



**Biomethane for vehicles
creates a new industry**

**4th Global Biogas Markets summit
Brussels, 21st November 2007**

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Business Region Göteborg**



Head and project manager Business Region Göteborg

Represents 13 municipalities in the Göteborg region

A regional company for business development

A neutral and non-profit company

- Strong economical growth
- Diversity trade and industry
- High level of employment

EU-project Biogasmax Demonstration project – biogas as vehicle fuel



- Purpose –increase the use of biogas as vehicle fuel
- 28 partners in 8 countries
- Budget 17 million €



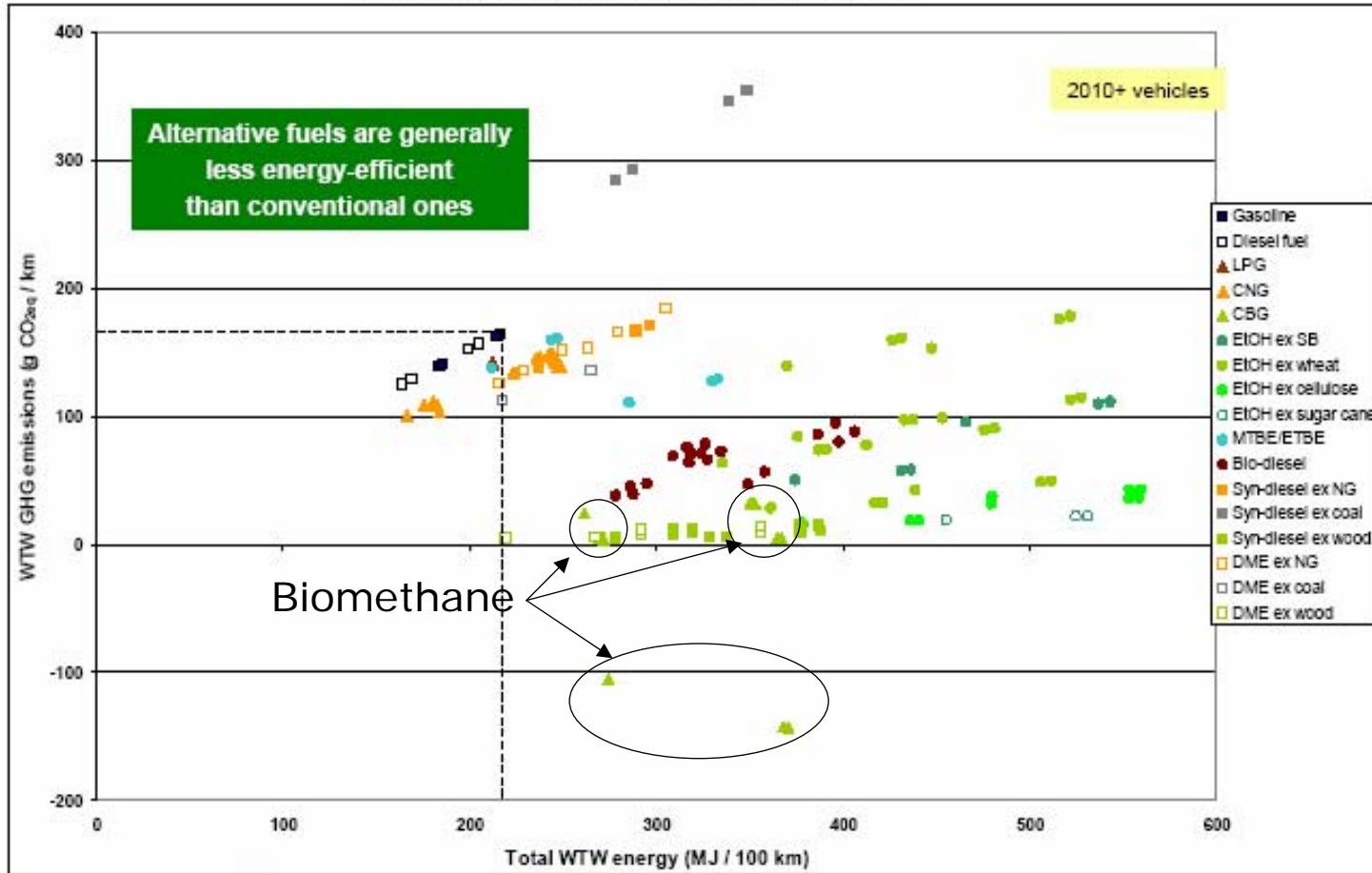
The presentation includes

- Biogas facts
- The renewable fuel situation in Sweden
- Biogas Väst project
- Future plans and new techniques
- International perspectives

