Biogas - trends on the german and the international market

Clemens Findeisen
Consultant Development Cooperation
German Biogas Association
Content

- German Biogas Association
- The biogas market in Germany
- Different operation techniques in use
- Trainings in the area of safety
- Trends on international biogas markets
## Structure of the German Biogas Association

### Headquarters in Freising
- 23 employees, organised in 10 departments

### Berlin Office
- 5 employees

### Regional offices (North, South, East, West and Editorial Office Biogas Journal)
- 5 employees

### Steering Committee
- 7 members, elected for a 4-year period

### Board of Trustees
- Elected honorary spokesmen of regional groups, working groups and advisory boards

### Advisory Boards, Working Groups
- Advisory boards of plant operators, companies, the legal profession, funders; Working groups for the areas permissions, safety, feeding-in of biogas, environment, heat, waste and fertiliser law

### 23 Regional groups in Germany

- **Operators of biogas plants**
- Providers of feedstock
- Research Institutions

- **4,800 Members**
- Interested private individuals
- Public authorities
- Lawyers

- **Companies and manufacturers**
- Corporate finance
- Planners, advisers, laboratories

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*Member of the European Biogas Association (EBA)*

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*Fachverband Biogas e.V.*
German Biogas Association - Objectives

Objectives:

- Promotion of the biogas sector
- Promotion of a sustainable energy supply
- Definition of legal framework for reliable and long-term investments
- Creation of adequate technical rules and standards
- Promotion of R & D
- Exchange of information
- Members service

Lobbying on federal state, federal and EU level in the following fields:

- Renewable Energy Act (EEG)
- Energy management
- Regulatory approval
- Environmental law
- Laws on agricultural issues
- Tax law
- ...

4 Fachverband Biogas e.V.
European Biogas Association

26 countries – 34 National Organisations – 40 Companies

www.european-biogas.eu
Content

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Frontrunner ...

- Share of RES in **Final Energy Consumption 12.4%**
- Share of RES-E **28.5% (1st Half 2014)**
- **35 GW windpower** capacity inst. el. Power (9% of total Power consumption)
- **36 GW PV** capacity installed el. Power (5% of total PC)
- **4 GW Biogas** capacity installed el. Power (**5% !** of total PC)
- **380,000** people **employed** in the RES-sector
- **31.5 billion € turnover** from construction and operation of RES
Structure of the German electricity production from renewable energy sources

Overall: 151 TWh

- Wind: 34.3%
- Biomass: 31.3%
- Photovoltaic: 20.5%
- Hydro: 13.8%
- Biogas: 18%
- Solid biofuels: 8.3%
- Biowaste: 3.45
- Landfill gas: 0.4%
- Sewage gas: 0.9%
- Liquid biofuels: 0.3%

More than 50% of the RES are fluctuating

Source: FvB based on BMU 2014
Flexibility instead of base load: The new role of bioenergy

- With increasing share of RES baseload loses importance
- Flexible systems fill the valleys of the wind and sun
  - CHP with bioenergy & natural gas
  - New role of biogas

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20% RES</td>
<td>red</td>
<td>Wind &amp; Solar</td>
</tr>
<tr>
<td>40% RES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80% RES</td>
<td>green</td>
<td></td>
</tr>
</tbody>
</table>
Number of biogas plants & installed electric capacity

© Fachverband Biogas e.V. / German Biogas Association
Fields of Application for Biogas

- **EEG 2000**
  - Consistent fee for 20 years
  - Priority connection
  - 250 new plants a year

- **EEG 2004**
  - Bonus for new techniques
  - Bonus for emission reduction
  - Bonus for manure
  - 1000 new plants a year

- **EEG 2009**
  - Bonus for energy crops
  - Bonus for using heat
  - 450 new plants a year

- **EEG 2012**
  - New system
  - New requirements on efficiency and ecology
  - 340 new plants a year

- **EEG 2014**
NEW EEG 2014 (as of 1st August 2014)

For New Plants:
• No more bonus for energy crops and manure
• No more bonus for biogas upgrading
• No more heat utilization obligation
• Max. 100 MW gross additional plants each year
• Special feed-in-tariff for:
  - small „manure plants: 23,73 ct/kWh
  - waste fermentation plants: 15,26 ct/kWh
• Common tariff (§44)
  \[
  \begin{array}{ll}
  \leq 150 \text{ kW} & 13,66 \text{ Cent/kWh} \\
  \leq 500 \text{ kW} & 11,78 \text{ Cent/kWh} \\
  \leq 5 \text{ MW} & 10,55 \text{ Cent/kWh} \\
  \leq 20 \text{ MW} & 5,85 \text{ Cent/kWh}
  \end{array}
  \]
Future towards auctions (tender) in Germany?
Content

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- **Different operation techniques in use**
- Trainings in the area of safety
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# Technologies in use in Germany

