HORDALAND FYLKESKOMMUNE

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?

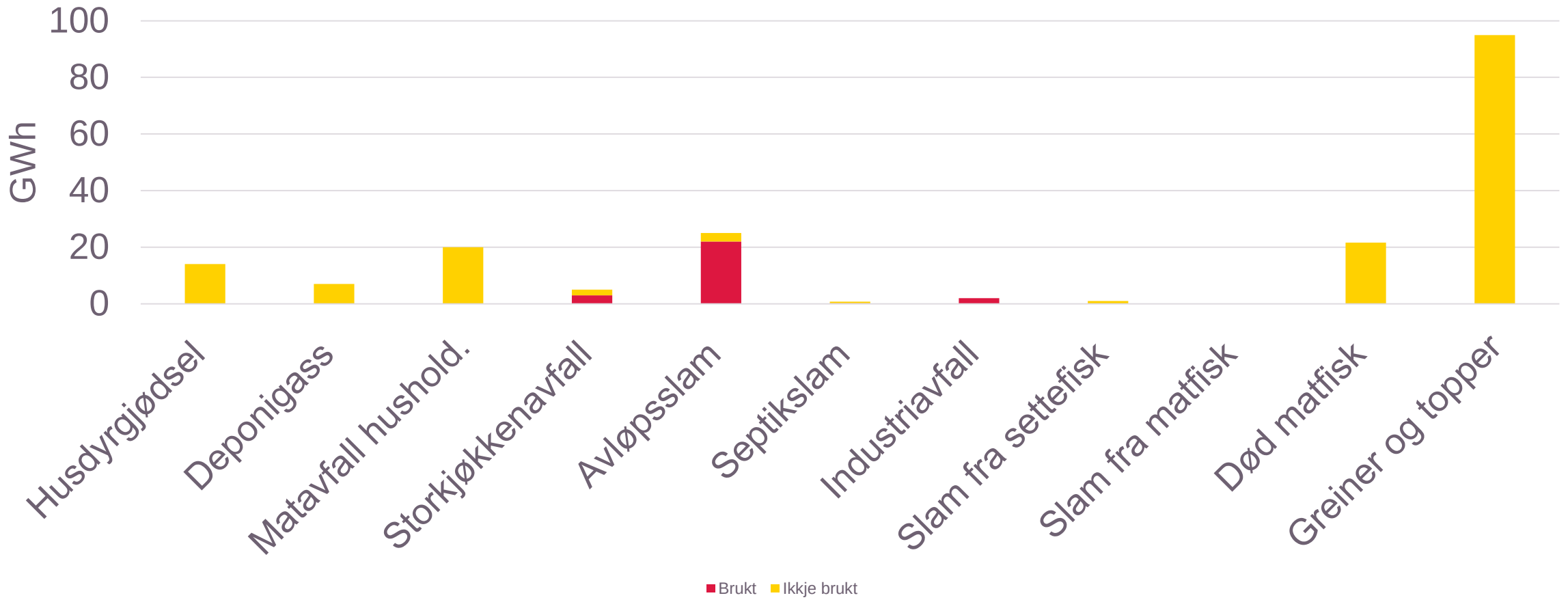
- Energy carrier *and* energy source:
  - > Energy from biological material carried in gas form
  - > Gas based on biological energy sources

Value chain perspective

Resources	Production	Products /use
• Manure • Sewer sludge • Houshold waste • Industry waste • Food crops	• Economic scale? • Technical procedure? • Co-digestion?	• 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)



