Biogas Plant Inventory

Number of plants

Number of plants (end of 2012)

Agriculture: 89 plants
Biowaste: 26 plants
Industrial waste water: 22 plants
Waste water treatment plants: ~ 463 plants (282 with CHP)

Detailed statistic data:
http://www.bfe.admin.ch/themen/00526/00541/00543/?dossier_id=00772&lang=de
Biogas Plant Inventory

Gross gas production

- Agriculture
- Industrial waste water
- Biowaste

GWh/a

250
200
150
100
50
0

Biogas Plant Inventory

WWTP – gross gas production

GWh/a

# Biogas Upgrading Plant Inventory

<table>
<thead>
<tr>
<th>Place</th>
<th>Substrate</th>
<th>Utilisation</th>
<th>Technology</th>
<th>Capacity</th>
<th>Operation start</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volketswil</td>
<td>Biowaste</td>
<td>Gas grid</td>
<td>Chemical scrubber</td>
<td>100 Nm³/h</td>
<td>2010</td>
</tr>
<tr>
<td>Lavigny</td>
<td>Biowaste</td>
<td>Gas grid</td>
<td>PSA</td>
<td>100 Nm³/h</td>
<td>2009</td>
</tr>
<tr>
<td>Utzensdorf</td>
<td>Biowaste</td>
<td>Gas grid</td>
<td>PSA</td>
<td>100 Nm³/h</td>
<td>2009</td>
</tr>
<tr>
<td>Pratteln</td>
<td>Biowaste</td>
<td>Gas grid</td>
<td>Organic physical scr.</td>
<td>100 Nm³/h</td>
<td>2006</td>
</tr>
<tr>
<td>Otelfingen</td>
<td>Biowaste</td>
<td>Vehicle fuel</td>
<td>PSA</td>
<td>50 Nm³/h</td>
<td>1998</td>
</tr>
<tr>
<td>Rümlang</td>
<td>Biowaste</td>
<td>Vehicle fuel</td>
<td>PSA</td>
<td>30 Nm³/h</td>
<td>1995</td>
</tr>
<tr>
<td>Samstagern</td>
<td>Biowaste</td>
<td>Gas grid</td>
<td>PSA</td>
<td>50 Nm³/h</td>
<td>1995</td>
</tr>
<tr>
<td>Widnau</td>
<td>Agr., co-digestion</td>
<td>Gas grid</td>
<td>PSA</td>
<td>100 Nm³/h</td>
<td>2008</td>
</tr>
<tr>
<td>Inwil</td>
<td>Agr., co-digestion</td>
<td>Gas grid</td>
<td>Amine scrubber</td>
<td>300 Nm³/h</td>
<td>2008</td>
</tr>
</tbody>
</table>
## Biogas Upgrading Plant Inventory

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<th>Capacity</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Geneva</td>
<td>Sewage sludge</td>
<td>Gas grid</td>
<td>PSA</td>
<td>350 Nm³/h</td>
<td>2013</td>
</tr>
<tr>
<td>Zurich</td>
<td>Sewage sludge</td>
<td>Gas grid</td>
<td>Amine scrubber</td>
<td>1400 Nm³/h</td>
<td>2013</td>
</tr>
<tr>
<td>Fribourg</td>
<td>Sewage sludge</td>
<td>Gas grid</td>
<td>PSA</td>
<td>250 Nm³/h</td>
<td>2012</td>
</tr>
<tr>
<td>Roche</td>
<td>Sewage sludge</td>
<td>Gas grid</td>
<td>PSA</td>
<td>250 Nm³/h</td>
<td>2009</td>
</tr>
<tr>
<td>Obermeilen</td>
<td>Sewage sludge</td>
<td>Gas grid</td>
<td>Chemical scrubber</td>
<td>60 Nm³/h</td>
<td>2008</td>
</tr>
<tr>
<td>Berne</td>
<td>Sewage sludge</td>
<td>Gas grid</td>
<td>Amine scrubber</td>
<td>1500 Nm³/h</td>
<td>2007</td>
</tr>
<tr>
<td>Romanshorn</td>
<td>Sewage sludge</td>
<td>Gas grid</td>
<td>Organic physical scr.</td>
<td>20 Nm³/h</td>
<td>2007</td>
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<tr>
<td>Emmenbrücke</td>
<td>Sewage sludge</td>
<td>Gas grid</td>
<td>PSA</td>
<td>90 Nm³/h</td>
<td>2005</td>
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<tr>
<td>Münchwilen</td>
<td>Animal by-products</td>
<td>Gas grid</td>
<td>Chemical scrubber</td>
<td>650 Nm³/h</td>
<td>2011</td>
</tr>
<tr>
<td>Aarberg</td>
<td></td>
<td>Gas grid</td>
<td>PSA</td>
<td>500 Nm³/h</td>
<td>2013</td>
</tr>
</tbody>
</table>
Biogas Upgrading Plant Inventory

