

# Biomethane as an Automotive Fuel

Global Biogas Congress,  
28-30 November 2011

Stimulating Market Development ....  
The case of Sweden

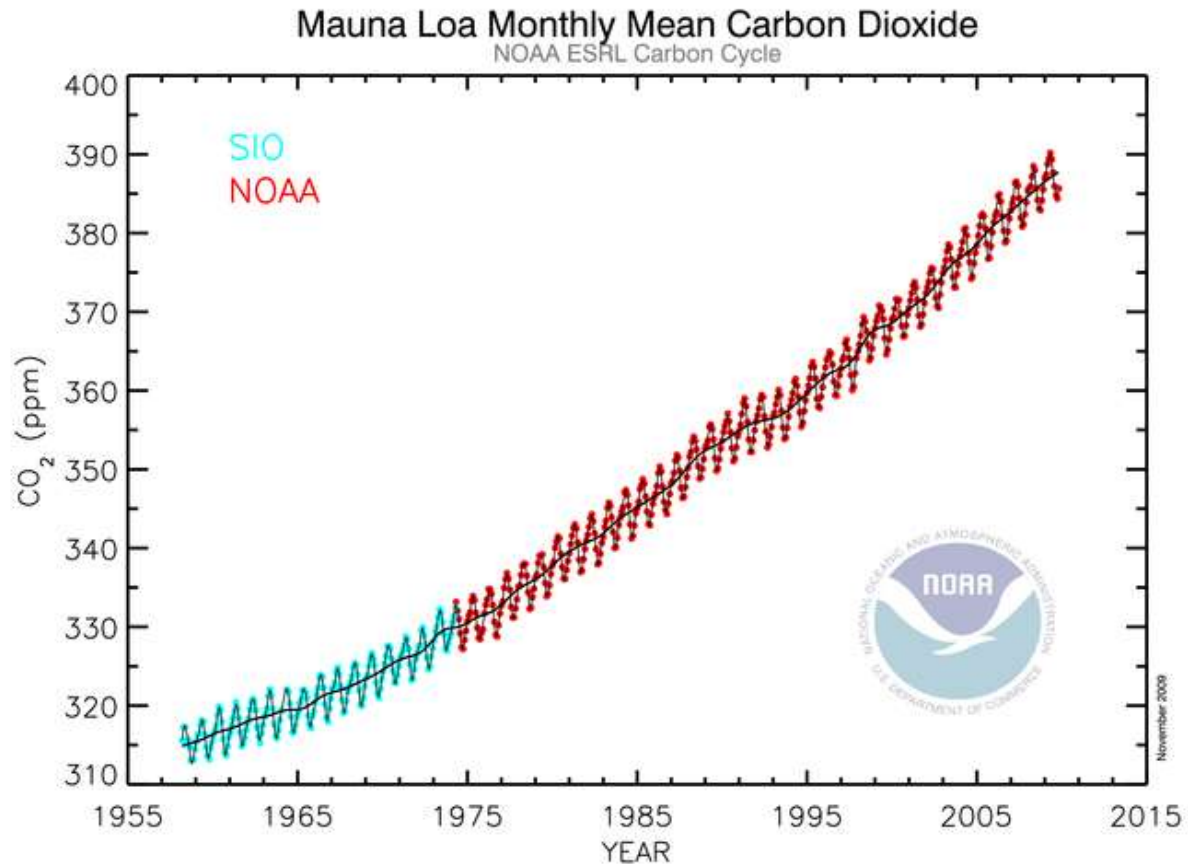
**Bo Ramberg**  
**FordonsGas Sweden AB**





# The climate change is still there .....

- Hawai
- Financial problems
- Stern report 2006



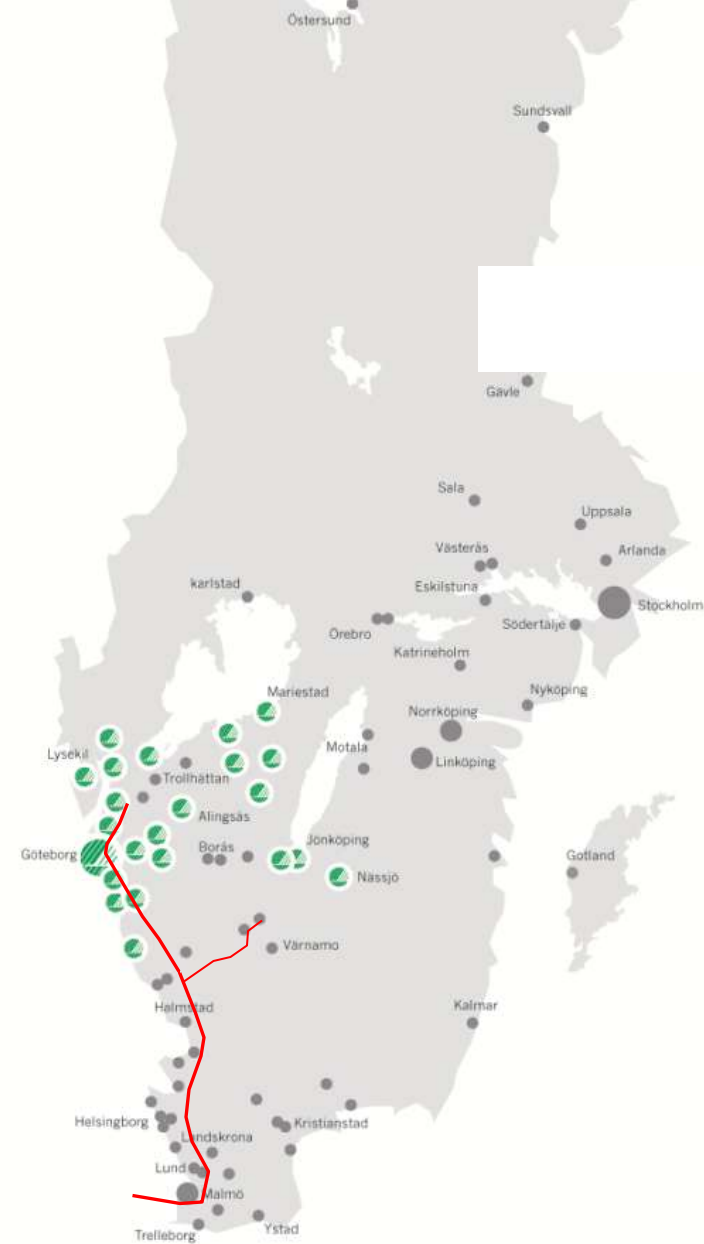
Atmospheric carbon dioxide monthly mean mixing ratios. Data prior to May 1974 are from the Scripps Institution of Oceanography (SIO, blue), data since May 1974 are from the National Oceanic and Atmospheric Administration (NOAA, red). A long-term trend curve is fitted to the monthly mean values. Contact: Dr. Pieter Tans, NOAA ESRL Carbon Cycle, Boulder, Colorado, (303) 497-6678, [pieter.tans@noaa.gov](mailto:pieter.tans@noaa.gov), and Dr. Ralph Keeling, SIO GRD, La Jolla, California, (858) 534-7582, [rkeeling@ucsd.edu](mailto:rkeeling@ucsd.edu).



