Virtual Power Plants

IRENA session at G-STIC

Paul Kreutzkamp, 23/10/2017
BEING A UTILITY IN A NEW ENERGY WORLD
Liberalisation, Decentralisation, Digitalization

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of utilities a German household could choose from</th>
<th>Number of Power Plants in Germany</th>
<th>LTE connections worldwide</th>
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<tbody>
<tr>
<td>1990</td>
<td>1</td>
<td>800</td>
<td>0</td>
</tr>
<tr>
<td>2017</td>
<td>≈150</td>
<td>&gt;1,500,000</td>
<td>&gt;1 trillion</td>
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</tbody>
</table>
Next Kraftwerke operates a large Virtual Power Plant and is certified electricity trader on different markets in Europe (DE, BE, FR, AT etc.).

**NEXT KRAFTWERKE**
- Founded in 2009
- Valorizing flexibility on all markets: reserve power and electricity markets
- One of the largest VPPs in Europe
- > 4200 units connected
- ~3 GW in the Next pool
- 135 co-workers
- 10 TWh traded in 2016
- ~1.5 GW R1/R2/R3

**ACTIVE IN THE FOLLOWING COUNTRIES**
- Germany (2009)
- Austria (2013)
- Belgium (2014)
- France (2015)
- Poland (2016)
- The Netherlands (2016)
- Switzerland (2016)
- Italy (2017)
Why has flexibility a value?
Balancing markets

Imbalance prices on 12-10-2015

Hours

€/MWh

MW

NRV (MW)  POS (€/MWh)  NEG (€/MWh)
The value of a Virtual Power Plant
Source & Combine Flexibility and Bring it to where it worth most!

- Production or consumption owners
- BRPs
- Digital Utility
- Self consumption & Peak avoidance
- Site owner
- Grid operators (DSO/TSO)
- Electricity markets
- Trading
- Ancillary services
- Services
Example I: Secondary reserve in Germany

Division of setpoints for an activation of negative reserve power

- 235 installations
- 334 installations
- 376 installations
Example BEST OF 96: To pump or not to pump?

Association for coastal management

› Use pumps to pump the water from the marshes back into the sea
› Pumps do not run constantly, because a basin collects rain water
› Capacity of 3 pumps: 576 kW
› Product: Best of 96: For all 96 quarters of the day Next Kraftwerke pushes price signals. The client decides to pump or not to pump: This is Best of 96
Generation and Demand – Who Leads, Who Follows?

Based on: Henrik Dam, Energy Decarbonisation and Flexibility Needs H2020 REFLEX Workshop, 17/11/2016
<table>
<thead>
<tr>
<th><strong>THE GOAL</strong></th>
<th>Making 100% renewable energy possible</th>
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</thead>
<tbody>
<tr>
<td><strong>THE PATH</strong></td>
<td>Digital, Flexible, Sustainable</td>
</tr>
<tr>
<td><strong>THE STATUS</strong></td>
<td>One of the largest Digital Utilities in Europe</td>
</tr>
<tr>
<td><strong>THE TEAM</strong></td>
<td>About 135 employees with a broad academic background</td>
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