Bio resources and potential for biogas

Energy Lab, 26th October 2017, Einar Aalen Hunsager
Key points

• What are the potential biogas resources?
• What is the potential for biogas demand?
• What is the potential for further development?
What is biogas?

• Energy carrier and energy source:
  > Energy from biological material carried in gas form
  > Gas based on biological energy sources
Value chain perspective

**Resources**
- Manure
- Sewer sludge
- Household waste
- Industry waste
- Food crops

**Production**
- Economic scale?
- Technical procedure?
- Co-digestion?

**Products /use**
- Flare
- Combined heat and power (CHP)
- Heating
- Fuel for transport
- Biofertilizer
- Biobased CO2
What are the potential biogas resources in Hordaland today?
Expected biogas resources in Hordaland (energy potential)

Sources: (HOG Energi, FMHO, Fiskeridirektoratet, Nibio 2016, SSB)
<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure</td>
<td>&lt;14 GWh</td>
<td>14 places (post number) &gt;0.6 GWh (Nibio).</td>
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<tr>
<td>Landfill gas</td>
<td>&lt;10 GWh</td>
<td>Landfill ban 2009. Landfill methan reduced from 35 GWh 2010 to 10 GWh 2016 (FMHO). Flaring.</td>
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<tr>
<td>Household organic waste</td>
<td>4 – 20 GWh</td>
<td>No collection in Bergen. 25 % additional costs for separate collection. In Nordhordaland and Sunnhordland organic waste is collected and composted in Fitjar (4 GWh 2012).</td>
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<tr>
<td>Industry organic waste</td>
<td>1 – 2 GWh</td>
<td>Wide-spread.</td>
</tr>
<tr>
<td>Sewer sludge</td>
<td>3 GWh</td>
<td>Project run by HOG Energy to explore the potential of a coordinated collection from the surrounding municipalities of Bergen.</td>
</tr>
<tr>
<td>Aquaculture sludge</td>
<td>1 – 15 GWh</td>
<td>Today industry only collects sludge from land-based facilities. The sludge potential from all the fishes is much bigger then from the hatchery which is kept on land today.</td>
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<tr>
<td>Dead fish</td>
<td>22 GWh</td>
<td>Biogas production in Denmark? Feed production and cosmetics.</td>
</tr>
<tr>
<td>Fish entrails</td>
<td>0 GWh</td>
<td>Oil and feed production.</td>
</tr>
<tr>
<td>Greiner, røter og toppar (GROT)</td>
<td>95 GWh</td>
<td>Branches and tops = 25 % of felling. This is not transported today. Gasification produces heat.</td>
</tr>
<tr>
<td>Anna trevirke og energivirke</td>
<td>0 GWh</td>
<td>Priority for material use</td>
</tr>
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</table>
What is the potential for biogas demand in Hordaland today?
Potential customers: Natural gas usage in Hordaland 2016

GWh

0 50 100 150 200 250 300 350 400 450 500

Industri  Sjøtransport  Landtransport  Oppvarming o.l.

LNG  CNG
Klimagassutslepp i Hordaland etter kjelde 2015

- Olje- og gassutvinning - stasjonær forbrenning, landanlegg: 139 000 (3%)
- Olje- og gassutvinning - prosessutslipp, landanlegg: 43 000 (1%)
- industri og bergverk - stasjonær forbrenning: 722 000 (15%)
- Industri og bergverk - prosessutslipp: 1513 000 (33%)
- Energiforsyning: 123 000 (3%)
- Oppvarming i andre næringer og husholdninger: 631 000 (14%)
- Veitrafikk - lette kjøretøy: 734 000 (16%)
- Veitrafikk - tunge kjøretøy: 127 000 (3%)
- Dieseldrevne motorredskaper: 122 000 (3%)
- Jordbruk - husdyr og husdyrgjødsel: 123 000 (3%)
- Jordbruk - kunstgjødsel og annet jordbruk: 123 000 (3%)
- Avfallsdeponigass: 12 000 (0%)
- Avløp og avløpsrensing: 22 000 (5%)

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What is the potential for further development?
When to make biogas? When to use biogas?

- Preservation
- Reuse
- Recycle
- Energetical use
- Despose

- Battery electric
- Hydrogen electric
- Biogas
- Synthetic diesel (HVO)
- Biodiesel
Barriers and strengths

- Lack of rentability
- Need for coordination across sectors
- Transport distances
- Price difference biogas vs natural gas
- Lack of demand for biproducts

- Gas competence and infrastructure
- Industry waste from aquaculture (in combination with lignious material?)
State and regional tools to enfold the potential

Depository treatment of waste is ruled out
Delivery support for manure to biogas reactor (60 NOK/ton)
State cofunding for
  > pilot facilities
  > Substrat combination tests
Regiona1 support to Hordavekst – aiming for coordinated collection and delivery of waste from municipalities

State funding for R&D in the cooperation along the value chain:
  > Resources
  > Productions processes
  > Services
State investment support to new reactors

Regional funding for
  > ocean-energy
  > Bioeconomy
  > Innovative municipality service production

State support of filling infrastructure
Natural gas fuel tax (vegbruksavgift) with exemption for >50 % biogas
Region and municipality explore the need for help to energy stations

09.11.2017 15