Overall picture: GHG v. total energy



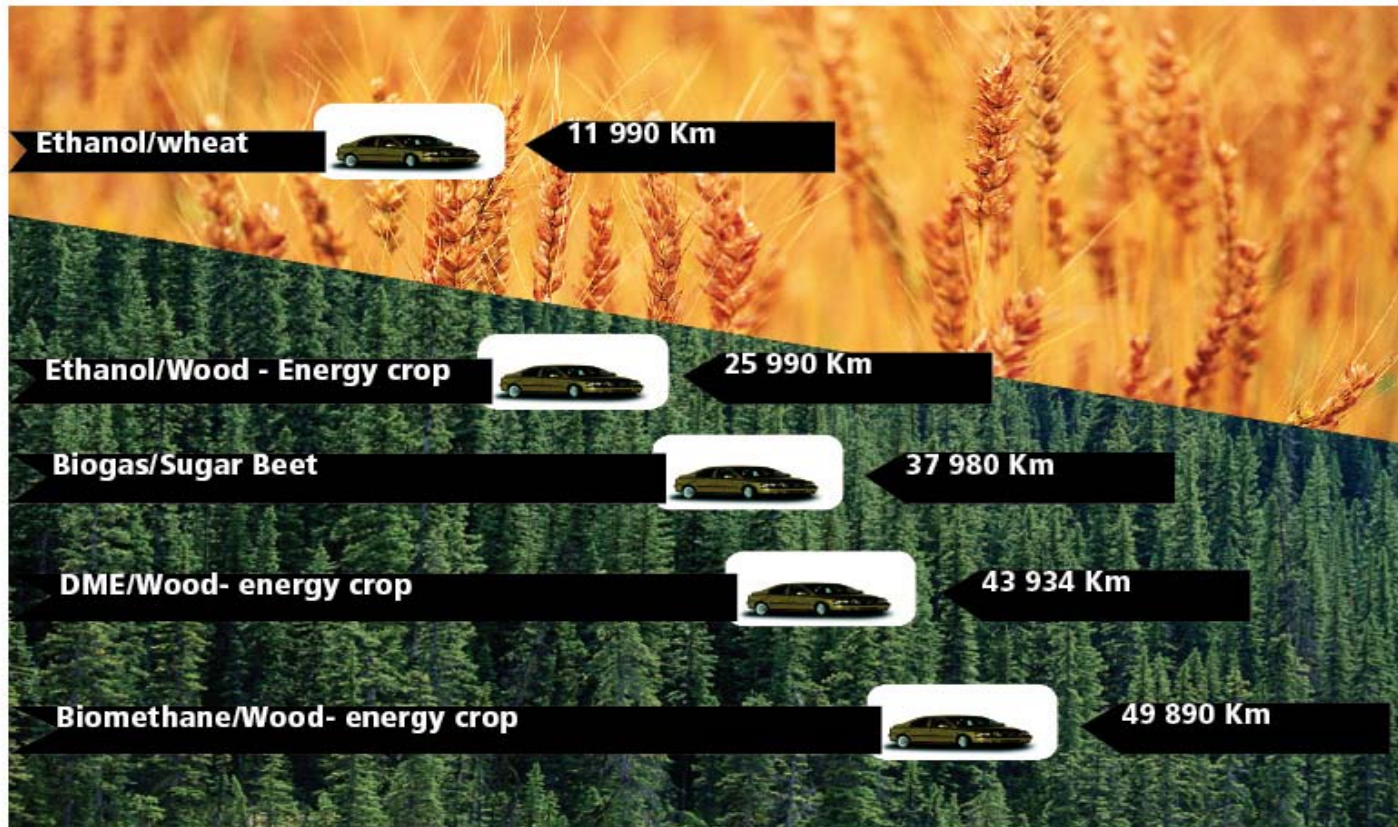
Liquid fuels, DME/LPG/CNG/CBG



The lowest GHG emissions!

