

Vehicle gas utilization in Sweden -today and tomorrow

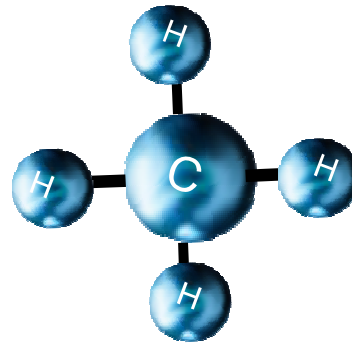


Anders Mathiasson
The Swedish Gas Association

Vehicle gas

Vehicle gas = natural gas and/or biogas
(sometimes also hydrogen gas)

Methane

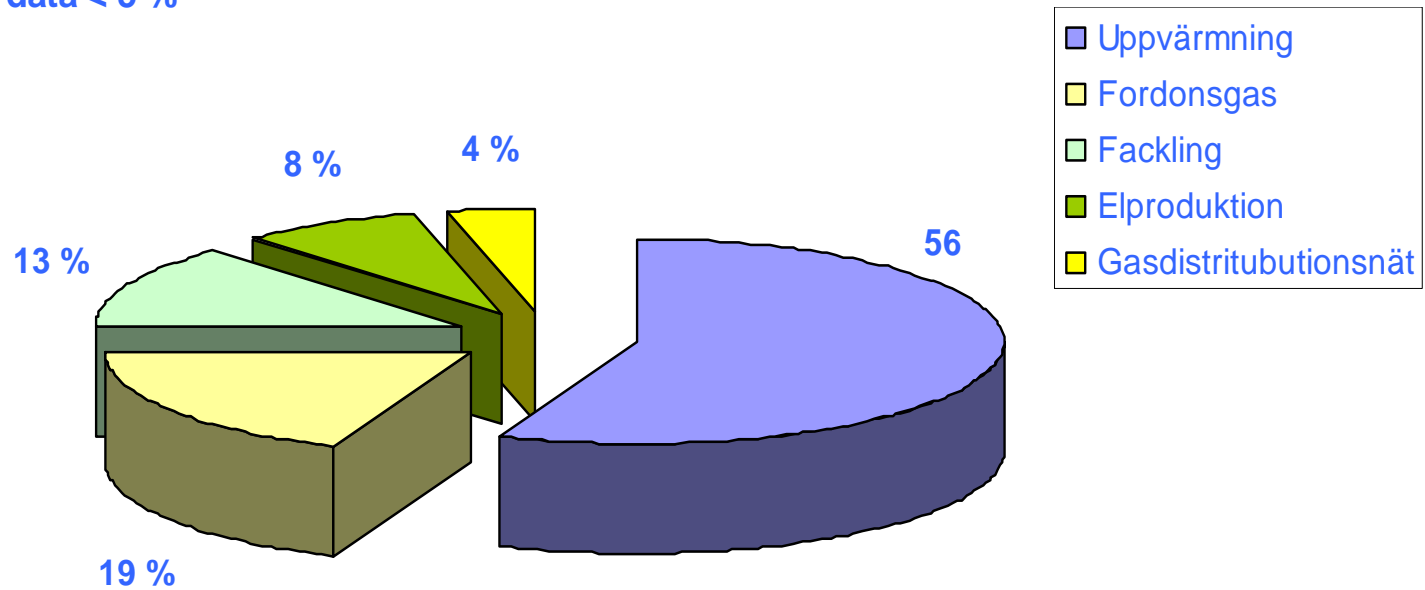