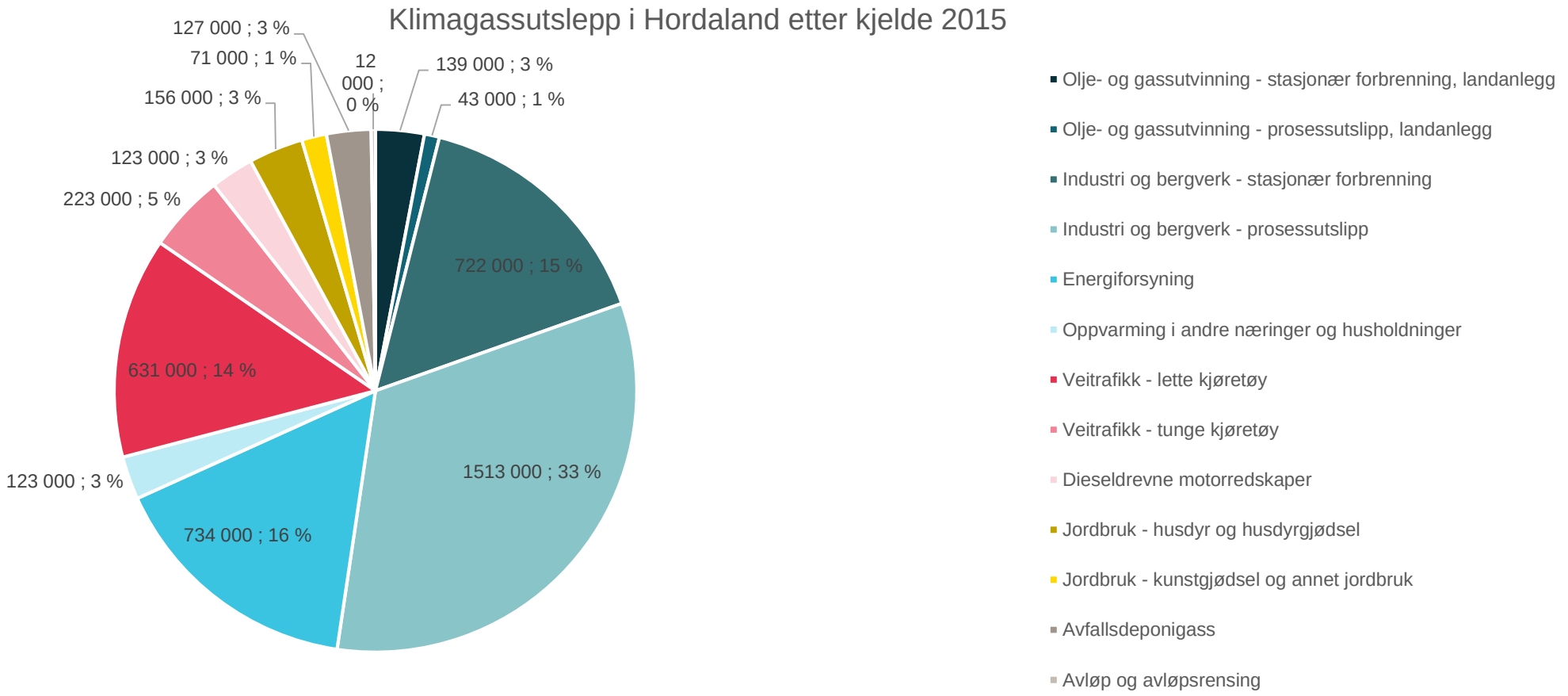
Sources: (HOG Energi, FMHO, Fiskeridirektoratet, Nibio 2016, SSB)

Manure	<14 GWh	14 places (post number) >0,6 GWh (Nibio).
Landfill gas	<10 GWh	Landfill ban 2009. Landfill methan reduced from 35 GWh 2010 to 10 GWh 2016 (FMHO). Flaring.
Household organic waste	4 – 20 GWh	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).
Industry organic waste	1 – 2 GWh	Wide-spread.
Sewer sludge	3 GWh	Project run by HOG Energy to explore the potential of a coordinated collection from the surrounding municipalities of Bergen.

