European Business Congress Study - 2012

Study "Legal and Regulatory Environment for the Construction and Operation of CNG Filling Stations in European Countries"

BACKGROUND TO THIS PROJECT (2011-2012)

- Sponsor: European Business Congress
- Primary Contractor: National Gas Vehicle Association Russia, assisted by Clean Fuels Consulting
- Project Scope
  - 21 European NGV Country Profiles (West & East Europe) – PowerPoint file
  - Legal & regulatory environment to build fuelling station network – Excel File
  - Strategic approaches to create NGV fuel infrastructure – PowerPoint file
  - NGV Infrastructure Calculation Tool (NICA) – Excel File

PURPOSE OF THE PROJECT

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The European market for natural gas vehicles has been expanding steadily since 1994 when there were 524,000 natural gas vehicles (NGVs) and 1,693 CNG fuelling stations. Today the European market has expanded to 1.5 million NGVs and 4,000 fuelling stations; growth of 286% and 236% respectively.

While NGVs and the fuelling infrastructure are a practical potential business opportunity they compete with the 'politically attractive' technologies such as hydrogen fuel cells and electric battery vehicles.

Thus, the time is right for the wider European business community to be made aware of the 'NGV potential.' This is best done by highlighting the excellent opportunities to invest in a sustainable fuel and technology that addresses today's important concerns about energy and the environment through the wider use of NGVs, whether they run on fossil natural gas, liquefied natural gas or renewable biomethane.

The European Business Congress has recognized this need and now is seeking a way to inspire new investments in the CNG fuelling infrastructure across Europe. Once in place, this can lead to a much more widespread development of the European NGV market in individual countries that are linked across Europe along the normal transportation corridors.

ACKNOWLEDGMENTS

The project sponsors wish to thank the following individuals for their dedicated research and analysis in making this project possible

- EBC Project Coordinator: Detlef Wessling, E.On Ruhrgas
- NGVRUS Project Manager: Eugene Pronin, Gazprom
- Clean Fuels Consulting
- Principal Investigator: Dr. Jeffrey M. Seisler
- Research Assistant: Marco Dal Pont
- Project engineer for the Natural Gas Infrastructure Calculation Tool (NICA): Gijs van Schoonhoven (Ingenieurbüro van Schoonhoven)

NGV COUNTRY PROFILES

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NGV Country profiles provide, in a PowerPoint format, a template of information that represents in-depth analyses on a country-by-country basis. The profiles focus on the specific elements that are important to understand the investment environment to develop a CNG fuelling infrastructure. Taken together, these country profiles provide a unique window into individual markets that may be attractive to different commercial interests investing in the NGV infrastructure.

FINLAND
(November 2011)

COUNTRY PROFILE TEMPLATE

European Business Congress Study - 2012

- NGV Profile
- Motivation
- Energy Profile (oil & gas/imports & exports)
- Vehicles
- Fuelling Infrastructure
- Government Support
- Gas Industry Support
- Conclusions

NGV PROFILE

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- Number of NGVs: 970
- NGVs are 0,03% of total vehicle population
- 0,18 NGVs per 1000 population
- CNG fuelling stations: 17
- 60,6 vehicles per fuelling station
- Price differential CNG-Petrol/diesel:
  - CNG equivalent per liter gasoline: 0,825 €/liter
  - Regular Gasoline: 1,642 €/liter

Natural gas costs 50% less then gasoline

Source (June 2011): IGU NGV Final Report Country Profile

MOTIVATION

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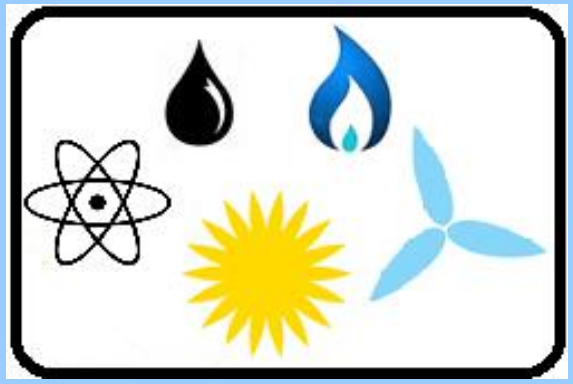
- Environment
- Biogas production to reduce natural gas imports