CH₄

Biogas consumption (GWh) in Sweden 2006

Total production 1.2 TWh 2006

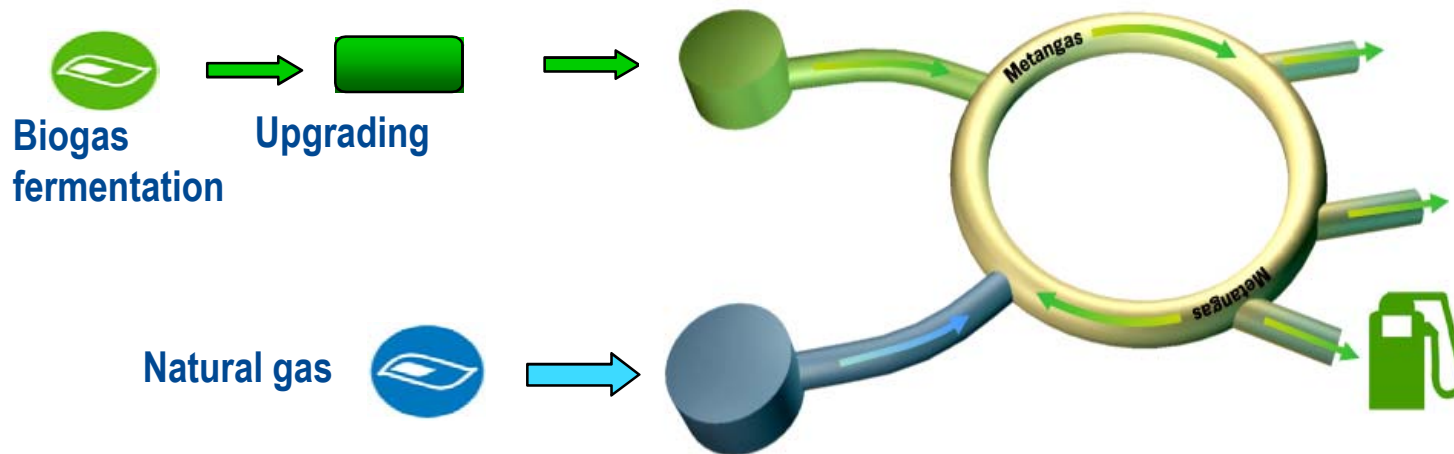
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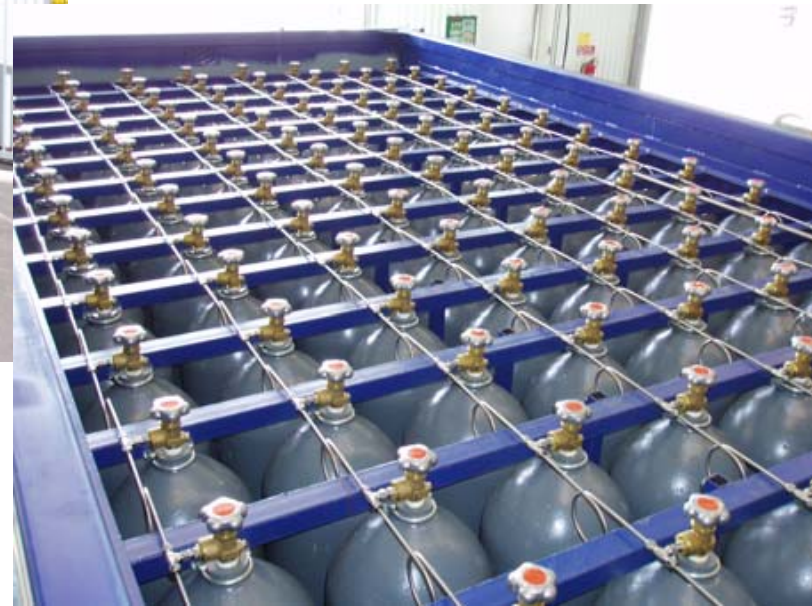
Source: Swedish National Energy Administration

