Biogas for vehicles

Lars Holmquist
Göteborg Energi
Our owners say:

“Göteborg Energi shall actively contribute to the development of a sustainable Göteborg”

Our tools:
- Infrastructure
- Recycling of energy
- Innovative technology
- Innovative business models

Our roles:
- District heating
- Electricity retailer
- Electricity and Gas distribution
- Wind power
- Energy services
  - Biogas
  - etc...
Our perspective on a Circular Economy
Biogas potential

Biogas has a wide range of biomass feedstock.

<table>
<thead>
<tr>
<th>Cities</th>
<th>Agriculture</th>
<th>Forestry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sludge</td>
<td>Manure</td>
<td>Residues from forest &amp; industry</td>
</tr>
<tr>
<td>Household waste</td>
<td>Rest-products</td>
<td></td>
</tr>
<tr>
<td>Industry org waste</td>
<td>Energy crops</td>
<td></td>
</tr>
<tr>
<td>Landfill</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The largest potential of all biofuels!
Where are the fossil fuels in Sweden?

TWh
Rya WWTP

- Regional Wastewater Treatment plant.

- Serves a population equivalent of approx 800000 with a total catchment area of 200 km².

- Gothenburg is traditionally an industrial city but service sector increasing.

- Gryaab operates the plant and the network of tunnels (130 km) supplying the plant.

- Combined sewers - Influent flows vary between 2-16 m³/s.
Gasendal

- Biogas from Göteborg’s WWTP.
- 60 GWh = 6,000 cars
- Distributed through the NG grid.
- Investment: 35 MSEK
- Support from KLIMP.
- In operation since 2007.
Lidköping Biogas

- Sweden’s first plant for Liquefied Biogas.
- 60 GWh = 6,000 cars
- Distributed by tanker truck.
- Support from KLIMP.
- In operation since 2012.
GoBiGas – The Great Leap Forwards

Performance goals

- Biomass to biomethane 65 - 70%
- Energy efficiency > 90%
- Continuous operation 8000 h/y

Phase 1

- Demonstration plant
- Indirect gasification
- 20 MW generating 160 GWh/year
- Evaluation, R&D programme
- In operation 2014
- 22 million euro support from government

Phase 2

- Commercial plant
- Decision after evaluation of Phase 1
- Technology not yet chosen
- 80-100 MW generating 640-800 GWh/year
CNG infrastructure in Sweden

• 151 public filling stations in Sweden
• Around two thirds of gas sold is biogas
The first ecolabelled fuel in the world

- Certified from well to wheel
- Minimum 1/3 renewable fuel
- Limited greenhouse gas emissions
- Controlled energy usage during production and distribution
- Lower cancer risk
- Certified sustainable and traceable cultivation
The Green gas concept

A green gas concept enables biogas to be offered at all filling stations for vehicles.
Vehicles are on the market
Volvo Trucks

Methane – a prioritized alternative fuel

- Energy efficiency and climate in focus
- MethaneDiesel technology and liquified methane opens up for long-distance
- Volvo FM MethaneDiesel
  - LNG tank system
  - Able to run on diesel only
  - 50-80% gas
  - Range 26-60 ton
  - Driving range 500-1000 km
What about the future – Can the transport sector be de-carbonized?

Biofuels are especially important in the mid-term perspective. Other measures take more time.
Potentials for biogas production – It depends on policy instruments

Realiserbar biogaspotential år 2030 under givna förutsättningar

- Scenario 3: 1.2 - 2.5 TWh
- Scenario 2: 9 - 12 TWh
- Scenario 1: 11 - 22 TWh

2014-06-05 •