# FordonsGas Sweden AB

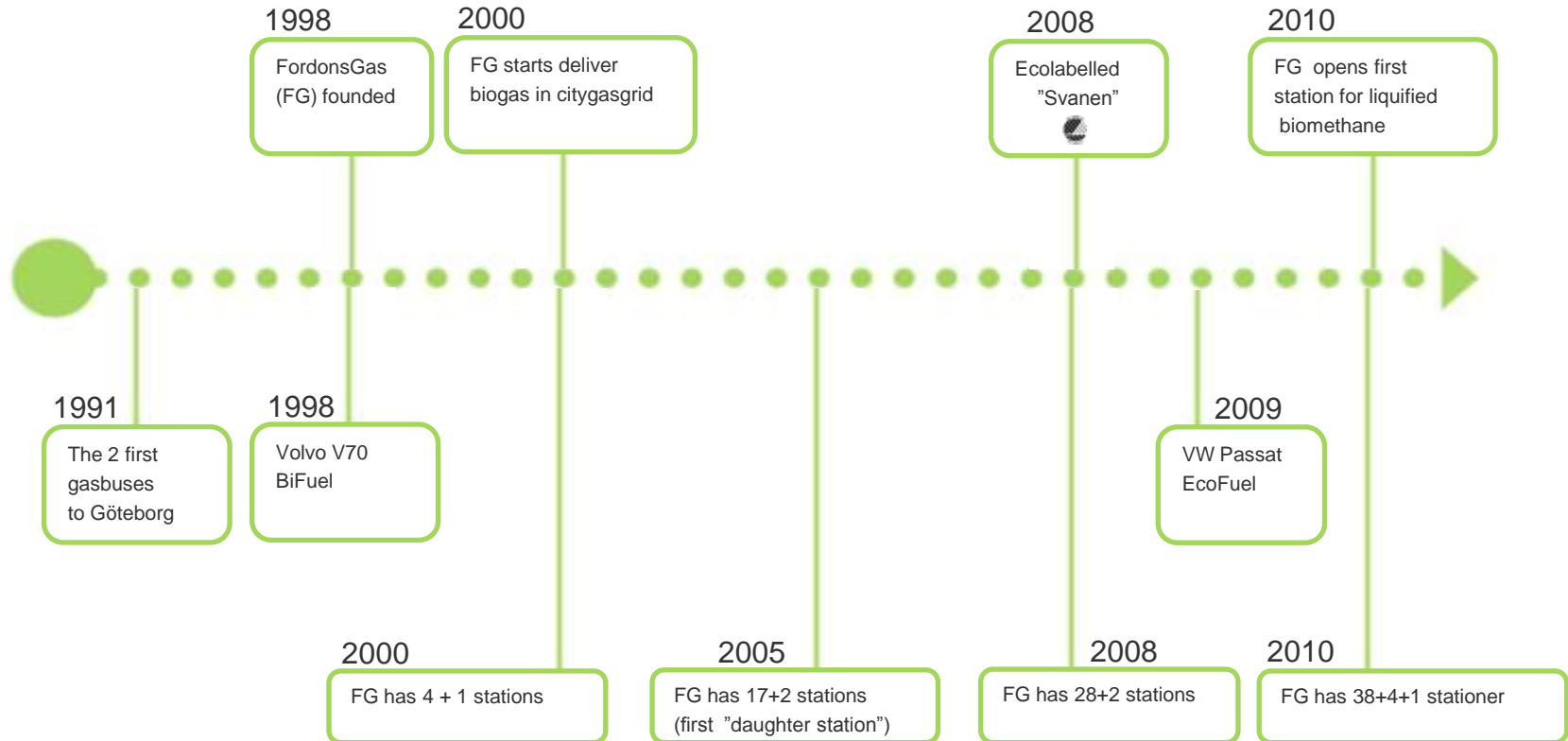
- Founded in 1998
- Owners: Göteborg Energi AB  
DONG Energy A/S
- Number of employees: 31
- Turn over: 20,3 M€
- Sales volume 2011: 17,5 MNm<sup>3</sup> (57% biogas)
- 38 filling stations
- 1 LCMG/LMG station
- 4 bus filling stations

The Nordic Ecolabel on fuels





# Our journey ...



Give us a lot of experience ....



# Competence inside FordonsGas

- Market development
- Marketing
- Filling stations
- Distribution of methane
- Back-up, service & maintenance
- Import, export of gas





# The actors need to work together



Local & regional  
authorities

Government & national  
authorities



Vehicle  
manufacturers



Customer  
in focus



Gas  
suppliers





# Driving forces

Public awareness in combination with Government incentives to:

- **decrease** the emissions that effect the environment
- **decrease** the dependency of oil





# Incentives for clean vehicles

- Low tax on natural gas, tax exemption on biogas.
- 40 percent reduced tax, company gas-cars.
- Free parking in some towns.
- Congestion charge exemption in Stockholm (no new cars since 1 Jan 2009)
- Clean taxis are given priority at airports





