The future of Energy & Utilities with Blockchain & IoT

Prashant K Singh
The future of Energy

Old Grid Vs Smart Grid

**Centralized**
- Central generation
- One-way flows
- Central control
- Dummy loads

**Distributed**
- Transactive energy model
- Distributed generation
- Two-way flows
- Distributed storage
- Distributed Control
- Responsive loads
- Loads/ Local Generation IoT enabled

**Energy Web: “Plug and Play” and “Peer to Peer”**

- $2.5 - 7 Billion
  - new US market for distributed power
  - GS 2016

By 2020...
- 2 million households with solar PV in Germany
- 2 TWh surplus energy of these households
## Blockchain applications across value chain

<table>
<thead>
<tr>
<th>Network – Transmission &amp; Distribution</th>
<th>Consumer &amp; Prosumers</th>
<th>Market</th>
<th>Regulatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Grid Management</td>
<td>• Community P2P markets</td>
<td>• P2P Energy &amp; Utility trading</td>
<td>• Supplier switching (KYC)</td>
</tr>
<tr>
<td>• Smart Meter Utility</td>
<td>• EV share &amp; charge</td>
<td>• Energy commodity Trading &amp; Ops</td>
<td>• Government utility subsidy</td>
</tr>
<tr>
<td>• Supplier switching</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
First Blockchain Energy project - “Brooklyn Grid”

TransActive Grid (Lo3 Energy and ConsenSys)
Siemens Digital Grid Division, specific microgrid

Regulatory - Reforming the Energy Vision
Transacting Local Energy with Neighbors

Works on top of existing infrastructure. Utilities can receive transaction & maintenance fees.

Consumers can choose where to buy renewables from:
- Local Transactive Microgrid
- Regional Renewable Provider

Monthly bill:
- 10% from Regional
- 10% from Local Microgrid

TransGrid Application view

Daily

<table>
<thead>
<tr>
<th>Your Total Usage</th>
<th>7.6 kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your Local Microgrid Offset</td>
<td>25%</td>
</tr>
<tr>
<td>From</td>
<td>per kWh</td>
</tr>
<tr>
<td>Con Ed</td>
<td>$1.25</td>
</tr>
<tr>
<td>Local Microgrid</td>
<td>$2.01*</td>
</tr>
</tbody>
</table>

* price may change based on local demand

Your Max Contribution
- $4.50 average

Your Max
- $4 daily

Your Usage | Neighborhood
---|---

Your Max Contribution
- $4 daily

Your Usage | Neighborhood
---|---

Local Microgrid Volume* | Max Contribution
- YOU: 1.9 kWh | $4.00 |
- Neighbor 1: 2.5 kWh | $4.50 |
- Neighbor 2: 2.5 kWh | $4.00 |
- Neighbor 3: 2.5 kWh | $5.00 |
- Neighbor 4: 2.5 kWh | $3.50 |

Local Average | $4.50

* Increasing Your Max can increase your Volume tomorrow
Energy Market – Sharing economy future

- **Tokenization**
- **P2P Markets**
- **Prosumers**
- **Community ESCOs**

### Smart Grid Technology
- Transactive, distributed consensus intelligence system developed to control Microgrids
- Based on open source, cryptographically-secure protocol layer
- Military-grade cybersecurity and real-time data

**Smart Meter Proliferation** - Transact and price energy with Microgrid neighbors directly

- Price, green energy, clean signals, social good Multi-factor tokens
- Reputation system
Energy commodity trading ecosystem
Energy commodity trading ecosystem

**Current State**
- **Communication/Notification**
- **Contract agreement**
- **Document Exchanges**
- **Real time status**

**Future State**
- **Federated Blockchain**
- **Smart Contract**

**Blockchain applications**
- **TRADE EXECUTION & CONTRACT PHASE**
- **SCHEDULING PHASE & VOYAGE**
- **TRADE FINANCE & SETTLEMENT**
EV charging & sharing

EMotorWerks

Innogy, Subsidiary of RWE

BlockCharge
Share & Charge – Application view
EWF is an alliance body aimed at introducing an open-source blockchain designed for the electricity market, identifying use cases & helping build an ecosystem of participants.
Blockchain Firms in ENU

- **P2P Trading & Connected Home**
  - POWER
  - LEDGER
  - Vector
  - co-tricity
  - LO3 ENERGY
  - alliander
  - Fortum

- **EV Charge / Share**
  - oxygen
  - Innogy
  - Slock.it
  - Ze

- **Consortia and Research**
  - ENERGY WEB FOUNDATION
  - WANXIANG BLOCKCHAIN LABS
  - endesa

- **Bitcoin Meter Payments**
  - Marubeni
  - enercity
  - elegant
  - bitpay
  - BAS
  - PEY
  - bankymoon

- **Solar Cryptocurrencies**
  - smappee

- **Notable Startups**
  - Volt Markets
  - M-PAYG
  - CHRONICLED
  - OSy
  - Gem

- **Wholesale Trading & Smart Markets**
  - Qiwi
  - NEW 4.0
  - yusco
  - PRIogen
  - Wien Energie
  - BTL
Thank you
Refernces

• AP Energia
• World Energy Council
• Transactive Grid
# Leading Energy Blockchain Firms

<table>
<thead>
<tr>
<th>#</th>
<th>Company</th>
<th>Description</th>
<th>Investments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Conjoule</td>
<td>Conjoule offers a blockchain platform designed to support P2P trading of energy among rooftop PV owners &amp; interested public-sector or corporate buyers.</td>
<td>Pulled in $5.3 million in funding from Tokyo Electric Power Company and others in July</td>
</tr>
<tr>
<td>2</td>
<td>Drift</td>
<td>Seattle-based Drift is leveraging DLT, machine learning and high-frequency trading to create a differentiated competitive retail energy provider.</td>
<td>Raised $2.1 million in May and is currently operating in New York City</td>
</tr>
<tr>
<td>3</td>
<td>Greeneum</td>
<td>Greeneum is running test nets and pilots for its peer-to-peer energy trading platform “in Europe, Cyprus, Israel, Africa and the U.S.</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Grid+</td>
<td>Blockchain-based competitive retail provider in Texas. The hype was partly a result of Grid+’s origins: It was created by ConsenSys.</td>
<td>Grid+ last month raised $29 million through its token pre-sale</td>
</tr>
</tbody>
</table>
# Leading Energy Blockchain Firms

<table>
<thead>
<tr>
<th>#</th>
<th>Firm</th>
<th>Description</th>
<th>Investments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Conjoule</strong></td>
<td>Conjoule offers a blockchain platform designed to support P2P trading of energy among rooftop PV owners &amp; interested public-sector or corporate buyers.</td>
<td>Pulled in $5.3 million in funding from Tokyo Electric Power Company and others in July</td>
</tr>
<tr>
<td>2</td>
<td><strong>Drift</strong></td>
<td>Seattle-based Drift is leveraging DLT, machine learning and high-frequency trading to create a differentiated competitive retail energy provider.</td>
<td>Raised $2.1 million in May and is currently operating in New York City</td>
</tr>
<tr>
<td>3</td>
<td><strong>Greeneum</strong></td>
<td>Greeneum is running test nets and pilots for its peer-to-peer energy trading platform “in Europe, Cyprus, Israel, Africa and the U.S.”</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td><strong>Grid+</strong></td>
<td>Blockchain-based competitive retail provider in Texas. The hype was partly a result of Grid+’s origins: It was created by ConsenSys.</td>
<td>Grid+ last month raised $29 million through its token pre-sale</td>
</tr>
</tbody>
</table>