The Demand Response business model and barriers in the German market

BSEC Seminar: Demand Side Response – when to realize what services and how?
Berlin, 10 December 2014
EnerNOC at a Glance

EnerNOC is a leading Demand Response and Energy Intelligence (EIS) software provider

**Proven Customer Track Record**
- Activities in over 100 nations, with active DR programs in 10 countries
- 24-27 GW of peak load under management across 14,000+ C&I buildings; 30-35% dispatchable DR
- Close to $1bn in customer payments/savings to date

**Full-Value Technology Offering**
- Energy Intelligence Software (EIS)
- Comprehensive technology, managed services, and market access
- 24/7/365 Network Operations Center and customer support

**Growing business across the world**
- Over 1,000 employees
- Publicly traded on the U.S. NASDAQ (ENOC)
The Demand Response Business Model
How EnerNOC operates as a DR-aggregator

MW, MWh

Industrial
Commercial
Institutional

Aggregate

NOC

Trade

Network Operation Center

Ancillary Services
Reserves
Balancing Group optimisation
Energy Trading
Capacity Markets

Consumers / Participants:
- Factories
- Buildings
- Households
- E-Cars

- Recruiting
- Sign-up
- Provisioning
- Maintenance
- Forecasting
- Packaging
- Monitoring
- Controlling
- Sales
- Trading
- Reporting
- Balancing Mechanism

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The EnerNOC Network Operations Center uses single loads and aggregates them to create products that can be sold.

Flexibleities in industrial and commercial buildings

NOC (Aggregation Plattform)

Sale into the market

Power Market

Balancing Reserve
How Demand Response Events Work
Challenge Energiewende: Integration of intermittent renewable power

Demand Response is an important flexibility provider
EnerNOC has unlocked flexibilities in various industries and brought them to market

There are large potentials for DR in Germany

<table>
<thead>
<tr>
<th>Industries for Demand Response</th>
<th>Technical assets</th>
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<tbody>
<tr>
<td>Base material / chemical industry</td>
<td>Decentral generation (CHPs)</td>
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<tr>
<td>Processing of raw materials</td>
<td>Backup generation</td>
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<tr>
<td>Waste water treatment</td>
<td>Heating/Cooling/Drying processes</td>
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<tr>
<td>Pipelines</td>
<td>Ventilation processes</td>
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<tr>
<td>Waste incineration</td>
<td>Pumps, compressors</td>
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<tr>
<td>Paper, glas, steel, aluminium production</td>
<td>Stirrer</td>
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<td>Food production</td>
<td>Electrolysis</td>
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<td>Large buildings</td>
<td>Smelter</td>
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<tr>
<td>Data centers</td>
<td>Refiner, grinder</td>
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EnerNOC experience with DR around the world: about **10% of peak load** can be brought to market
The Role of a DR-Aggregator

Aggregation is key to unlocking the DR potential and to providing a reliable resource

The aggregator...

- Enables smaller loads to participate
- Knows where the flexibilities are hidden
- Has the technical infrastructure to connect, aggregate and sell flexibilities to the market

In PJM (US), one of the most developed DR-markets in the world, over three thirds of DR is delivered by independent aggregators
Largest barrier for DR in Germany: Market is closed for independent aggregators through ability of BRP/retailers to block DR

Standardised framework for dealing with balancing group adjustments following a DR-dispatch are required.
Many potential areas for DR – and many barriers
The market rules in the past have been written with generation in mind

Potential areas for DR

<table>
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<tr>
<th>Network</th>
<th>Energy-only Market</th>
<th>Capacity</th>
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<tbody>
<tr>
<td>TSO</td>
<td>BRP retailer trader</td>
<td>N.N.</td>
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<tr>
<td>DSO</td>
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</table>

### Network
- Balancing Power
- Redispatch
- DR can avoid network expansion
- Feed-in management

### Energy-only Market
- Minimise imbalance charges
- Intraday/day-ahead trading / arbitrage
- Provision for interruptable loads (AbLaV)
- Grid Reserve
- [Future: Capacity Market?]

### Capacity
- [Future: Capacity Market?]

### Barriers
- DR can lead to higher network charges (§19(2) StromNEV)
- Technical requirements are written from a generation perspective (product definitions, pre-qualifications, etc)
- Incentive regulation incentivises CAPEX over OPEX
- Incentives to balance are too weak
- AbLaV participation requirements can only be fulfilled by a very small number of very large consumers
- Grid reserve not open for DR
Key take-away messages

1. DR has big potential, and can be a key component to making the Energiewende a success.

2. Need to allow new, innovative business models to compete in the market. In particular, DR-aggregators play a key role in unlocking the DR potential.

3. More generally, DR needs to be allowed to compete on equal footing with generation across all market segments – as required by the EU Energy Efficiency Directive (Article 15.8)
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BACKUP
Key issue: Network fees and market signals are in conflict

Market rules penalise DR for participating in the negative reserve market

- §19(2) StromNEV gives discounts to large consumers on their network fees if their consumption pattern is relatively flat
- However, if an large industrial firm provides negative reserve to the grid, it might lose out on the network fee discounts
- The load profile should be adjusted for that, as it is done in the AbLaV and in the Austrian market for negative reserve

![Diagram showing the impact of provision of negative reserve on peak load and network charges](image-url)
Our rigorous process works

We have consistently delivered more than 100% of our committed resources across all DR programs.

![Graph showing dispatches and performance](image)

Key success factors

- Our technology platform enables **automated dispatch** of multiple events simultaneously, with **real-time visibility** into performance.
- We monitor end-use loads **continuously** to ensure capacity availability.
- We **thoroughly test each site** prior to event dispatch, including acceptance tests and notification tests.
- We are experts at **building a “portfolio”** that ensures reliable delivery.