchanged TSO products on one single market place in real-time timeframe
Building Markets for Flexibility: Strengthening overall Price Signals

» Introduction of costs-by-cause principle and strengthen responsibility for balancing groups

» Implementing a transparent real-time full marginal cost mechanism, to create an efficient scarcity price towards balancing groups
Building Markets for Flexibility: Strengthening overall Price Signals

- Establishment of real-time market for reliability options
- Implementation of decentralised reliability options allows also foreign market players to participate in the mechanism, provided that appropriate cross-border hedges are available.
Building Markets for Flexibility: Strengthening overall Price Signals

- From a centralized generation system to a decentralized prosumer system
- Further development of pooling concept for flexible loads by supplying customer flexibility on the balancing energy and wholesale market
A common goal:

With the development of markets for flexibility, we try to exploit potentials of the future electricity system.