Coordination of infrastructure and synergies biogas - natural gas - hydrogen gas

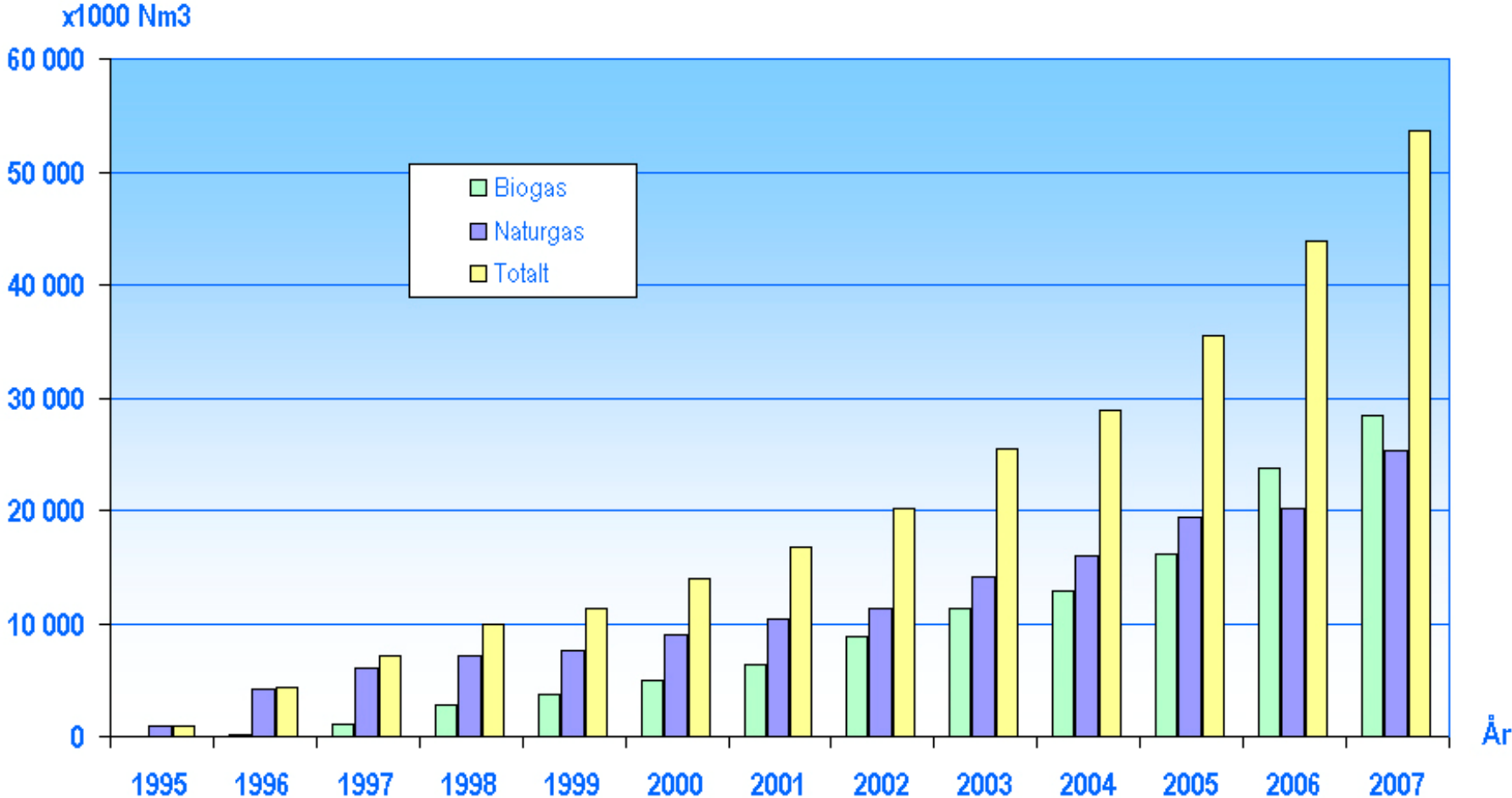
- Biogas can be distributed through existing natural gas grid
 - Low distribution costs
 - New customers can be reached
 - Continuous sale
- Biomass gasification can increase share of renewable gas in the grid
- Hydrogen gas can be added to the grid, up to about 10% (Malmö project)



Distributed by truck transport (CMG/LMG)