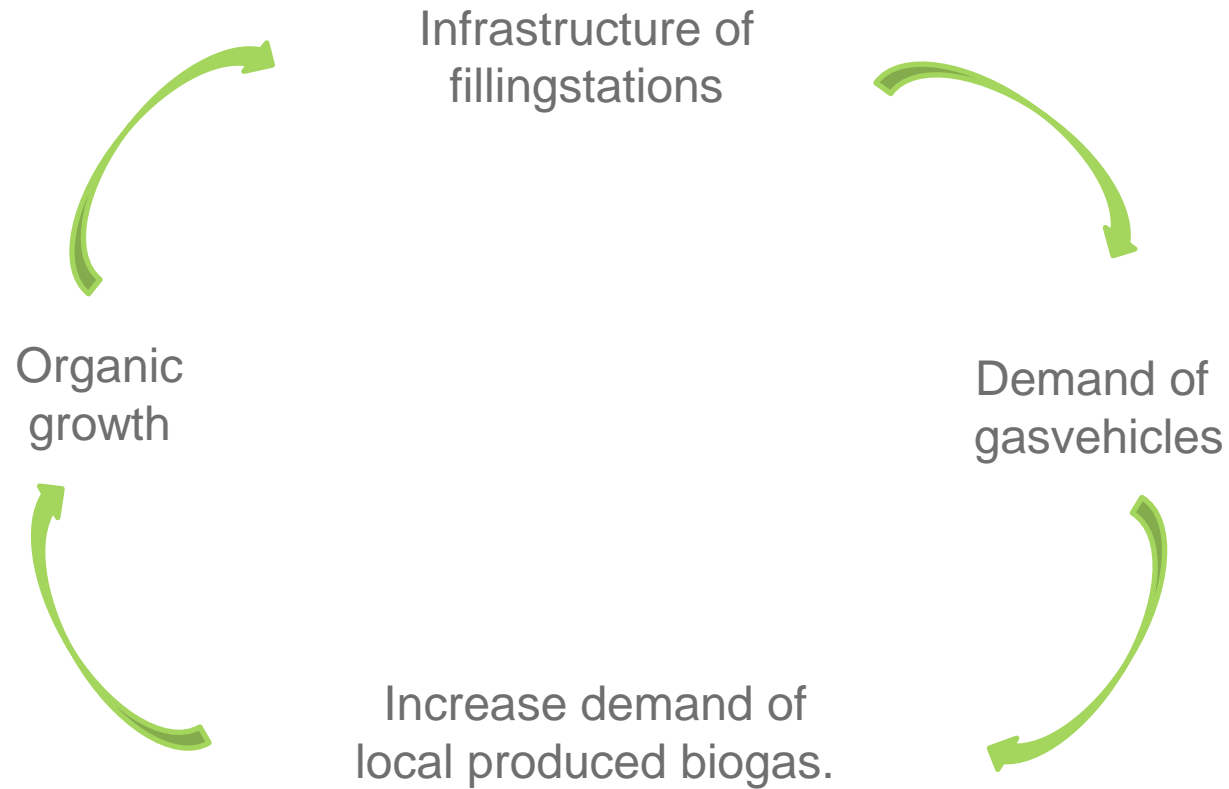
# Government incentives for renewable fuel

- National grants (Climate program), 30% of investments in biogas production and upgrading facilities 2003-2008
- Compulsory to provide renewable fuels at all major filling stations -> **Resulted in ethanol pumps**
- Approx 17 million Euro towards (30% of investment) establishing filling stations for renewable fuels, 2006-2009
- 20 milj Euro, 30 % investment support for farm plants for biogas (2009-2013)
- 5 milj Euro/year for three years for production of biogas
- Established a biogas strategy -> **No target!**





# The good development cycle





# Build the market at the same time as the infrastructure!



Chicken or egg ?

- Municipalities
- Local authorities
- Taxi vehicles
- Logistic companies
- Public transport
- Company cars





# Keeping the client in focus

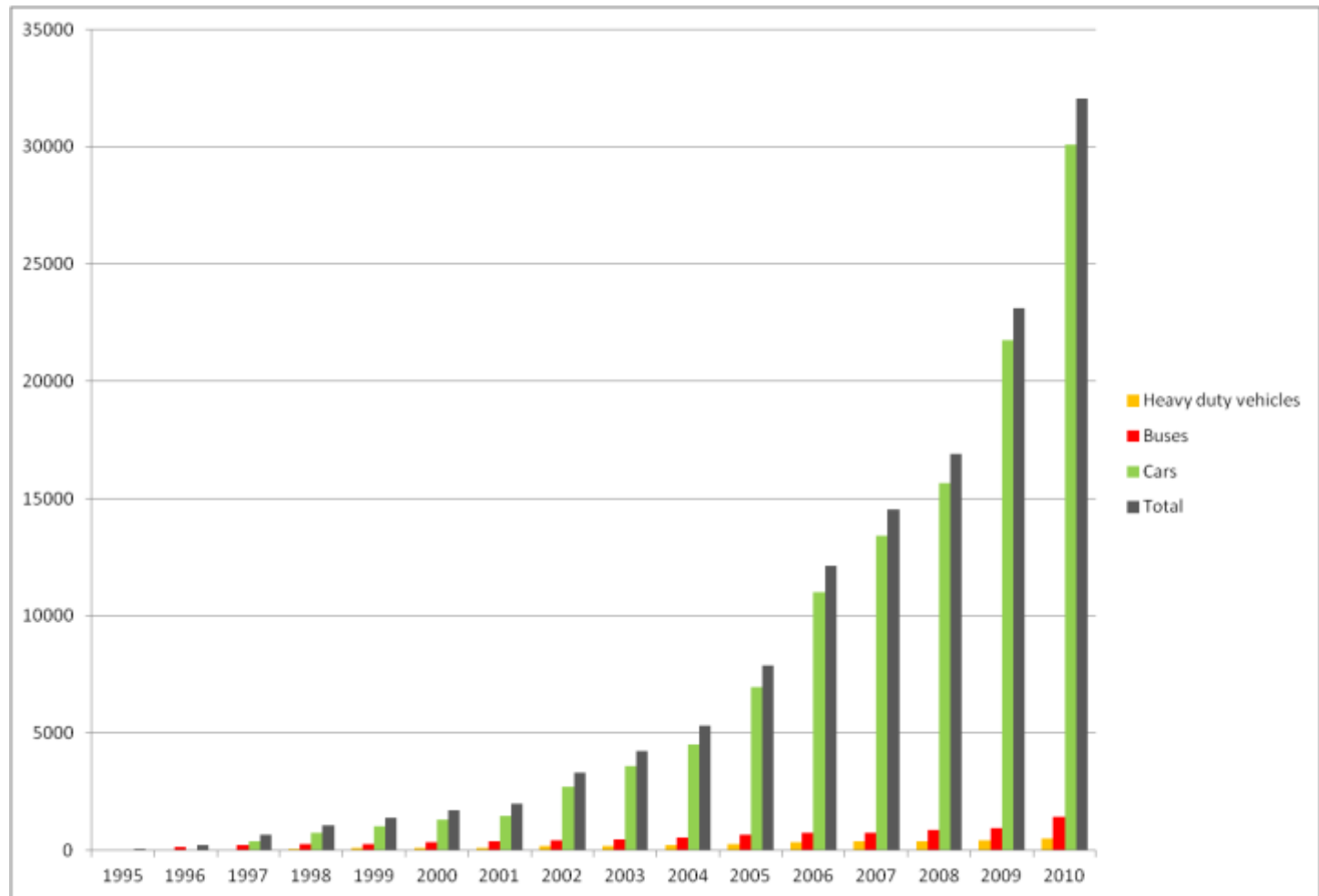


- Key location
- High availability – more than 99 %
- Official road signs
- Open 24 hours
- Safe and clean
- Easy to access
- Good location for strategic clients
- High quality support