Aquaculture sludge	1 – 15 GWh	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.
Dead fish	22 GWh	Biogas production in Denmark? Feed production and cosmetics.
Fish entrails	0 GWh	Oil and feed production.
Greiner, røter og toppar (GROT)	95 GWh	Branches and tops = 25 % of felling. This is not transported today. Gasification produces heat.
Anna trevirke og energivirke	0 GWh	Priority for material use

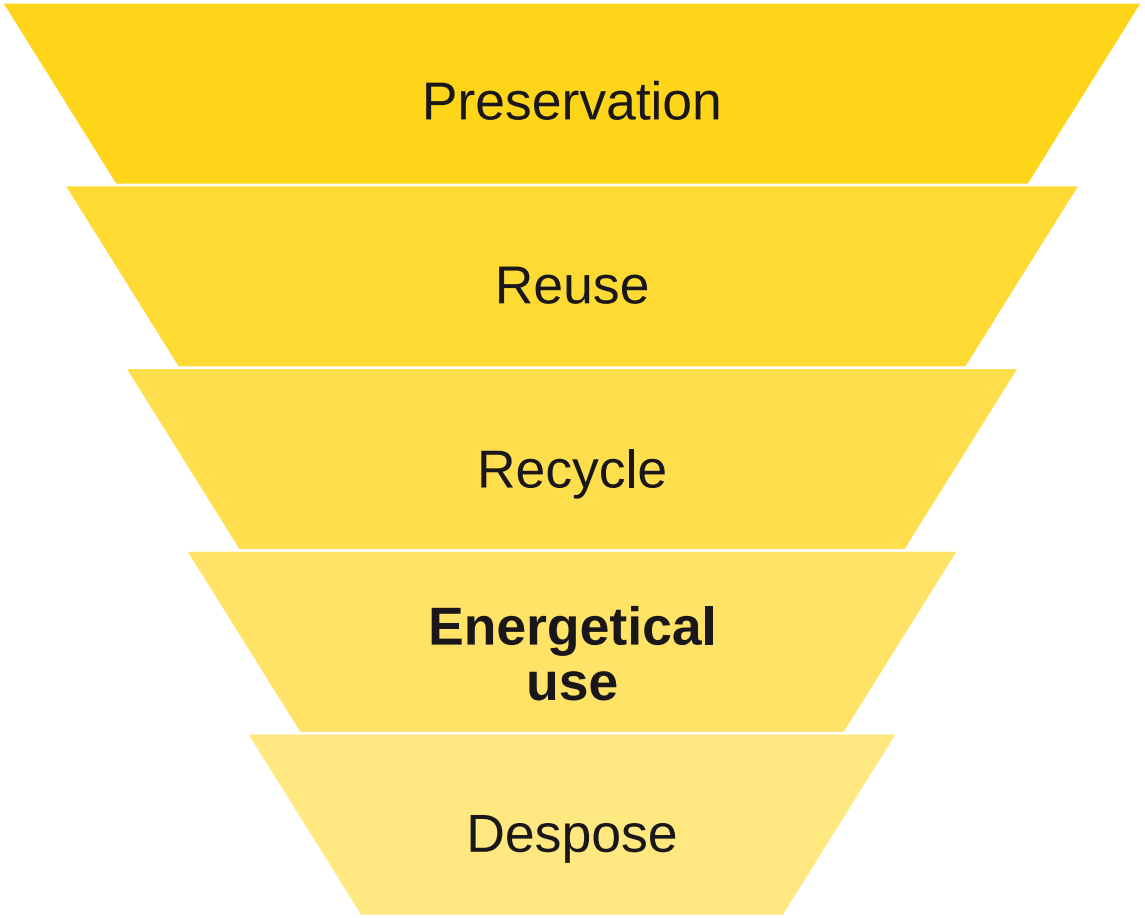
What is the potential for biogas demand in Hordaland today?