Delivered volume of vehicle gas



Source: The Swedish Gas Association

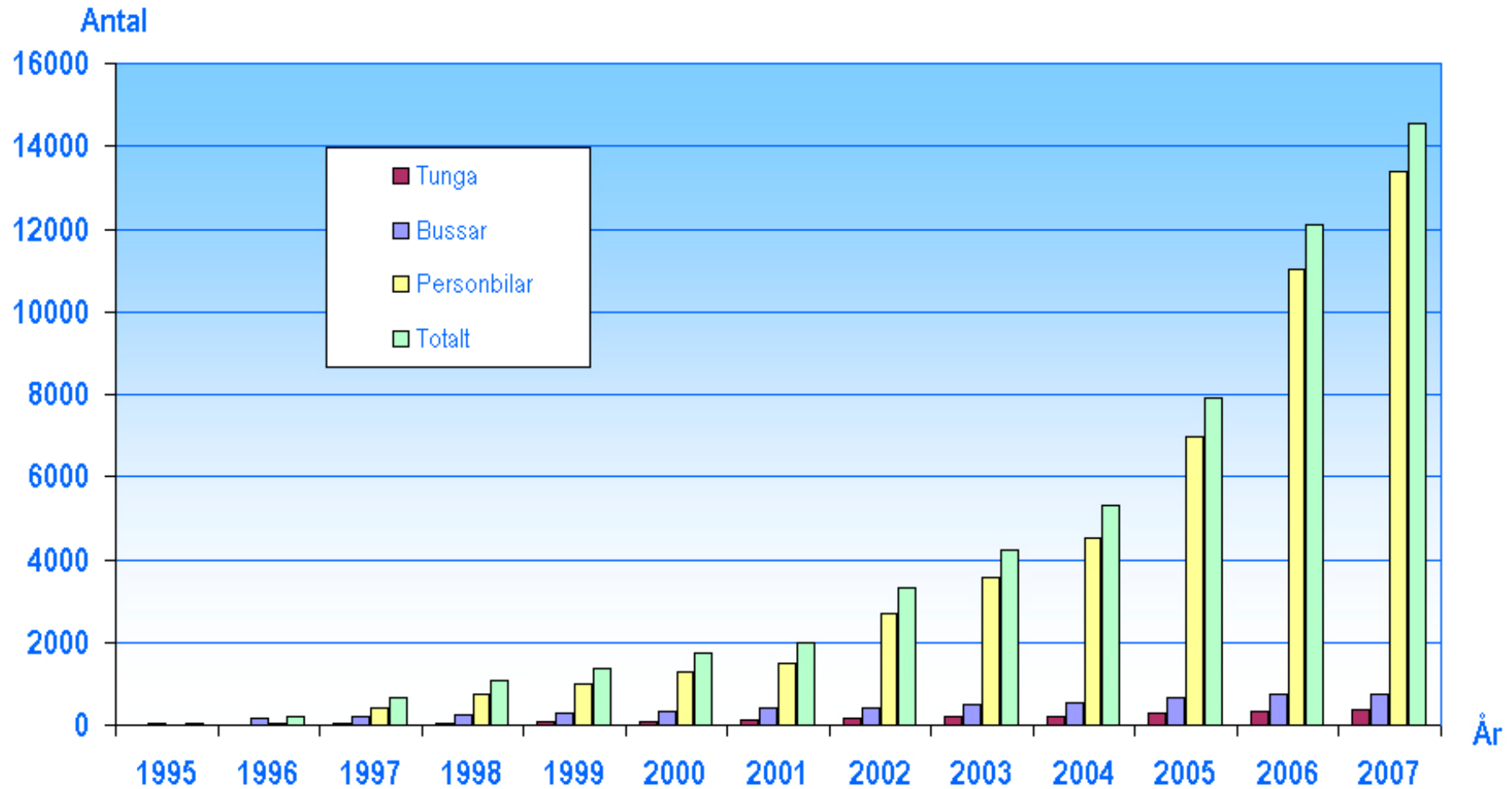
Gas filling stations

End of December
2007

- 86 public gas filling stations
- 27 gas filling stations for buses
- Subsidized 2007-2008

