Country report Germany

P. Weiland
Johann Heinrich von Thünen-Institute (vTI)
Federal Research Institute for Rural Areas, Forestry and Fisheries

Content

- Status of biogas production
- Trends in biogas production
- Status of biogas upgrading
- New concepts for biogas utilization
Current status of biogas production

- Number of biogas plants: 4,500
- Installed electric capacity: 1,650 MW_{el}
- Total electricity production 2009: 10 bill. kWh
- Number of provided households: 3.8 mill.
- Share on electricity consumption: 1.6 %
- Avoided CO_{2}-emissions: 13.5 mill. tons
- Number of biogas upgrading plants: 35
- Cultivation area for biogas crops: 530,000 ha
- Share of manure utilization: ~ 15 %
- Number of workplaces: 11,000
Trends in biogas production

- Most of the plants erected in 2009 have an installed electric capacity ≤ 250 kW.
- Erecting of satellite CHP’s result in a higher degree of heat utilization.
- The majority of biogas plants use a daily substrate blend with more than 30 % manure in order to receive the manure bonus of 4 cent per kWh.
- Biomass from grassland and sugar beets find increased application as substrate feedstocks.
- Conditioning of digestate finds increased application in areas with high animal population.

Number of biogas injection plants in Germany

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>2</td>
</tr>
<tr>
<td>2007</td>
<td>6</td>
</tr>
<tr>
<td>2008</td>
<td>12</td>
</tr>
<tr>
<td>2009</td>
<td>35</td>
</tr>
<tr>
<td>2010</td>
<td>70</td>
</tr>
</tbody>
</table>

(expected)
Biomethane feed-in capacity of 34 upgrading plants

**Biomethane productivity \([m^3/h]\)**

<table>
<thead>
<tr>
<th>Relative frequency [%]</th>
<th>&lt; 200</th>
<th>200-499</th>
<th>500-799</th>
<th>800-1099</th>
<th>&gt; 1200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Application of upgrade technologies (1/2010)

<table>
<thead>
<tr>
<th>Technology</th>
<th>Number of plants</th>
<th>Percent [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSA</td>
<td>13</td>
<td>41</td>
</tr>
<tr>
<td>PWS</td>
<td>9</td>
<td>28</td>
</tr>
<tr>
<td>MEA</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>Genosorb</td>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>
Feed-in capacities according the different upgrade technologies (1/2010)

<table>
<thead>
<tr>
<th></th>
<th>PWS</th>
<th>PSA</th>
<th>MEA</th>
<th>Genosorb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity [Nm³/h]</td>
<td>8,608</td>
<td>7.075</td>
<td>4.175</td>
<td>1,305</td>
</tr>
<tr>
<td>Percent [%]</td>
<td>41</td>
<td>33</td>
<td>20</td>
<td>6</td>
</tr>
</tbody>
</table>

Trends in biomethane production

- Most of the biomethane plants are operated by energy supply companies.
- Transport and sales of biomethane from its production site to the end consumer is usually coordinated by a biogas trading company.
- Repowering of biogas plants is often used for gas upgrading and gas injection. Around 20% of the injection plants are repowered biogas plants.
- A new process is developed which allows the return injection from a local grid to a host grid of higher pressure.
Outlook for 2010

- Around 500 new biogas plants will be built in 2010.
- The installed electric capacity will grow by 200 to 250 MW.
- Specific biogas grids will be installed in some cities with CHP’s at different locations (Example: City Lünen, 9 mill Nm³/a biogas, 10 CHP).
- The number of bioenergy villages increases due to the financial support given by the Federal Ministry of Agriculture and some State Ministries.
- Around 35 biogas upgrading plants will be constructed in 2010.
- The conditioning of digestate (drying) increases and the products are market as organic fertilizer.

Many thanks for your attention!

IEA Task 37
Copenhagen, 26-28 May 2010