# Number of CNG vehicles in Sweden





# CNG/CBG Filling Stations

130 public stations

47 non-public  
stations for fleets,  
buses and heavy  
duty vehicles



33 600

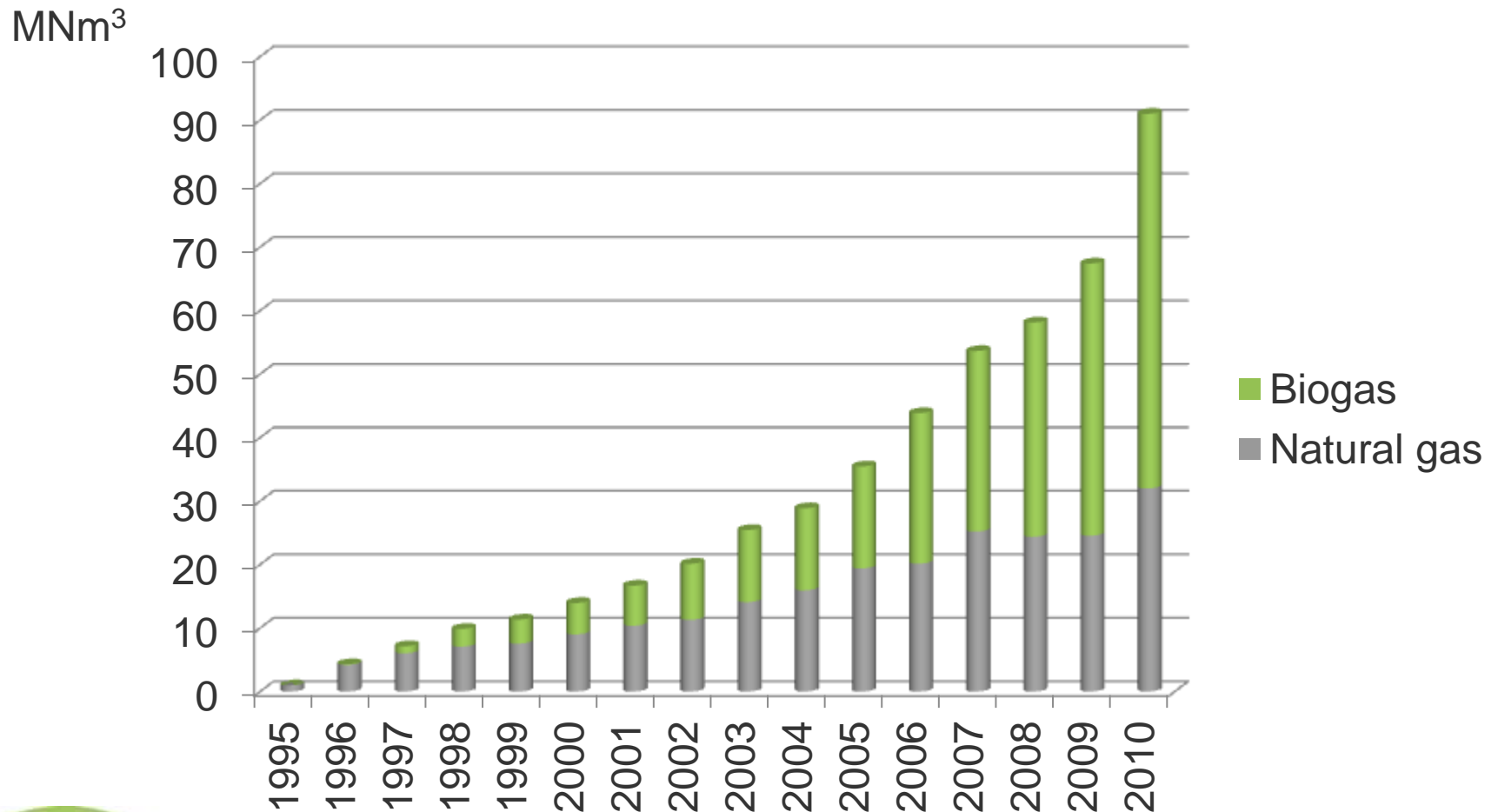
1 700

550





# Volumes in Sweden





# The world's first ecolabelled fuel

- Certified from well to wheel
- Minimum 1/3 renewable fuel
- Limited greenhouse gas emissions
- Controlled energy usage during production and distribution
- Lower cancerogenic risk
- Certified sustainable and tracable cultivation



