Internet of Energy
Storage ↔ Sharing

Koln, 7 march 2017

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Alliander

Alliander is a ‘separated’ DNO
Shareholders: provinces / cities

Vision
We stand for an universal access to reliable, affordable and sustainable energy

Strategy
Support customers in their choices
Invest in new open markets
Digitize
Excellent network management

+ German networks
Alliander Germany
Alliander new activities

- Open Charge infrastructure
- Open Heat Networks
- Upgrade homes: Insulation / PV / ....
- Collaboration platform
- Open IT platform connecting devices
- Local → Island energy solutions
- Open Flex trade platform
Mayor Trends

Trend 1: society electrifies
More Electric, Less Natural Gas Grids
The end of fire: Transport and Chemical process electric with a growing role of H2

Trend 2: bottom-up drive towards more renewable energy
Local solutions, more than energy
Solar / Wind / Green gas / Heat
Grid Defection

Trend 3: crucial role for information technology and data
New Opportunities
Privacy / Security / Cryptography / Digital ID
Trust / Democracy
Big / Open / Quality Data
Gamification / New Processes
Flexibility - Balance

- Conversion
- P2G / H / L
- Production
- Transport
- Demand
- Storage
Flexibility - Balance

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- Transport
- Storage
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Flexibility - Balance

- Conversion
- Production
- Transport
- Demand
- Storage
Values electricity storage

Optimizing production
Customer Values

- Own PV Energy
- Autonomy $\rightarrow$ Grid defection
- No Breaks: Medical, safety, ICT
- Reset clock
- €: Lower feed in tariffs
- €: Trading
- €: Smaller connection
- Local community green
- Support local DC net
Markets: Frequency
Grid Values

More Grid Capacity

Temporary Grid Capacity

Power Quality
Heat Pumps & Heat Storage

- Low temperature renewable heat energy recovered from the environment
- Electrical power in: 1 kW
- Heat Pump: 3 kW
- High temperature heat output: 4 kW

Heat Storage:
- Sensible: 50 m³ (Water: 0.2 GJ/m³)
- Latent: 25 m³ (PCMs: 0.4 GJ/m³)
- Chemical: 5 m³ (TCMs: 2 GJ/m³)
Neighborhood Battery
Owning → Sharing

A home battery has energy losses up to 400 kWh / Year / Household
Convertor create most losses
A neighborhood Battery combines values Houses / Markets / Grids
Sharing Energy ➔ Jouliette

The ま is the female variant off Joule.

The ま is based on shared sustainable energy.

P2P transactions possible, based on blockchain.
The KiloWattsApp

Where participants can choose to be Tessa, who has surplus supply of solar energy, which she wants to share with her grandma.
<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Market Cap</th>
<th>Price</th>
<th>Available Supply</th>
<th>Volume (24h)</th>
<th>% Change (24h)</th>
<th>Price Graph (7d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bitcoin</td>
<td>$9,618,140,541</td>
<td>$606.74</td>
<td>15,852,240 BTC</td>
<td>$75,018,000</td>
<td>0.20%</td>
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<tr>
<td>2</td>
<td>Ethereum</td>
<td>$963,693,480</td>
<td>$11.51</td>
<td>83,702,629 ETH</td>
<td>$6,741,150</td>
<td>-1.56%</td>
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<tr>
<td>3</td>
<td>Ripple</td>
<td>$209,035,978</td>
<td>$0.005919</td>
<td>35,316,813,001 XRP</td>
<td>$568,997</td>
<td>-0.19%</td>
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<tr>
<td>4</td>
<td>Litecoin</td>
<td>$188,038,374</td>
<td>$3.96</td>
<td>47,435,804 LTC</td>
<td>$1,648,780</td>
<td>-0.75%</td>
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<tr>
<td>5</td>
<td>Monero</td>
<td>$168,860,405</td>
<td>$13.16</td>
<td>12,830,946 XMR</td>
<td>$25,483,000</td>
<td>1.94%</td>
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<tr>
<td>6</td>
<td>Ethereum Classic</td>
<td>$120,179,503</td>
<td>$1.44</td>
<td>83,668,321 ETC</td>
<td>$3,210,950</td>
<td>-5.14%</td>
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</tr>
</tbody>
</table>

https://coinmarketcap.com/