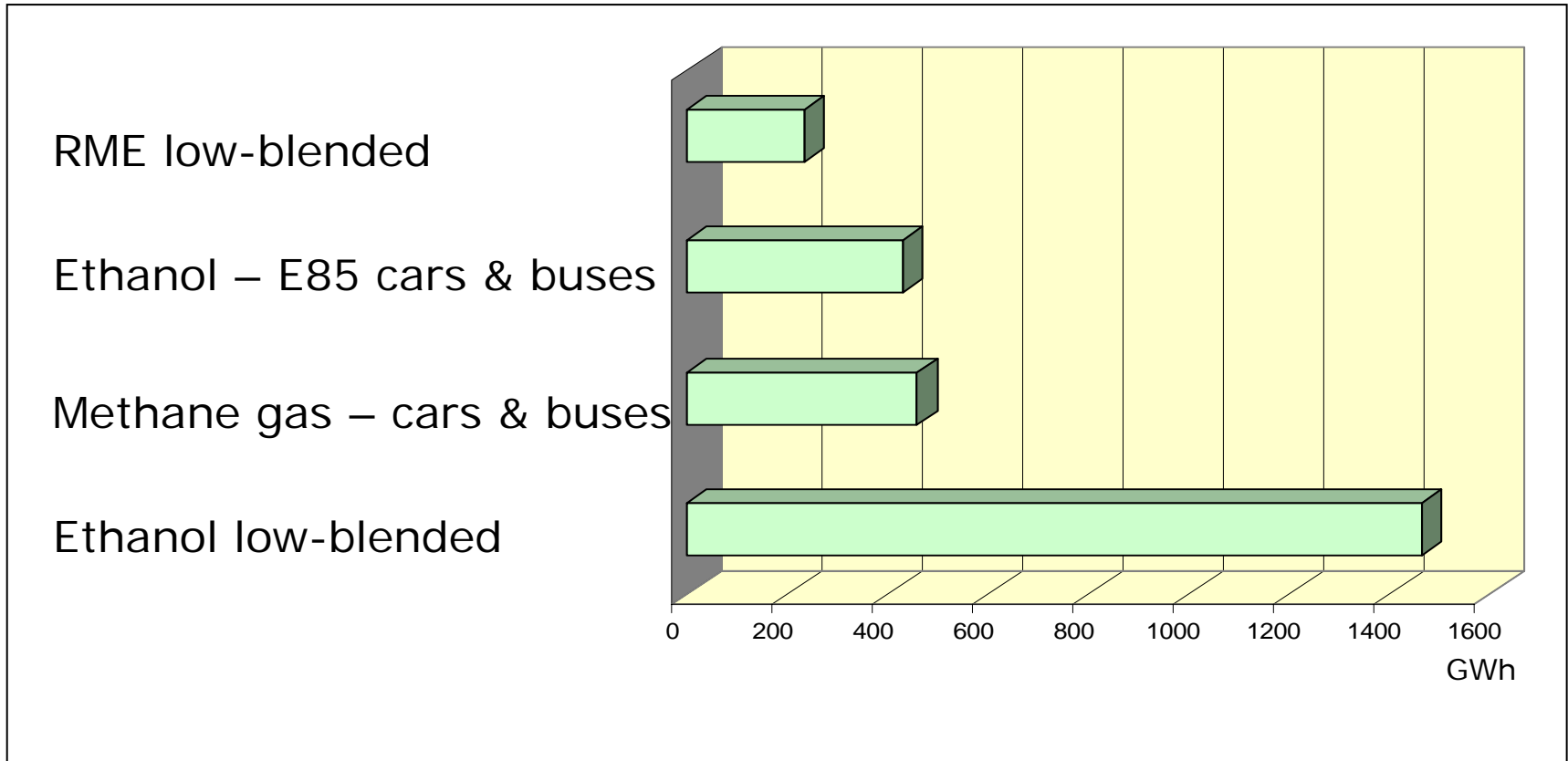
Very low WTW Energy!

How many km can a car be driven on one hectare biomass?