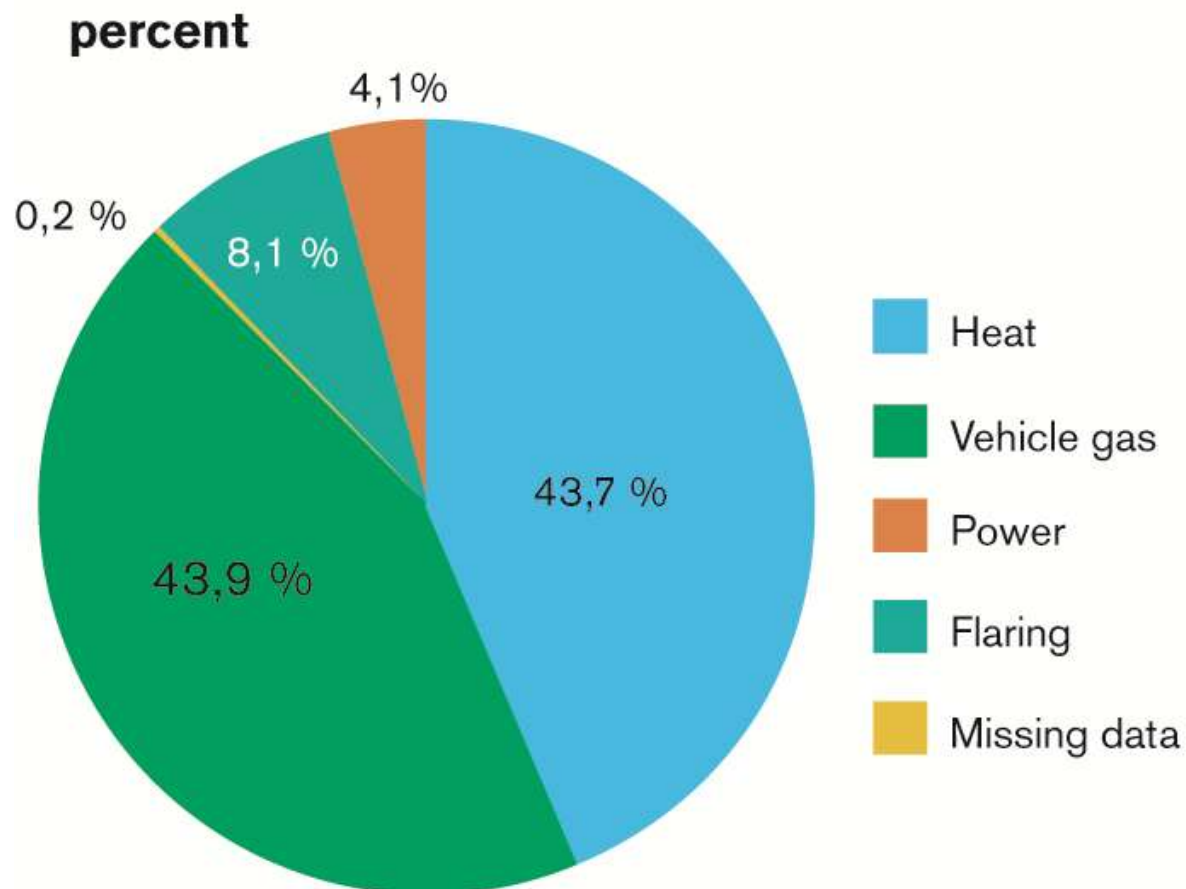


A journey with challenges and opportunities!



