Country report: Sweden

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Swedish Gas Centre
Sweden
Statistics for 2006

- 1.2 TWh produced per year
- 223 plants
  - 138 municipal sewage treatment plants
  - 60 landfills
  - 3 Industrial wastewater treatment plants
  - 14 Co-digestion plants
  - 8 Farm plants

Source: Swedish Energy Agency, ER 2008:02

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Utilization of biogas in Sweden (2006)

Source: Swedish Energy Agency, ER 2008:02

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Utilization of biogas as vehicle gas

Source: Swedish Gas Association

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Utilization of biogas as vehicle gas

Source: Swedish Gas Association

Filling stations

Source: Swedish Gas Association

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Voluntary system for control of emissions of methane

Photo: Magnus Holmberg, Vattenfall Power Consultants

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Reasons to implement the system

• Environmental
  – Methane is a strong GHG
  – Odour

• Economical
  – Reduced leaks and emissions = higher yield

• Safety

• Goodwill
  – To show that the biogas sector acts responsibly
  – To be pro-active on this issue (relation to authorities)

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Plants that have joined

17 Biogas production plants
- Bjuv
- Boden
- Borås
- Eskilstuna (WWT)
- Falköping
- Helsingborg
- Jönköping (mainly WWT)
- Kalmar
- Kristianstad
- Laholm
- Linköping
- Linköping (WWT)
- Norrköping
- Skellefteå
- Uppsala
- Vänersborg
- Västerås

16 Biogas upgrading plants
- Bjuv
- Boden
- Borås
- Bromma (WWT)
- Eskilstuna (WWT)
- Göteborg (WWT)
- Helsingborg
- Jönköping (mainly WWT)
- Kalmar
- Laholm
- Linköping
- Norrköping
- Norrköping (WWT)
- Skellefteå
- Uppsala
- Västerås

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Current setup of the system

• Plant personnel identifies sources of emission

• Inventory of whole plant – Systematic leak detection
  – If possible, leaks are dealt with at once

• Quantification
  – Measurements or estimations of methane and flow
  – Calculations of mass emission and percentage loss

• Targets and measures
  – Plants report results, set targets and plan measures to reach the targets

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System boundaries – biogas plant

Source: Magnus Holmberg, Vattenfall Power Consultants

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System boundaries – biogas upgrading plant

Source: Magnus Holmberg, Vattenfall Power Consultants
Leak detection

Biogas plants
• In general, a few larger leaks
  – Relief valves
  – Digestion residue (digestate)

Biogas upgrading plants
• In general, many smaller leaks
  – Various gas equipment parts
  – Compressors

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Quantification – biogas plants

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Quantification – upgrading plants

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Put things in perspective

• Emissions from one biogas plant producing 3 million Nm$^3$/year with a methane loss of 2 %, is only 0.03 % compared to total emissions from animals.

• Only 8 % of Swedish GHG emissions is methane.

• Emissions of methane from biogas plants are not significant to Swedish emissions of GHG
<table>
<thead>
<tr>
<th>Technique</th>
<th>Number of plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water wash, with water regeneration</td>
<td>18</td>
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<tr>
<td>Water wash, without water regeneration</td>
<td>7</td>
</tr>
<tr>
<td>PSA</td>
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<tr>
<td>Chemical absorption</td>
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<td>Sum</td>
<td>34</td>
</tr>
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</table>

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Upgrading plants in Sweden
257 registered delegates...
...from 15 different countries
19 exhibitors
25 presentations available on www.nordicbiogas.com
Thank you for your attention!

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