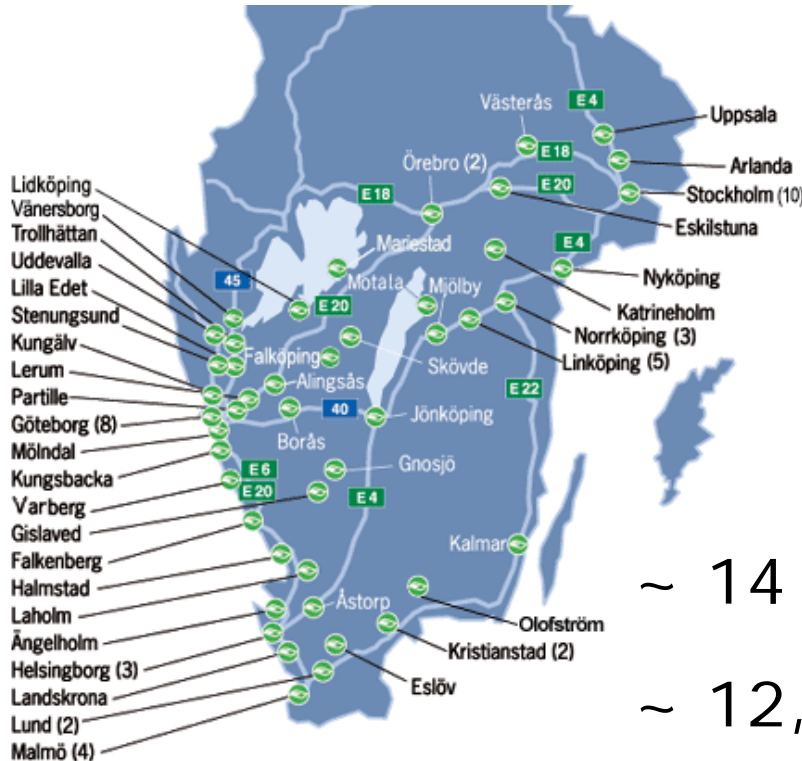
Source:
Lund University

Alternative fuels in Sweden Sales 2006



Biomethane as vehicle fuel in Sweden

30 June 2007



~ 13 500 gas-powered vehicles
(39 % increase)

~ 109 fuelling stations for
CBG/CNG

~ 14 mNm³ biogas (38 % increase)

~ 12,7 mNm³ naturgas (31 % increase)

(1st half year)



Driving forces

market development for biogas and vehicle sales

- No taxes on biogas and lower taxes on CNG
- Increased prices for petrol and diesel
- State subsidies for vehicles, fuelling stations and production plants
- Reduced tax with 40 % for company cars*, free street parking in several cities
- Governmental organisations- 75 % clean vehicles, municipalities change policies for fleets*