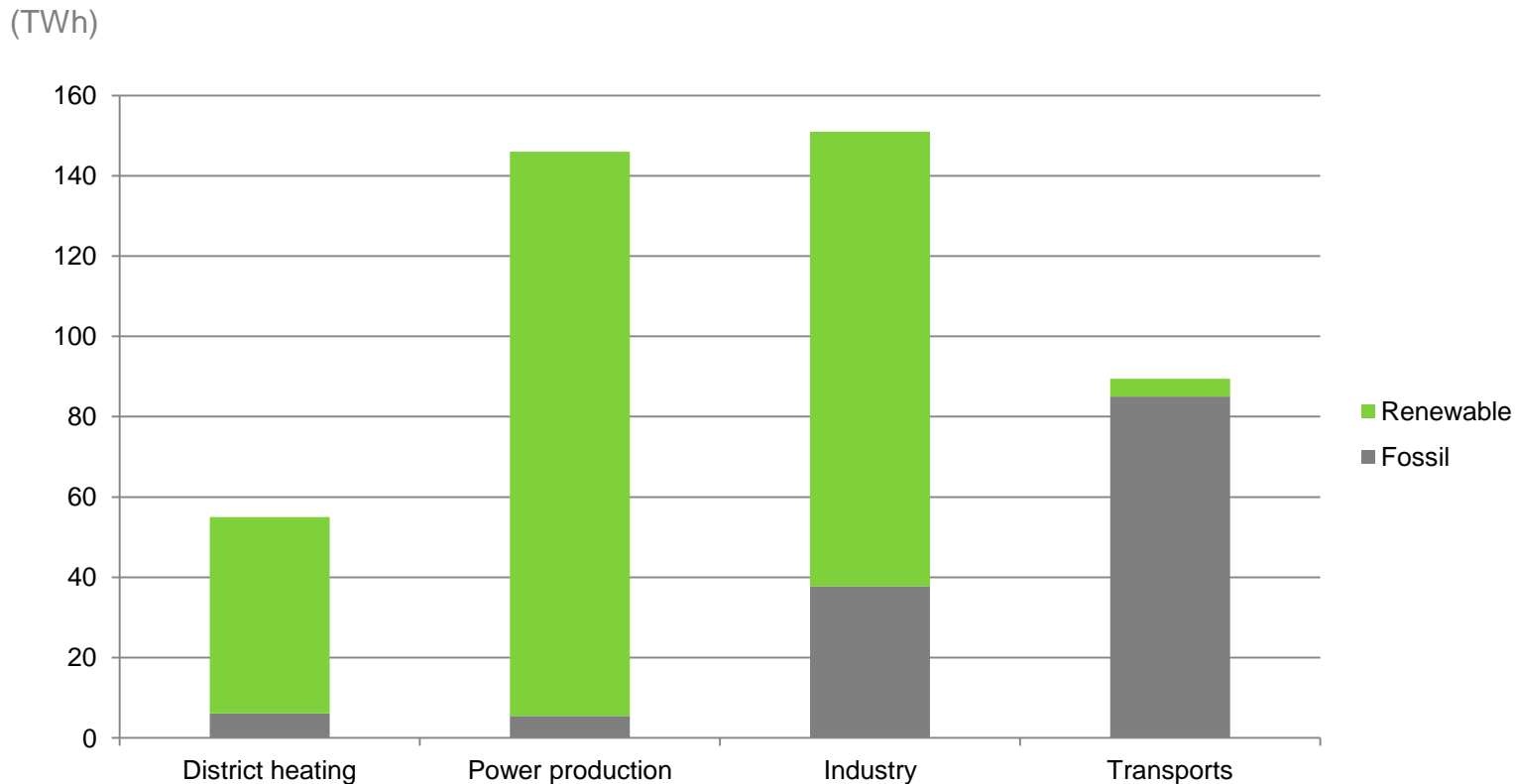


# Utilisation of biogas in Sweden 2010



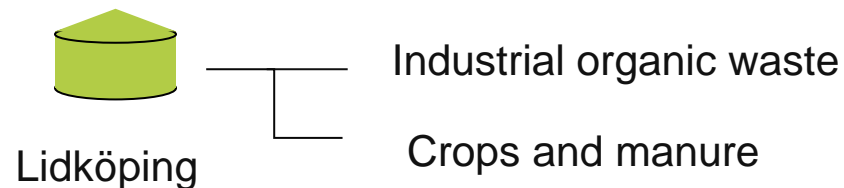
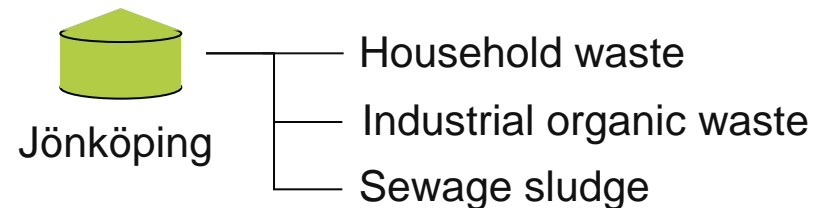
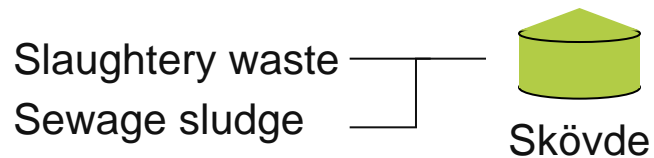
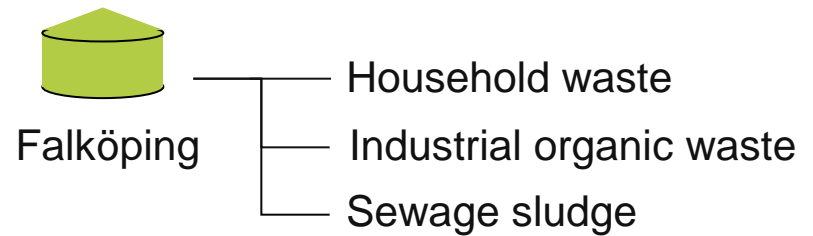
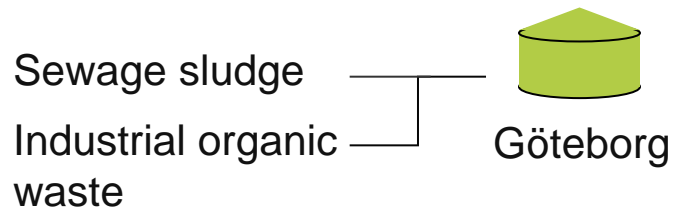


# Why transport? Situation in Sweden:





# Biogas production





# Wastewater treatment plant for the region of Gothenburg

- Preventing nutrients from 834 000 population equivalent (pe) reaching the sea
- Publicly owned by Göteborg and neibouring 6 municipalities
- Cost: ~26 €/pe year – tariff system, non-profit basis
- → Huge amounts of nutrient rich sludge





# Biogasupgrading by Chemical absorbtion/COOAB



- Production of 60 GWh/y upgraded Biogas injected into the Natural Gas Grid
- Chemical absorption technology with very low methane slip
- Investment: € 4 million
- Supported by Swedish KLIMP-program and BiogasMax
- In cooperation with City of Göteborg and the WWTP
- In operation since april 2007





# Falköping – the beginning of a new concept

Biogas produced using sewage sludge and household waste.

- Upgraded at new plant to vehicle quality and piped to local filling station.
- Raw gas pipes next to clean gas pipes.
- Upgrading raw gas from manure and other agri-waste in the near future.
- Capacity: 10 GWh/y
- Supported by Swedish KLIMP-program and BiogasMax.





# Biogas in Lidköping



- Utilizing waste from ethanol production and other food production
- Producing 60 GWh/y of upgraded, liquefied biogas

- In cooperation with the Municipality of Lidköping and Swedish Biogas International
- In operation 2011 (9 dec liquid)





# Kartåsen biogasplant in Lidköping





# Gas supply

## – four ways to distribute biomethane

- Local biomethane grids Gas
- Mobile HP storage Gas
- Grid injection Gas
- Thermotrailer LMG





# Two challenges.....

Large biogas production potentials situated far from markets.

High fuel consumption on existing technique for heavy duty vehicles on gas.





## ... two solutions

Liquefied Methane Gas, LMG, solves the problem of distribution and makes large biogas potentials available.

Together with the Methane Diesel technique it offers a market for heavy duty vehicles.





# Two new thermotrailers:



- Supplier : Cryo
- Capacity: 18 tons LBG
- Length: 13 m
- Width: D 2,5 m
- Total weight: 33 ton
- Own pump
- Flowrate: 600 l/min
- Delivery time: 1 hour
- Insulation: vaccum, multi layer (al-folie).





# Stigs Center – Europe's 1<sup>st</sup> public filling station for LMG

- Opened 1<sup>st</sup> october 2010
- Deliveres LMG for heavy trucks, and CMG for public cars and light duty vehicles
- Investment grant from Swedish Environmental Protection Agency





# Stigs Center – Europe's 1<sup>st</sup> public filling station for LMG

- High environmental performance
- Closed system – no methane emissions
- Low electricity consumption (wind-power)
- MID-approved
- Situated on Sweden's largest fuel provider for heavy trucks





# Biogas potential

Biogas has a wide range of biomass feedstock.

Cities



Sludge  
Household waste  
Industry org waste  
Landfill

Agriculture



Manure  
Rest-products  
Energy crops

Forest



Residues from  
forest & industry

The largest potential of all biofuels!





