Living up to its strengths:
Biogas across borders in practice

Kevin Hayward
BayWa r.e., Brussels 8th November 2018
Living up to its strengths: Biogas across borders in practice

Agenda

1. BayWa r.e. Energy Trading

2. Biogas in a Renewable Market Place: The Challenge

3. Biogas in a Renewable Market Place: Best Practice Flexibility

4. Biogas in a Renewable Market Place: The Framework
BayWa r.e. Energy Trading
The Business Entity Energy Trading

Business Segments

Bio-methane Trading
- Purchase, trading and sale of physical bio-methane as well as Biomethane-certificates
- Mainly long-term contracts
- For all market segments: CHP, heating and fuel
- Nomination and energy data management
- Portfolio and balancing group management
- Management of guarantees of origin (via dena Biogas register)

Direct marketing
- Direct marketing of power from distributed power plants: wind onshore, wind offshore, PV bioenergy, geothermal energy, and CHP
- Full service including forecast, balancing group management, and remote control (via VPP)
- Mainly according to EEG’s market premium model
- Long-term PPAs for new power plants and mid-term PPAs for post-EEG plants under development

Flexibility Management
- Flexible management and cross market optimisation of decentral generation at all power and ancillary service markets
- Virtual power plant based on own system EC24 as well as own developed optimization software 5/1
- Management of consumption of industrial power clients according to intraday price changes and demand of ancillary services (Demand Side Management)
The Business Entity Energy Trading

### Business Entity Energy Trading

#### Key Facts and Figures

<table>
<thead>
<tr>
<th>1 600 GWh</th>
<th>Bio-methane and green gas traded</th>
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<tr>
<td>1 500</td>
<td>Wind, PV, bioenergy, geothermal power plants and CHP plants with</td>
</tr>
<tr>
<td>2 200 MW</td>
<td>Of capacity under management</td>
</tr>
<tr>
<td>950 GWh</td>
<td>Power supply to industrial, commercial and private customers</td>
</tr>
<tr>
<td>20 000</td>
<td>Customers are supplied with clean and sustainable green power</td>
</tr>
<tr>
<td><strong>Awarded</strong></td>
<td>Certificates and awards testify our high standard and excellent service (e.g. TÜV Süd, Ökotest)</td>
</tr>
<tr>
<td>90</td>
<td>Highly qualified and experienced employees work with us in our offices in Munich, Leipzig and Frankfurt</td>
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Biogas in a Renewable Market
Place: The Challenge
Renewable Energies are Changing the Basis of our Energy System

- Distributed and fluctuating generation from wind and solar
- Baseload has no value anymore
- Increasing demand for flexibility
- Digitalisation enables the paradigm change

The Challenge

Load [GW]

20% Renewable Energies

40% Renewable Energies

80% Renewable Energies

Pic: Prof. Dr. Stadler/ Westfalen Wind GmbH

red Power demand Germany (2010)
green Generation wind & solar @ different shares
The market is becoming more and more flexible

A growth in volatility requires an increased flexibility
Biogas in a Renewable Market Place: Best Practice Flexibility
Biogas Plants are complex systems, without the demands of dynamic dispatching
1st Step: Creation and Execution of the Optimised Schedules

Best Practice Flexibility

Weather & Price Forecasts

Restrictions

Technical Units

Trading Floor / Markets

5/1 Dynamic Optimisation

24/7 Trading Team

EC24 Virtual Power Plant

5/ONE

ec/24

Generation Schedule

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Best Practice Flexibility

But Things Always go Different than Expected…

Deviations from Forecasts

Weather Forecast

Market price Forecast

Heat demand

Plant Availability

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Best Practice Flexibility

2nd Step: Continuous Intraday Optimisation... Every 15 Minutes

Intraday Orderbook

Live Data

Optimised Generation Schedules

Automated Schedule Download

Automated Intraday Trading
Result: Economically Optimised Operation of a Biogas Plant
Biogas in a Renewable Market Place: The Framework
Biogas is effective under the right conditions

Competitive Framework
- Technical
  - Gas Storage
  - Heat Storage
  - Additional Electrical Production Capacity
- Contractual
  - OEM Maintenance & Guaranty
  - Direct Marketing Contract
- Cost of Upgrades and Operations
  - Investment Costs (~130€/kW for upgrading plants)
  - Motor Efficiency
  - Maintenance Costs
- Operational Best Practices
  - A new paradigm – Agricultural Expert to Power Producer!

Regulatory Framework
- Power Market Design
  - Liberalized Ancillary Services Market
  - Liberalized Power Supply Market to allow for the direct marketing of REN by 3rd party market representation.
  - Efficient Imbalance Market, w/o Caps & Floors
  - Efficient Day-Ahead and Intraday Markets, w/o Caps or Floors
  - Liquid Intraday Market for each balancing unit (ex. ¼ hr)
- Market Support
  - Today Flexibility is subsidized at a level to enable the investment upgrades

What will the value of flexibility be in the future?
Backup
With an increase in decentralization and free markets, the short term market volume increases.

Abbildung 13 - Entwicklung der Volumen an den Intraday-Märkten der EPEX SPOT 2004-2016, Quelle: EPEX SPOT

Ref.: Report Direktvermarktung von erneuerbaren Energien an der Strombörse, EPEX Spot for DFBEW
Highly volatile power production means growing spreads in the short term power prices.
Main Markets for Flexibility are Ancillary Services and Short-term Power Markets (Spot Markets)

**Ancillary services**
Provision and activation of reserves

- Increase of generation or reduction of consumption if grid frequency drops below 50 Hz or vice-versa if frequency rises above 50 Hz
- Remuneration of provision by capacity payment (€/MW) and of activation by energy payment (€/MWh)

**Short-term power markets**
Balancing of demand and generation of power based on price signals on spot markets

- Scheduled operation of power plants, consumers, or storages: Increase of generation or decrease of consumption if prices are high and vice-versa if prices are low
- Markets: Day-ahead & intraday auction and continuous intraday trading
The variety of variable requires a complex system.
Foward looking analysis with respect to all relevant data and restrictions

For a Biogas Plant, 5/1 considers over 30 plant relevant restrictions in the model to deliver the optimal dispatching plan for the plant.
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