*clean vehicles



The Biogas Väst co-operation project in Westsweden



Market development

- Production
- Distribution
- Vehicles

Purpose: To develop a new industry

Vision for Biogas Väst 2020

Biomethane can replace 20 % of fossil fuel
in transport sector

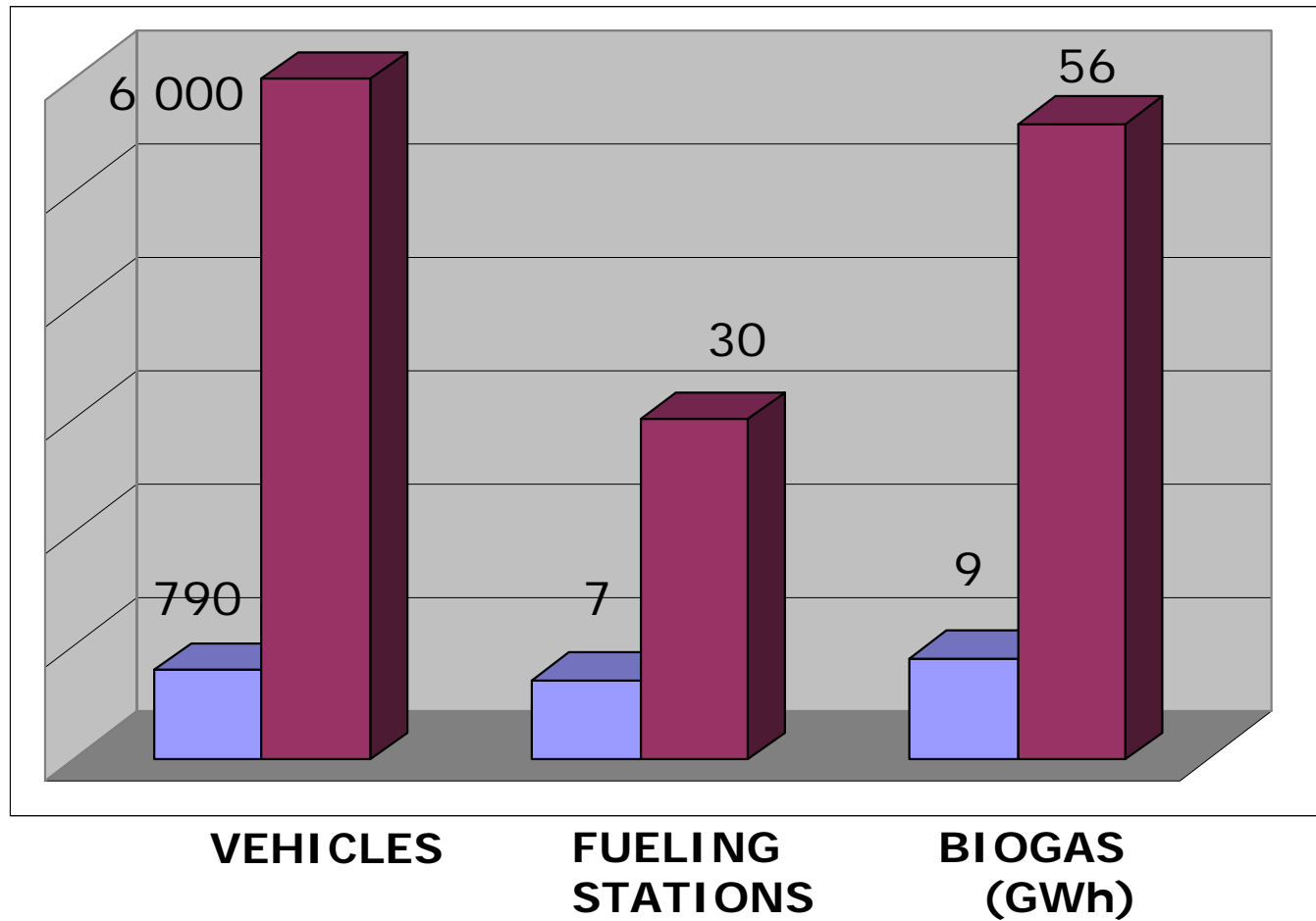
Target 2009

65 fuelling stations

16 000 gas-powered vehicles

Biogas & CNG replace 33 m. litres petrol/diesel

Development Biogas Väst 2001-2006



Trends and markets

A new generation gas-powered cars

Biogas/natural gas in diesel engines (dual fuel)

Fueling stations for liquified biometan/natural gas

Up-grading plant for liquified biometan

Gasification for biometan produktion

LNG & LBG - Shipping



A new generation bi-fuel cars



VW PASSAT

VW deliver a new gas-powered car in 2008!

- Turbo & Compressor
- Down-sized engine
- Make use of the high octane number



- Low fuel consumption
- Longer distance powered on methane gas

Methane gas in diesel engines – Dual fuel



AB Volvo has a new diesel-engine fueled by 90 % biometan & 10 % biodiesel!

Engine with diesel efficiency!

This opens for a quite new market

- H.D vehicles for goods transport
- Public bus transportation, local & regional

Infrastructure for liquified methane

The h.d. vehicle market need, in the long-term, a fueling infrastructure for liquified methane gas

Around 25 fueling stations has to be built in Sweden

The fueling stations can deliver both liquified and compressed methane gas

We need to co-operate in Europe to build this infrastructure!



Production of liquified biomethane

Cryogenic up-grading can replace traditional techniques (scrubbers, etc) but only at bigger biogas plants >50 GWh!

The biogas is cooled down ($-163\text{ }^{\circ}\text{C}$) to liquified state

Two products: liquified biomethane and liquified carbon dioxide



Shipping – a new market



There are some driving forces for LNG in ships and in the longer term LBG !

