Country Report Switzerland

Jyväskylä, April 27, 2009

Arthur Wellinger
Nova Energie Ltd.
The contribution is made up of 3 parts:

- Deployment of biogas production and utilisation in Switzerland
- Technical developments
- Legal novelties
Agricultural Waste: Number of Plants & Energy Production

Entwicklung Landwirtschaft

Anzahl Anlagen

Jahr

Anzahl Anlagen

Bruttogasproduktion GWh/a

NOVA Energie
Bio-Waste: Nr of Plants & Energy Production

Number of plants

- Number of plants
- Gross gas production GWh/a

Year
- 1990
- 1993
- 1994
- 1996
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007

Number of plants:
- 1
- 3
- 4
- 6
- 8
- 10
- 11
- 13
- 13
- 13
- 12
- 16
- 18
- 62.4
- 75.2
- 88.9

Gross gas production GWh/a:
- 1.9
- 4.77
- 7.95
- 11.8
- 17.3
- 30.8
- 43.9
- 51.8
- 51.8
- 42.8
- 14
- 16
- 18

NOVA Energie
## Biogas fuel in Switzerland

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of vehicles</td>
<td>730</td>
<td>1900</td>
<td>2400</td>
<td>5800</td>
<td>7163</td>
</tr>
<tr>
<td>Number of upgrading</td>
<td>4</td>
<td>7</td>
<td>6</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>plants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of fuelling</td>
<td>35</td>
<td>60</td>
<td>70</td>
<td>98</td>
<td>106</td>
</tr>
<tr>
<td>stations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of biogas [%]</td>
<td>45</td>
<td>37</td>
<td>26</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Price at pump station</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>in €/l petrol eq.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biogas</td>
<td>0.62</td>
<td>0.64</td>
<td>0.8</td>
<td>0.68</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1.32</td>
<td>1.32</td>
<td>1.34</td>
<td>0.68</td>
<td></td>
</tr>
</tbody>
</table>
Genosorb: Chemical washer

Sterling Pratteln
PSA with activated carbon

Carbotech Lucerne  Carbotech Berne

NOVA Energie
PSA with activated carbon

Verdesis, Widnau
Methane slip

Off-gas contains up to 12% CH4

New!

District heating

so far

45% CO₂
55% CH₄

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How operates a FLOX® burner?

Flame operation

FLOX-operation
Swiss Farmer Power

- Solid waste digestion of source separated waste with Kompogas and liquid digestion of manure
- Upgrading of gas with PSA (Verdesis)
- Off-gas oxidation with a Flox burner (Verdesis)
- Treatment of separated (decanter) liquid phase through UF and RO to „drinking water“ quality (3A)
- Distribution of concentrate and solid phase to 70 farmers
Swiss Farmer Power
Swiss Farmer Power

