Virtual Power Plant

The VPP demonstration project of Next Kraftwerke and TohokuEPCO
"Join us to become part of the energy transition and shape the energy landscape of the future.

Fair – sustainable – direct."

Jochen Schwill & Hendrik Sämisch (Founders & CEOs)
Europe’s leading VPP

**2009**
Established in Cologne, Germany

**2011**
First frequency response with aggregated generators

**2014**
First business outside Germany

**2018**
Launch of NEMOCS VPP-as-a-service for markets worldwide

- > 8,000 Aggregated assets
- > 7 GW Aggregated capacity
- 155 Employees
- 630 Mio. € Turnover 2018
Decarbonizing Energy
Changes in the energy landscape create new challenges

<table>
<thead>
<tr>
<th>Fossil world</th>
<th>Renewable world</th>
<th>Impact</th>
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<tbody>
<tr>
<td>large, central</td>
<td>smaller, decentral</td>
<td>more complex interaction</td>
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<tr>
<td>high voltage level</td>
<td>lower voltage levels</td>
<td>higher demand for grid management</td>
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<tr>
<td>integrated utilities</td>
<td>independent power producers</td>
<td>new market roles required</td>
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<tr>
<td>planable, high (fuel) cost energy</td>
<td>volatile low-cost energy</td>
<td>higher demand for grid management</td>
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The platform for the digital energy world

Operating a power plant without owning any assets

- Aggregation of decentralized renewable energy assets through a central virtual platform
- Sophisticated forecasting of generation, demand & system requirements
- Intelligent steering of all networked assets with automatic M2M-communication
- Grid stability: ensuring that production and consumption are harmonized
- Offering access to various markets (i.e. spot exchange, ancillary services, etc.)
What does a VPP offer?

- Live data monitoring and processing within milliseconds
- Elaborate forecasting models to anticipate ideal behavior
- Algorithmic calculation of each individual asset’s schedule of operation
- Profound short term trading decisions

Big scale data processing and optimization

- Control reserve set-point of the TSOs
- Weather forecast
- Power exchange forecasts
- Changes by the customers through online-platform
- Live data from each asset
- Current prices at the power exchange
- Optimised schedules
- Historical data (i.e., measured & metered data)

Assets in Pool
AI applications in the VPP
Utilizing the data streams of the power market

Forecast of generation/consumption

High data density with more than three billion data points per year allows to

- Combine meteorological information and live asset data into high accuracy forecasts
- Train self-learning algorithms to continuously improve forecast precision
- Predict load profiles, e.g. PV-battery-installation or electric fleets

Price forecasts & auto-trading

Algorithms facilitate short-term markets through

- Real time observation of trading positions
- Forecast of prices & bidding behavior
- algo-assisted trading decisions
- Automated transactions

Asset Control

- Automated steering of all assets as a cluster
- Taking into account a high number of individual restrictions, such as storage level, technical limits, marginal prices
- Price optimization in up to 15min intervals
AI applications in the VPP

Short-term forecasting of PV generation
Situation in Japan

- Avoidance of polluting technologies and replacement of nuclear energy requires high share of RES
- Geological conditions require distributed resources
- Trend towards electrification holds high potential for Demand Response
- Liberalization of markets is ongoing
- Redesign of balancing mechanisms is currently undertaken
- Feed-in-Tariff is expiring

- VPP technology allows business opportunities as well as macro-economic benefits

TohokuEPCO and Next Kraftwerke joined forces to unlock VPP potential
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