Better air quality

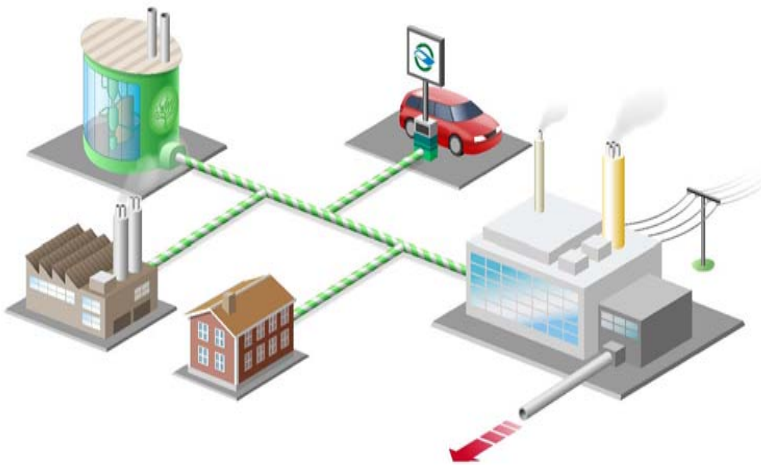
Reduced green house gases

Trading with green house gas emissions

Fuel economy



Biomethane from wood



GoBiGas

Göteborg Energi AB plans a gasification plant for biomethane 2012

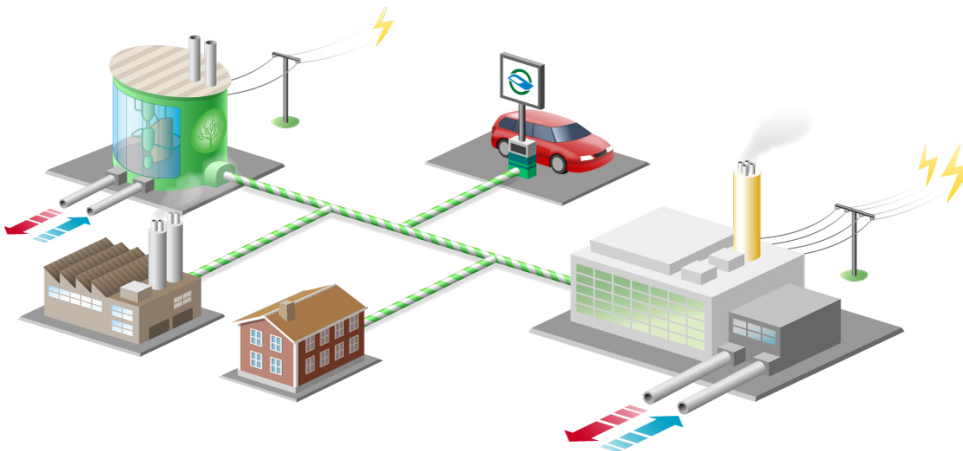
Commercial scale – 0,8 TWh biomethane

Research plant at Chalmers 2007

System efficiency comparison

Gasification

70 % biomethane
 20 % district heating
 10 % energy losses

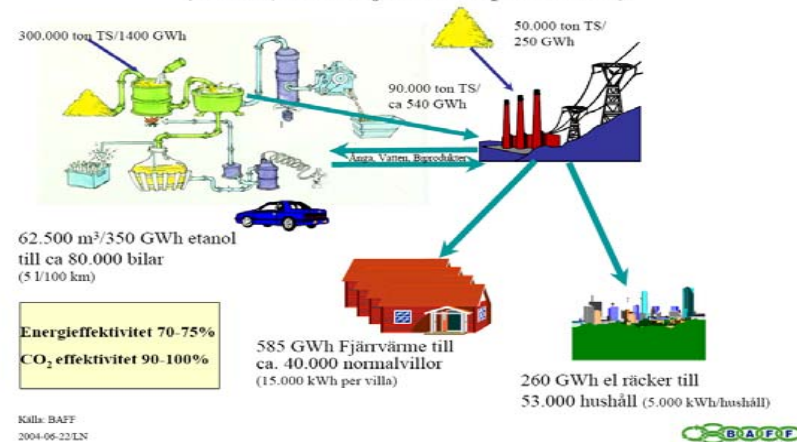


Source: Göteborg Energi

Ethanol

21 % ethanol
 16 % electricity
 35 % district heating
 28 % energy losses

BIORAFFINADERI OCH ENERGIKOMBINAT (etanol-, el- och fjärrvärmeproduktion)



Source : BAFF



Biomethane could by 2030 replace 25-35 % of fossil fuels used for road transports in Europe

- 1 400 000 km natural gas grid in 32 countries
- Biomethane is distributed via the natural gas grid
- A wide range of biomass feedstock & high efficient production
- 600 000 CNG vehicles already in traffic
- 2000 existing fueling stations for CNG and CBG



Thanks for your attention!

Biogas Väst

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