<table>
<thead>
<tr>
<th>Wet digestion</th>
<th>Dry continuous digestion</th>
<th>Dry batch digestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete Mixed Reactor</td>
<td>Plug Flow Reactor</td>
<td>Garage Systems</td>
</tr>
<tr>
<td>&lt; 15 % dm</td>
<td>15 – 30 % dm</td>
<td>&gt; 30 % dm</td>
</tr>
<tr>
<td>Thermophilic</td>
<td>Thermophilic</td>
<td>Thermophilic</td>
</tr>
<tr>
<td>Mesophilic</td>
<td>Mesophilic</td>
<td>Mesophilic</td>
</tr>
</tbody>
</table>

![Image of biogas process](image-url)
Other Technologies

Lagoon systems

Fotos: AD Solutions

Domestic biogas systems
Plug flow reactor

• Origen: Berlin Ruhleben, BSR
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Biogas Training Network

Since October 2013
Curricula of the 2 days operators qualifications training in Germany

- Legal Framework of plant construction and operation
- Risk assessment
- Explosion protection
- Documentation
- Mandatory obligations for the plant operator
- Damage and accident management
- Safety relevant checks and maintenance
- Best-practice-example (on-site check and evaluation)
- Multiple-choice exam
ฝ่าในคลุมบ่อเก็บก๊าซชีวภาพ (Covered Lagoon) แตกขาด และเกิดปลวกเปลี่ยนจากก๊าซชีวภาพคลอกก่ำเจรจา

ด้านหลังอาคารผลิตปุ๋ยมีน้ำสำหรับหลังด้วยได้ที่ศูนย์ตามม่วงจากบ่อเก็บก๊าซ 50-60 ม. ห้องน้ำและอาคารผลิตปุ๋ยเปลี่ยนพืชคลอกทั้งหลัง
Safety –
Establishment of Regulations and Standards –
Training standards for operators, etc.
Sustainable Image of Biogas!
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Biogas Plants in Europe 2012

Source: EBA Biogas Report 2013
## Biogas Plants in Europe 2011 and 2012

<table>
<thead>
<tr>
<th>Country</th>
<th>Total number of biogas plants 2011</th>
<th>Total number of biogas plants 2012</th>
<th>Agriculture</th>
<th>Landfill</th>
<th>Sewage</th>
<th>Other*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>433</td>
<td>436</td>
<td>201</td>
<td>15</td>
<td>95</td>
<td>125</td>
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<tr>
<td>Belgium</td>
<td>118</td>
<td>119</td>
<td>38</td>
<td>24</td>
<td>21</td>
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<tr>
<td>Bulgaria</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
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<tr>
<td>Croatia</td>
<td>6</td>
<td>12</td>
<td>9</td>
<td>1</td>
<td>2</td>
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<tr>
<td>Cyprus</td>
<td>n.d.</td>
<td>15</td>
<td>13</td>
<td>2</td>
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<tr>
<td>Czech Republic</td>
<td>327</td>
<td>481</td>
<td>318</td>
<td>55</td>
<td>97</td>
<td>11</td>
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<tr>
<td>Denmark</td>
<td>196</td>
<td>176</td>
<td>89</td>
<td>25</td>
<td>57</td>
<td>5</td>
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<tr>
<td>Estonia</td>
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<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Finland</td>
<td>75</td>
<td>78</td>
<td>10</td>
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<td>16</td>
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<td>France</td>
<td>498</td>
<td>557</td>
<td>90</td>
<td>301</td>
<td>60</td>
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<tr>
<td>Germany</td>
<td>8 400</td>
<td>8 700</td>
<td>7 515</td>
<td>n.d.</td>
<td>980</td>
<td>205</td>
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<tr>
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<td>3</td>
<td>11</td>
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<td>Hungary</td>
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<td>50</td>
<td>8</td>
<td>13</td>
<td>28</td>
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<tr>
<td>Ireland</td>
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<td>27</td>
<td>5</td>
<td>8</td>
<td>11</td>
<td>3</td>
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<tr>
<td>Italy</td>
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<td>1 264</td>
<td>994</td>
<td>210</td>
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<tr>
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<tr>
<td>Luxembourg</td>
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<td>4</td>
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<tr>
<td>The Netherlands</td>
<td>235</td>
<td>252</td>
<td>105</td>
<td>41</td>
<td>82</td>
<td>24</td>
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<tr>
<td>Poland</td>
<td>178</td>
<td>186</td>
<td>29</td>
<td>89</td>
<td>67</td>
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<tr>
<td>Portugal</td>
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<td>26</td>
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<td>17</td>
<td>7</td>
<td>0</td>
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<tr>
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<td>7</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Slovakia</td>
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<td>92</td>
<td>78</td>
<td>8</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Slovenia</td>
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<td>25</td>
<td>4</td>
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<tr>
<td>Spain</td>
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<td>22</td>
<td>22</td>
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<tr>
<td>Sweden</td>
<td>229</td>
<td>242</td>
<td>26</td>
<td>55</td>
<td>135</td>
<td>26</td>
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<tr>
<td>Switzerland</td>
<td>589</td>
<td>606</td>
<td>89</td>
<td>6</td>
<td>463</td>
<td>48</td>
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<tr>
<td>UK</td>
<td>299</td>
<td>312</td>
<td>39</td>
<td>75</td>
<td>146</td>
<td>52</td>
</tr>
<tr>
<td>TOTAL approx.</td>
<td>12 397</td>
<td>13 812</td>
<td>9 766</td>
<td>1 005</td>
<td>2 365</td>
<td>676</td>
</tr>
</tbody>
</table>

*Source: EBA Biogas Report 2013*
Motivation / Trends in developing and emerging countries

- Clean Development Mechanism (CDM) – focus on the **reduction of methane** rather than electricity production

- Decentralized energy solutions driven by industry – **avoid energy black outs and high costs of importing fossil fuels**

- **Environmental regulations** (waste water, municipal waste, agricultural waste, landfills, etc.)