100kW Flox-Burner
Swiss Farmer Power
NGV Sales in 2008 and total

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1 Opel Combo CNG</td>
<td>1103</td>
<td>355</td>
<td>392</td>
<td>-9.4</td>
</tr>
<tr>
<td>2 VW Touran EcoFuel</td>
<td>588</td>
<td>197</td>
<td>268</td>
<td>-26.5</td>
</tr>
<tr>
<td>3 Fiat Panda Natural Power</td>
<td>465</td>
<td>185</td>
<td>280</td>
<td>-33.9</td>
</tr>
<tr>
<td>4 Opel Zafira CNG</td>
<td>1008</td>
<td>157</td>
<td>294</td>
<td>-46.6</td>
</tr>
<tr>
<td>5 Citroën C3 GNV</td>
<td>503</td>
<td>157</td>
<td>230</td>
<td>-31.7</td>
</tr>
<tr>
<td>6 VW Caddy EcoFuel</td>
<td>383</td>
<td>142</td>
<td>183</td>
<td>-22.4</td>
</tr>
<tr>
<td>7 Fiat Doblo Natural Power</td>
<td>397</td>
<td>53</td>
<td>112</td>
<td>-52.7</td>
</tr>
<tr>
<td>8 Ford Focus Greenpower</td>
<td>132</td>
<td>51</td>
<td>35</td>
<td>45.7</td>
</tr>
<tr>
<td>9 Opel Vivaro 2.0 i 16V CNG</td>
<td>43</td>
<td>43</td>
<td>---</td>
<td>neu</td>
</tr>
<tr>
<td>10 Mercedes B170 NGT</td>
<td>34</td>
<td>34</td>
<td>---</td>
<td>neu</td>
</tr>
<tr>
<td>11 Chevrolet Nubira SW CNG</td>
<td>107</td>
<td>32</td>
<td>75</td>
<td>-57.3</td>
</tr>
<tr>
<td>12 IVECO Daily CNG</td>
<td>97</td>
<td>27</td>
<td>45</td>
<td>-40.0</td>
</tr>
<tr>
<td>13 Volvo V50 Multi-Fuel</td>
<td>18</td>
<td>18</td>
<td>---</td>
<td>neu</td>
</tr>
<tr>
<td>14 Ford Fiesta Greenpower</td>
<td>34</td>
<td>17</td>
<td>5</td>
<td>240.0</td>
</tr>
<tr>
<td>15 Mercedes Sprinter NGT</td>
<td>43</td>
<td>13</td>
<td>0</td>
<td>neu</td>
</tr>
<tr>
<td>16 Fiat Multipla Natural Power</td>
<td>388</td>
<td>11</td>
<td>48</td>
<td>-77.1</td>
</tr>
<tr>
<td>17 Ford S-Max Greenpower</td>
<td>12</td>
<td>11</td>
<td>1</td>
<td>1000.0</td>
</tr>
<tr>
<td>18 Citroën Berlingo First GNV*</td>
<td>118</td>
<td>10</td>
<td>23</td>
<td>-56.5</td>
</tr>
<tr>
<td>19 Peugeot Partner First GNV*</td>
<td>69</td>
<td>10</td>
<td>2</td>
<td>400.0</td>
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<tr>
<td>20 Ford Transit Greenpower</td>
<td>66</td>
<td>10</td>
<td>30</td>
<td>-66.7</td>
</tr>
</tbody>
</table>
Feed-in law for electricity from RE

The law passed the parliament in 2007

It has a cap at 0.4 ¢/kWh additional cost (Germany is at 7¢/kWh)
theroff hydro will get max 50%
   PV max 10%
   Biomass max 30%
   Wind max 30%

On 1st of May 2008 applications could be first placed
On May 2, the cap for PV was reached!
On February 1, 2009 the program was stopped because the cap was over booked by about 12%!
Feed-in law: Electricity from biogas

The retribution is based on the calculated equivalent power in relation to the respective class of power:

<table>
<thead>
<tr>
<th>Electric power</th>
<th>Basic compensation [UScts./kWh]</th>
<th>Agricultural bonus [UScts./kWh]</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 50 kW</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>&lt;= 100 kW</td>
<td>21.5</td>
<td>13.5</td>
</tr>
<tr>
<td>&lt;= 500 kW</td>
<td>19</td>
<td>11</td>
</tr>
<tr>
<td>&lt;= 5 MW</td>
<td>16</td>
<td>6</td>
</tr>
<tr>
<td>&gt; 5 MW</td>
<td>15</td>
<td>0</td>
</tr>
</tbody>
</table>

The agricultural bonus will be retributed only under condition that
- The major substrate is animal manure and waste from agricultural production
- co-substrates + energy crops < 20% (fresh weight)
Feed-in law: Electricity from biogas (2)

KVA: Waste incineration
SVA: Incineration of sludge from WWTP
KDA: Biogas from landfill and WWTP
UEB: Other biogas plants and wood

47 agric. Plants with manure bonus
26 industrial or agric. plants w/o MB
Labeling of electricity and biomethane

Requirements:  - Local criteria
                - Global criteria (LCA)

We are working on a new LCA

⇒ Allocation of environmental load is a problem
LCA for mineral oil tax exemption

A new ordinance has just been released on April 3rd, 09 defining the requirements to proof sustainability

- It is almost impossible to produce biomethane from energy crop unless using intermediate crop or perennial grass
- An even more pronounced fight for industrial waste material has started
GHG emission inventory

Table E-4 Switzerland’s total gross GHG emissions (excluding LULUCF) in CO₂ equivalent (Gg) and the contribution of individual source categories, selected years.