# Gasification of solid biomass changes the game !



Forestry waste



Waste from sewage treatment,  
industry, farming

Potential





# Next level - GoBiGas

## Gothenburg Biomass Gasification Project

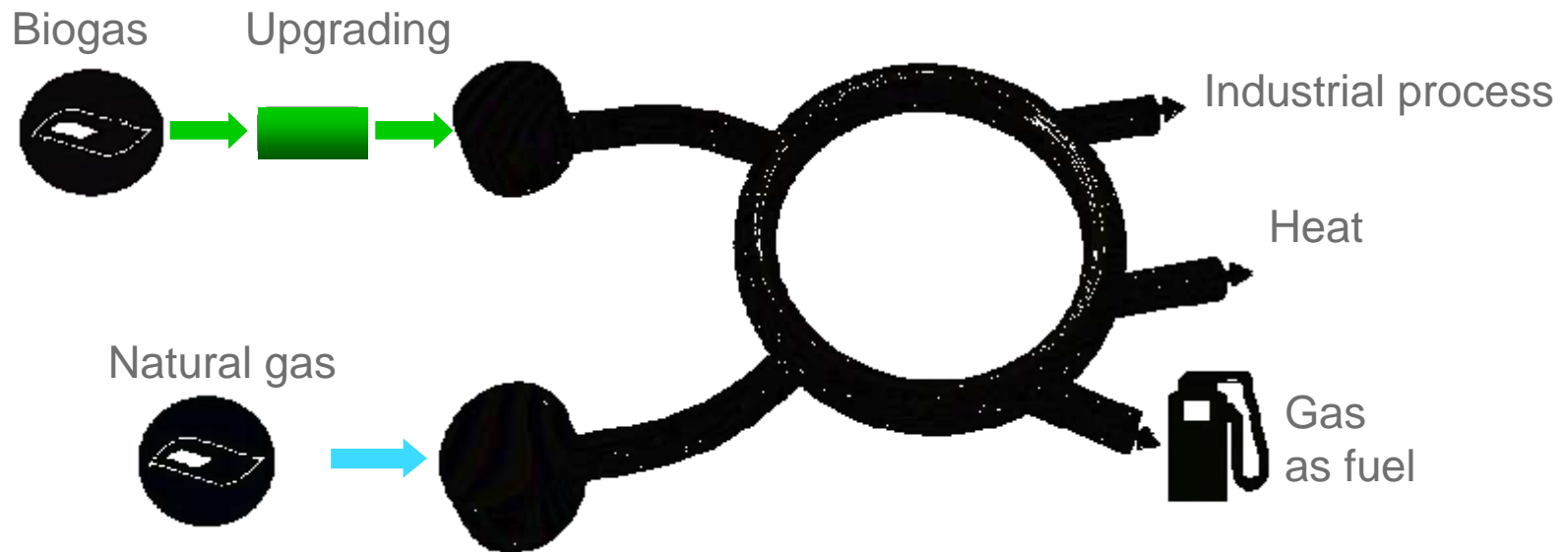
- 2<sup>nd</sup> generation biomethane production
- Thermo-gasification of biomass
- Commercial scale – approximately 100 MW gas
- High efficiency: 65% methane yield
- Total efficiency: 90% (incl. surplus heat)
- 800 GWh production – 75 000 cars
- Planned to be in operation in 2013 and 2015 - stage 1 and stage 2 respectively





# The Green gas principle – a prerequisite

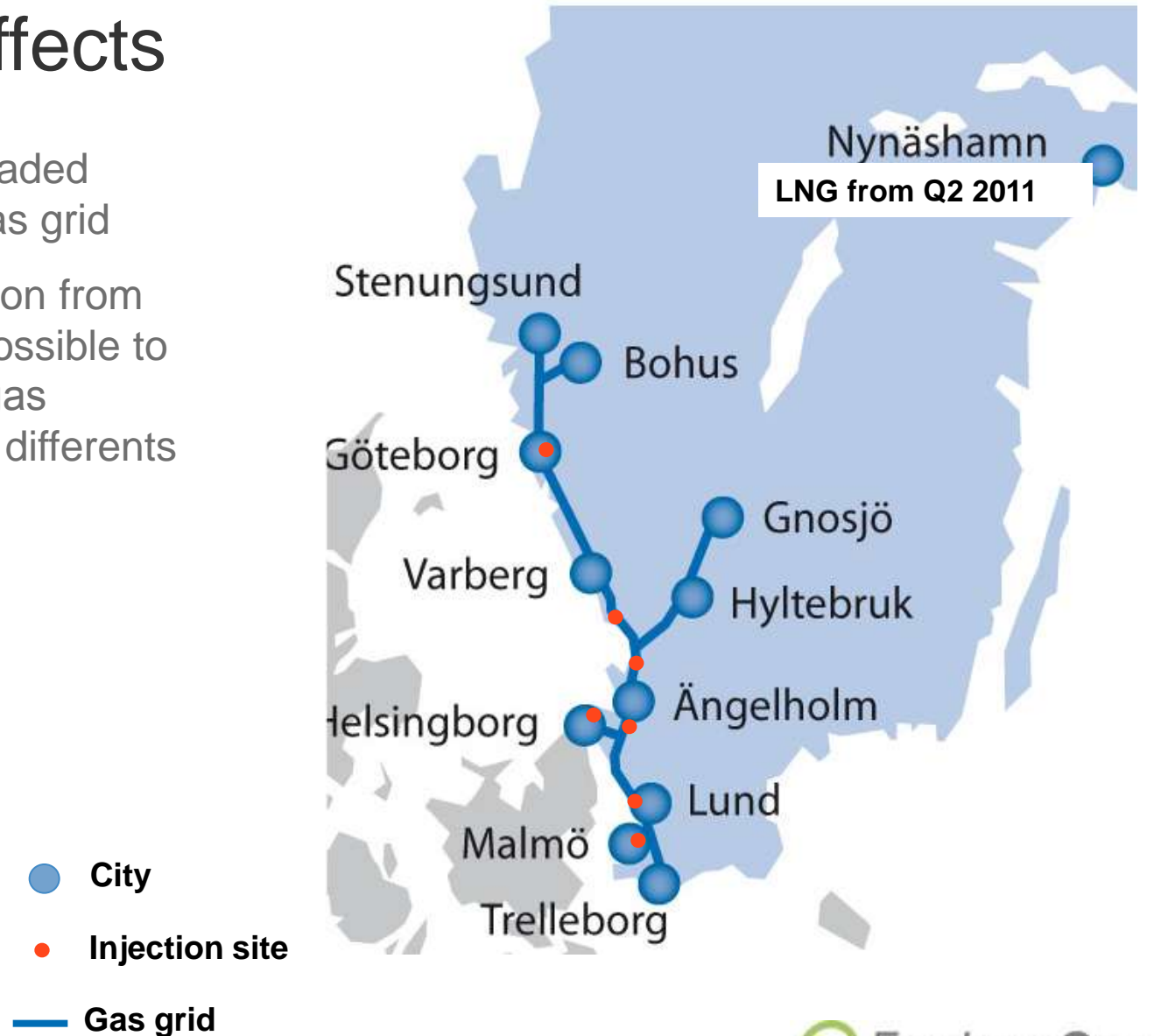
- A huge market is opened for biogas.
- The reliability of the biogas supply improves