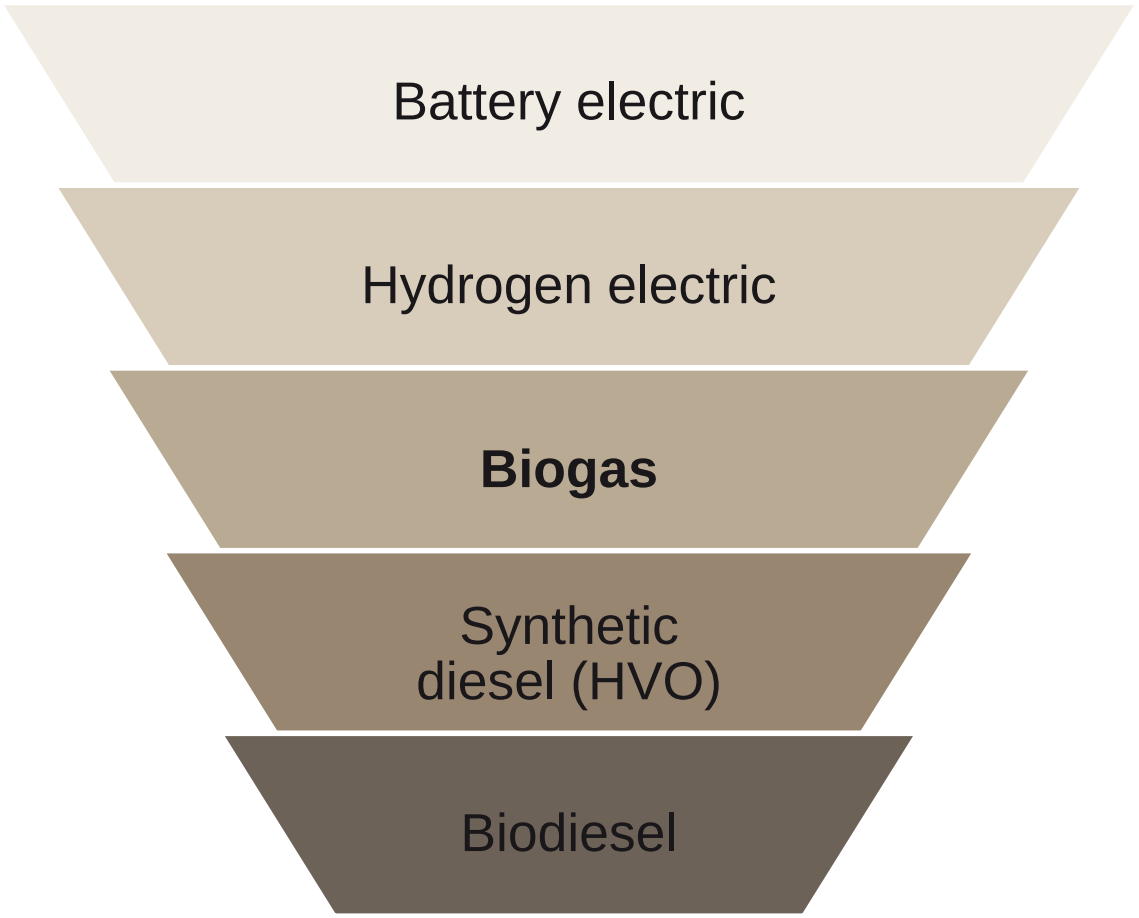
Potential customers: Natural gas usage in Hordaland 2016


Klimagassutslepp i Hordaland etter kjelde 2015
127 000 ; 3 %
71 000 ; 1 %
12 000 ; 0 %
139 000 ; 3 %
43 000 ; 1 %
156 000 ; 3 %
123 000 ; 3 %
223 000 ; 5 %
722 000 ; 15 %
631 000 ; 14 %
123 000 ; 3 %
1513 000 ; 33 %
734 000 ; 16 %
Olje- og gassutvinning - stasjonær forbrenning, landanlegg
Olje- og gassutvinning - prosessutslipp, landanlegg
Industri og bergverk - stasjonær forbrenning
Industri og bergverk - prosessutslipp
Energiforsyning
Oppvarming i andre næringer og husholdninger
Veitrafikk - lette kjøretøy
Veitrafikk - tunge kjøretøy
Dieseldrevne motorredskaper
Jordbruk - husdyr og husdyrgjødsel
Jordbruk - kunstgjødsel og annet jordbruk
Avfallsdeponigass
Avløp og avløpsrensing

What is the potential for further development?

When to make biogas? When to use biogas?





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

Regional 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