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gg CO₂ eq</td>
<td>%</td>
<td>Gg CO₂ eq</td>
<td>%</td>
<td>Gg CO₂ eq</td>
<td>%</td>
<td>Gg CO₂ eq</td>
<td>%</td>
<td>Gg CO₂ eq</td>
<td>%</td>
<td>Gg CO₂ eq</td>
<td>%</td>
</tr>
<tr>
<td>1. Energy</td>
<td>42056</td>
<td>79.6%</td>
<td>41651</td>
<td>81.6%</td>
<td>42433</td>
<td>82.2%</td>
<td>44350</td>
<td>82.7%</td>
<td>43653</td>
<td>82.7%</td>
<td>41966</td>
<td>81.9%</td>
</tr>
<tr>
<td>2. Industrial Processes</td>
<td>3258</td>
<td>6.2%</td>
<td>2854</td>
<td>5.5%</td>
<td>2789</td>
<td>5.4%</td>
<td>3081</td>
<td>5.7%</td>
<td>3041</td>
<td>5.7%</td>
<td>3058</td>
<td>6.0%</td>
</tr>
<tr>
<td>3. Solvent and Other Product Use</td>
<td>458</td>
<td>0.9%</td>
<td>371</td>
<td>0.7%</td>
<td>282</td>
<td>0.5%</td>
<td>230</td>
<td>0.4%</td>
<td>222</td>
<td>0.4%</td>
<td>231</td>
<td>0.5%</td>
</tr>
<tr>
<td>4. Agriculture</td>
<td>5903</td>
<td>11.2%</td>
<td>5638</td>
<td>11.0%</td>
<td>5411</td>
<td>10.5%</td>
<td>5282</td>
<td>9.9%</td>
<td>5277</td>
<td>9.8%</td>
<td>5346</td>
<td>12.4%</td>
</tr>
<tr>
<td>5. Waste</td>
<td>994</td>
<td>1.9%</td>
<td>824</td>
<td>1.5%</td>
<td>733</td>
<td>1.4%</td>
<td>682</td>
<td>1.3%</td>
<td>663</td>
<td>1.2%</td>
<td>663</td>
<td>1.3%</td>
</tr>
<tr>
<td>Total (excluding LULUCF)</td>
<td>52705</td>
<td>100.0%</td>
<td>51639</td>
<td>100.0%</td>
<td>51468</td>
<td>100.0%</td>
<td>53145</td>
<td>100.0%</td>
<td>53173</td>
<td>100.0%</td>
<td>51285</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Goal for 2012: -8%  
(as compared to 1990)
Achieved 2007: -2.7%

Total emission: 6.73 t/capita
European Biogas Association

Founded: 3.2.2009 in Hannover
Members: 11 founding members: Germany, Italy, Lethuania, Latvia, Austria, Poland, Roumania, Spain, Czech Republic, Switzerland
4 new members since: France (2), U.K., Sweden,
Seat: Brussels (EREF)
Secretariat: Freising

Goals: Optimisation of Information flow
Lobbying in Brussels
Acquisition of EU projects to promote biogas application
European Biogas Association

Committee:

President: Arthur Wellinger
Vice presidents: Harm Grobrügge (D)  
               Franz Kirchmeyr (A)
Representatives: Pierro Gattoni (I)  
                 Jan Štambaský (CzR)

Secretary general: Sebastian Stolpp (D)