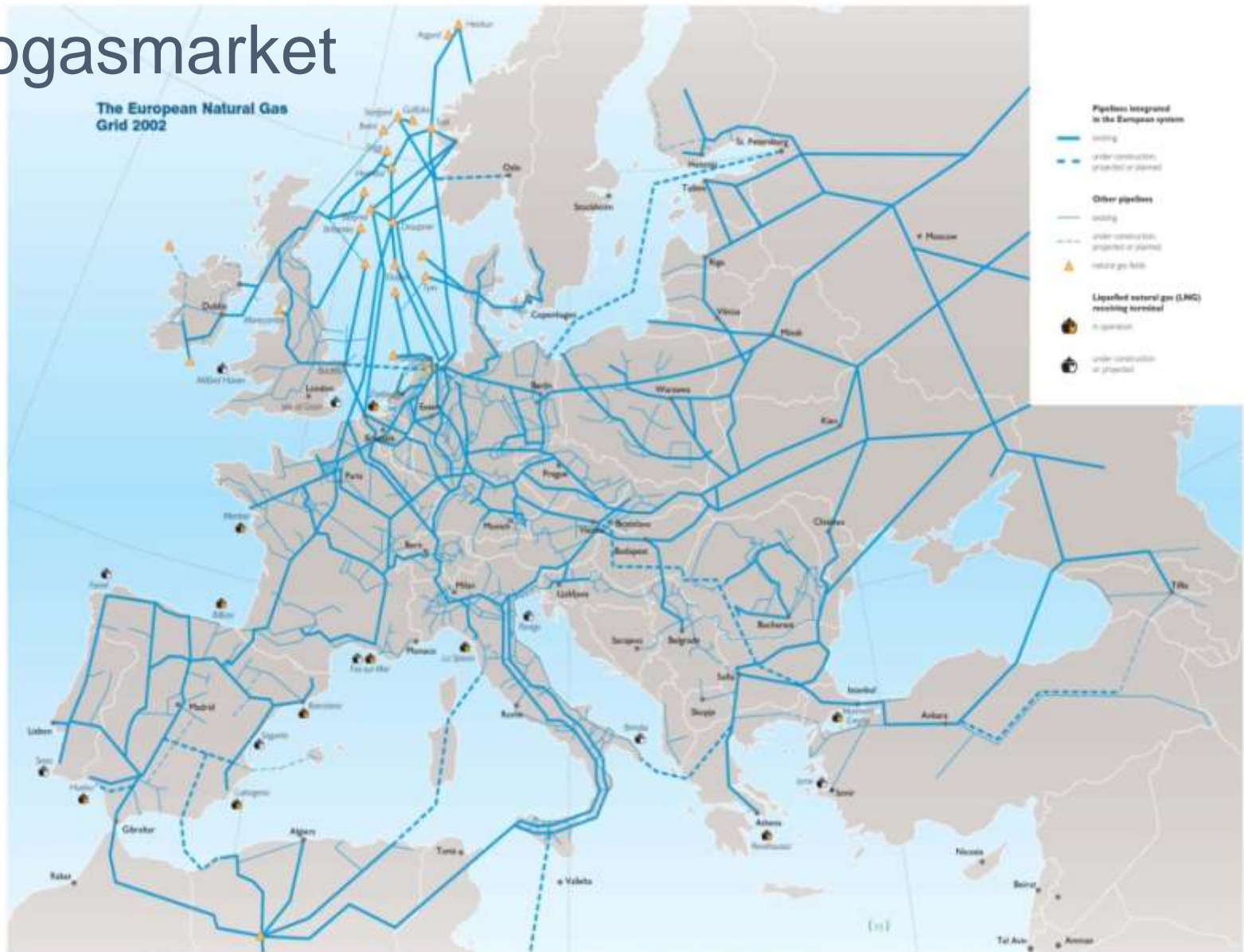
# Synergy effects

- Injection of upgraded biogas on the gas grid
- New tax legislation from 2011 makes it possible to use the "green gas concept" across different grids



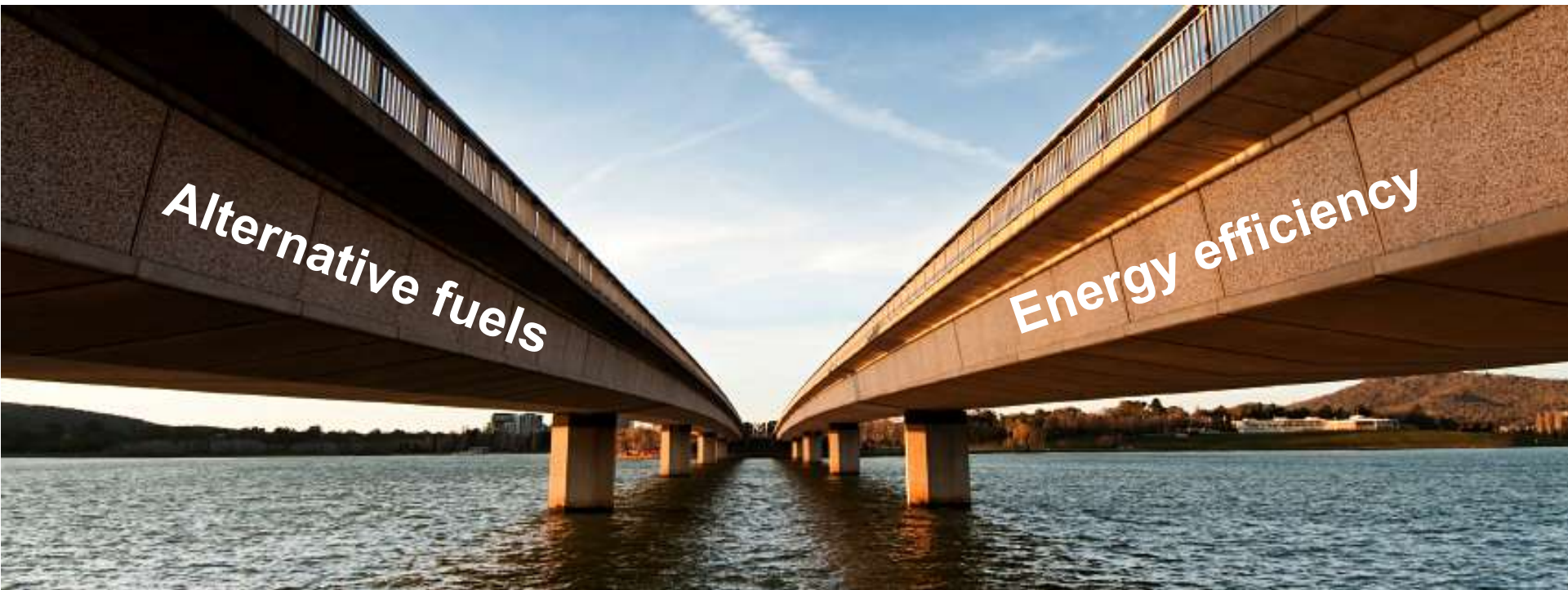


# Biogasmarket





# New strategies to decrease GHG emissions





Thank you very much for your attention!