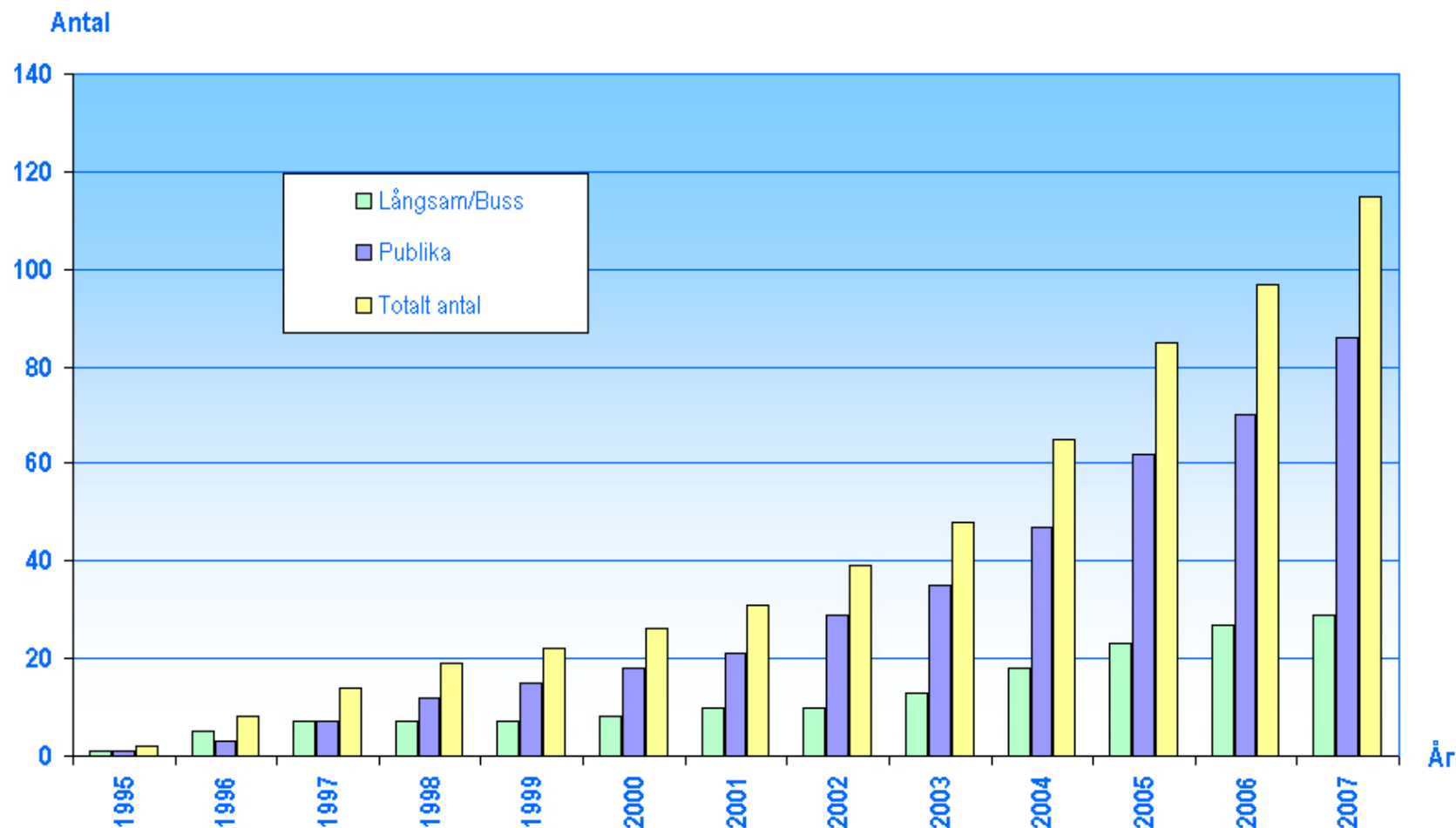


Gas vehicles in Sweden



Source: The Swedish Gas Association

Gas filling stations for vehicle gas in Sweden



Source: The Swedish Gas Association

Gastankställen i Sverige

● existerande tankställen december 2007 (86 st)



Gastankställen i Sverige

- existerande tankställen 2007
- planerade tankställen till och med 2010



Expansion needed

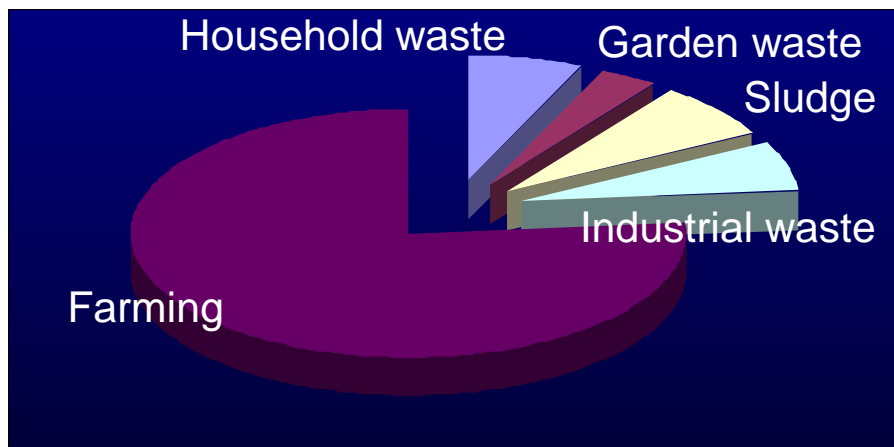


What lies in the future?