GWh/year

Biogas Utilisation
(numbers from 2012)

Total gross biogas production: 1024 GWh/year
(including WWTP)

- Total electricity production: 258 GWh/year
- Total biomethane production: 90 GWh/year

Number of gas filling stations: 135
New Biogas Plants (2013, 2014)

**Agriculture**
- **Bure**  Feb 2013, CHP 360 kW
- **Gutenswil**  Mai 2013, CHP 75 kW
- **Einsiedeln**  June 2013, CHP
- **Seigneux**  Aug 2013, CHP 150 kW
- **Densbüren**  Aug 2013, CHP 120 kW
- **Seedorf**  Sept 2013, CHP

**Biowaste**
- **Zürich**  Aug 2013, Upgrading
Biogas Plants Under Construction

Agricultural installations
Cournillens (CHP)

Biowaste
Vétroz (Kompogas, upgrading)
Winterthur (Kompogas, upgrading)
Financial Support Systems

Feed-in tariff for electricity from biogas

<table>
<thead>
<tr>
<th>Power class</th>
<th>≤ 50 kW</th>
<th>≤ 100 kW</th>
<th>≤ 500 kW</th>
<th>≤ 5 MW</th>
<th>&gt; 5 MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic tariff [CHF/kWh]</td>
<td>0.28</td>
<td>0.25</td>
<td>0.22</td>
<td>0.185</td>
<td>0.175</td>
</tr>
<tr>
<td>Agricultural bonus [CHF/kWh]</td>
<td>0.18</td>
<td>0.16</td>
<td>0.13</td>
<td>0.045</td>
<td>0</td>
</tr>
<tr>
<td>Heat bonus [CHF/kWh]</td>
<td>0.025</td>
<td>0.025</td>
<td>0.025</td>
<td>0.025</td>
<td>0.025</td>
</tr>
<tr>
<td><strong>Maximum [CHF/kWh]</strong></td>
<td><strong>0.485</strong></td>
<td><strong>0.435</strong></td>
<td><strong>0.375</strong></td>
<td><strong>0.255</strong></td>
<td><strong>0.20</strong></td>
</tr>
</tbody>
</table>

Found for biomethane injection
- Voluntary support program by the Swiss Gas Association
- Objective: injection of 300 GWh biomethane within 6 years


Certificates for emission compensation
Projects reducing GHG emissions can receive financial support

News and Developments

New positive list
The federal office of agriculture has updated the input list for biogas and composting facilities (January 2014):

Discussions about fusion
The two most important organisations involved in Biogas – Biomasse Schweiz and VKS-ASIC – consider to unify their forces. The members will vote on the fusion of the two organisations in autumn (Sept-Dec) 2014.
News and Developments

Organic fraction in household waste
A study of the federal office of environnement shows that the household wastes are still composed by one third of organic material. This proves that there is still an high potential for optimisation of the waste streams and their energetic recovery.


Presidency of EBA
The Presidency of EBA is no longer held by Switzerland (A. Wellinger); new President is J. Štambaský from the Czech biogas association
News and Developments

Blue BONSAI: in pilot stage

- **Project:** small scale biogas upgrading plant
- **Capacities:** 1 and 15 Nm$^3$/h of upgraded gas
- **Technology:** membrane separation
- **Markets:** decentralized biogas filling station or injection into the gas grid
- **Goals:** pilot plants shall demonstrate the economic feasibility and reliability of plants smaller than 50 Nm$^3$/h of upgraded gas

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U. Oester, Apex AG, Däniken, Switzerland, [info@apex.eu.com](mailto:info@apex.eu.com) or S. Duttwiler, Duttwiler Energietechnik, Flurlingen, Switzerland, [info@reg-en.ch](mailto:info@reg-en.ch)
Current Studies and Research Projects

**Determination of methane production in laboratory**
Comparision of laboratory BMP test results and real methane production in full-scale plants (2012 – 2014)
C. Holliger, EPFL ([http://lbe.epfl.ch/page-83701.html](http://lbe.epfl.ch/page-83701.html))

**ORION – Organic waste management by automated small-scale AD**
Development of an on-site organic waste treatment for SME ([www.project-orion.eu](http://www.project-orion.eu)). EU 7th framework program.

*Source: www.project-orion.eu*
Current Studies and Research Projects

**Agricultural dry batch digestion**
Pilot plant of a dry batch digester, fed with dry manure (2012 – 2014). C. Morrier

**Hygiene of digestate**
Tracking of pathogens in substrates from digester feeding until digestate spreading on agricultural fields (2012 – 2014). J. Fuchs / FIBL

**Membrane separation**
Studies and Research Projects

Published reports 2013 / 2014

- Post-treatment of digestate. H. Engeli et al.
- Mini-biogas. Identification and evaluation of technologies for small-scale digestion. Y. Membrez et al.
- Digestion of manure and Co-Substrates in a Membrane Bioreactor. Meier U. et al.