- **Feed in Tariffs / Quotas**

- **Biogas upgrading to Biomethane**

- **MSW, Agricultural residues, Landfill gas, Sewage gas, Energy crops?**

- **Establishment of National Biogas Associations!**
Biogas in Indien

- Indian Biogas Association
- Das Ministerium für erneuerbare Energien (MNRE) schätzt das Potenzial auf 150 Millionen Tonnen an Substraten aus landwirtschaftlichen, tierischen und menschlichen Abfällen, die für Biogas genutzt werden können.
- MNRE Schätzung für Biogas Potential: 1,700 MW von Haushaltsabfällen und 1,300 MW von Industrieabfällen.
- Kleine Biogasanlagen gibt es seit mehr als drei Jahrzehnten in Indien - kleintechnische und thermische Vergasungsanlagen.
Biogas in Indien

- Hindernisse für die Umsetzung von Biogasprojekten sind: komplizierte ländliche Logistik, hohe Transportkosten plus eine kleinteilige landwirtschaftliche Struktur sowie die Abhängigkeit von Biomasseluferanten

- Biogas Aufbereitung
Bsp: 2,4 MW BGA in Indien: Mabagas, IOT, Armatec
Bsp: 2,4 MW BGA in Indien: Mabagas, IOT, Armatec

• Origen: Armatec FS Rührwerke
Promoting international Biogas projects

Cooperation
GIZ Services for Energy

Project portfolio:
140 activities in 40 countries
Volume of orders: 500 million €
Yearly turnover: 110 million €

ongoing
biogas components
Some GIZ energy Programms with biogas components

- **Turkey**: Efficient and Climate-friendly Use of Animal waste (BMU, 2010–2014)
- **China**: Optimization of Efficient Biomass Utilization (BMZ, 2009–2013)
- **Mexico**: Energetic use of urban municipal waste (BMZ, 2014-2018)
- **Indonesia, Thailand, Vietnam, Philippines, Myanmar**: PEP Renewable Energy South-East Asia (BMWi, 2012–2015)
- **Caribbean Community**: Support to institutional structures for the promotion of renewable energies and energy efficiency (BMZ, 2012 – 2016)
- **Indonesia**: Promotion of Least Cost Renewables in Indonesia, (BMZ, 2012 -2015)
- **Serbia**: Development of a sustainable Bioenergy market (BMZ, 2013-2017)
- **South-Africa**: South African-German Energy Programme – SAGEN (BMZ, 2011-2014)
- **Vietnam, South Africa, Ghana, Colombia, Peru**: Wir holen die Welt nach Bayern und bringen Bayern in die Welt (Bavarian Ministry of Economic Affairs)
- **Central America**: Promotion of Renewable Energies and Energy Efficiency in Central America (BMZ, 2010–2014)
- **Powering Agriculture - Sustainable Energy for Food**: Regional (BMZ, 2013-2015)
- **Energising Development - ENDEV**: Regional (Multistakeholder)
- **India**: Emission-neutral Rural Energy Supply Programme (BMZ, 2009–2014)
- **Vietnam**: Support for the establishment of a renewable energy agency (BMU, 2010–2014)
Project cooperation Marketplace

Project or distribution partners, manufacturers, planners and investors can meet in the Project cooperation Marketplace. Business members of the German Biogas Association can post their offers and also view offers posted by others. All others can post offers.

Please note that this new offer is not an advertising platform for firms. If you want to raise awareness for your firm, you can do so under Members / My Biogas / Firm list.

Post offer

View offer (only members of German BioGas Association)

General Conditions of Use and instructions for use

www.biogas.org
Conclusion

- Germany is a **frontrunner in renewables**
- Biogas is as an **all-rounder** and a key in the energy mix
- Three main trends in Germany:
  1. Feedstock: manure/waste - no energy crops
  2. Flexibility (balancing the fluctuating power generation)
  3. Export business of the manufactures (60% forecast 2014 estim.)
- Huge potential and interest for biogas worldwide (biowaste digestion, agricultural residues, landfill gas, sewage gas) -> **know-how is necessary**
- Importance of National Biogas Associations, **Safety standards and operators training!**
- Lot of experience and know-how in Germany. **Partnerships!**
Thank you for your attention!

BIOGAS Convention & Trade Fair

- Biogas Basics!
- Know-How Transfer!
- International Panel on Development & Emerging Countries!
- Best practise on Waste digestion and „exotic“ substrates!

www.biogas.org
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