- Possible biogas increase to 14 TWh
- Next step is thermal gasification
- Cryogenic technology means
 - less expensive production
 - lower gas distribution costs
 - marketing segment
- Dual-fuel technology



Versatile biogas potential in Sweden



35-40
TWh/year

About 14 TWh* conventional technology distributed on
50% cultivated crops (biomass from fallow land)
18% manure, haulm
7% household waste
7% sewage sludge
18% miscellaneous (industrial waste, garden waste etc.)

About 26 TWh** biomethane from forestry/farming biomass
gasification

* BioMil 2005, Biodrivmedelskommittén

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Thermal gasification

- Gasification of woody cellulose – biomethane
- Semicommercial biomethane facilities in operation in Europe
- Two commercial biomethane facilities planned for operation 2012 in Sweden
- 800 + 400 GWh/year



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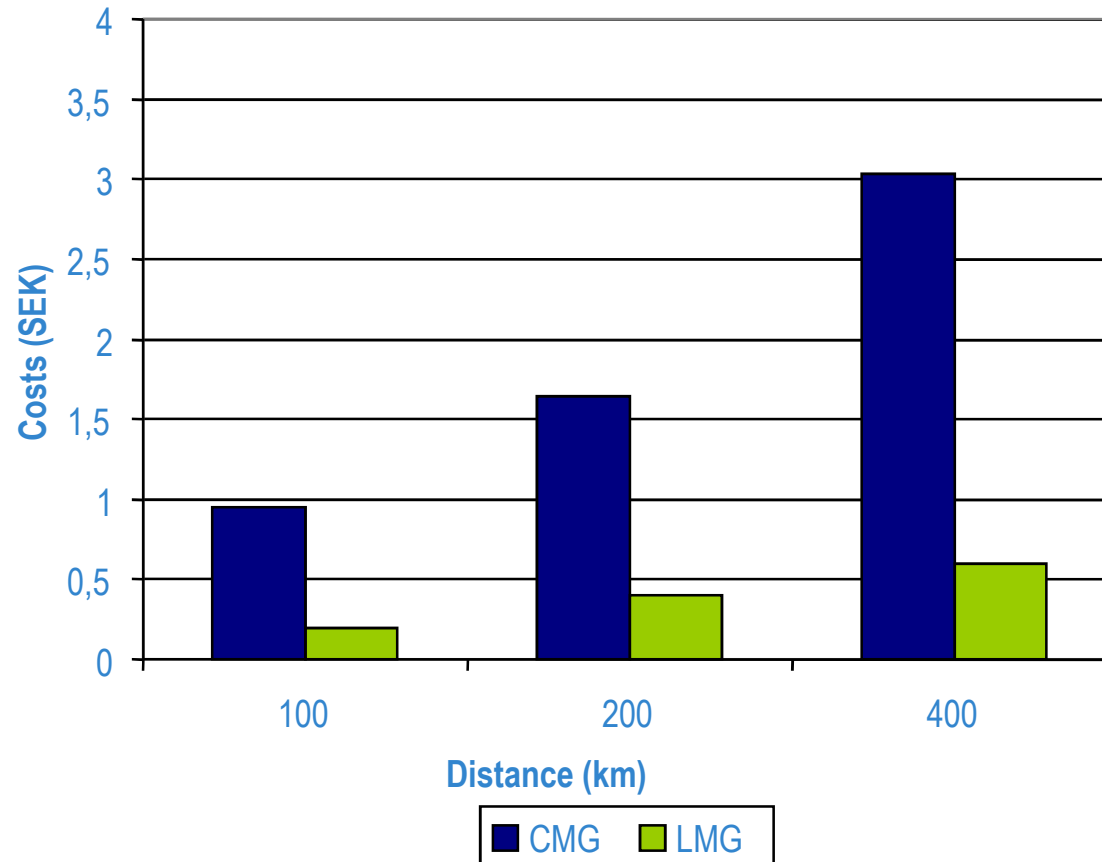
Cryogenic technology



Cryogenic upgrading facilities

Liquefied methane gas (LMG) vs compressed methane gas (CMG)

Transportation costs:
LMG compared to CMG



LMG transport:
Trailer for transport of 21 ton LMG.

CMG transport:
Swap body for transport of 1.8 ton CMG.

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Dual-fuel technology

- Both liquefied and gaseous biomethane can be used in diesel vehicles.
- Up to 90% of the diesel can be replaced by biomethane
- The technology is already used in some countries



Possible gas filling stations for dual-fuel

24 gas filling stations in Sweden



Thank you!