ENERGY PROFILE



ENERGY PROFILE SUMMARY

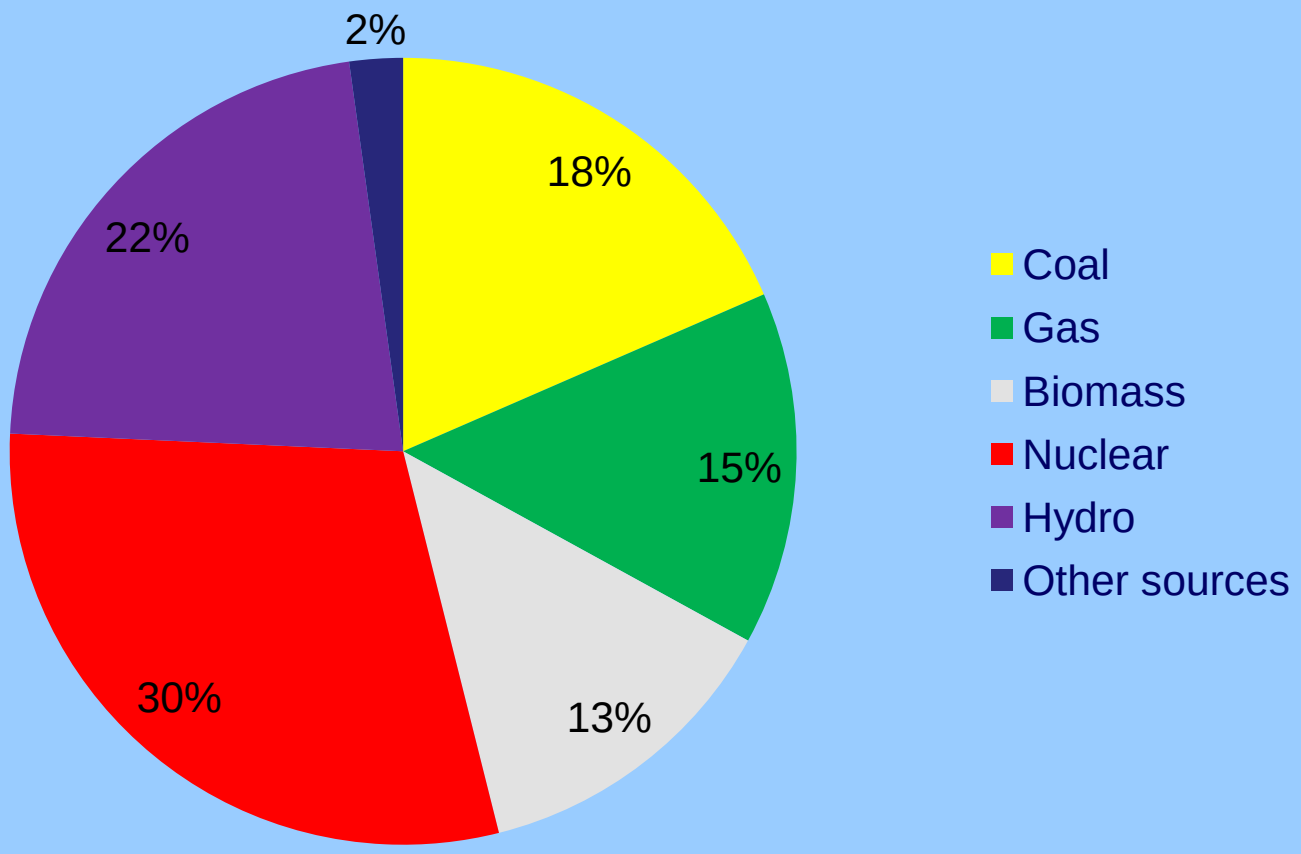
- Good use of domestic sources of biomass and nuclear
- As Finland continues to refine and enhance its energy policy, there are some areas that warrant special attention. As nearly all fossil fuels are imported and all natural gas comes through a single interconnection

ENERGY PROFILE

- **Oil**
  - production: 8,718 bbl/day
  - consumption: 217,400 bbl/day
  - imports: 328,100 bbl/day
  - exports: 133,600 bbl/day
  - reserves: 0 bbl
- **Natural gas**
  - production: n/a
  - consumption: 4,782 billion m^3
  - imports: 4,782 billion m^3
  - exports: 0 m^3
  - reserves: 0 m^3

Source: CIA World Factbook 2011

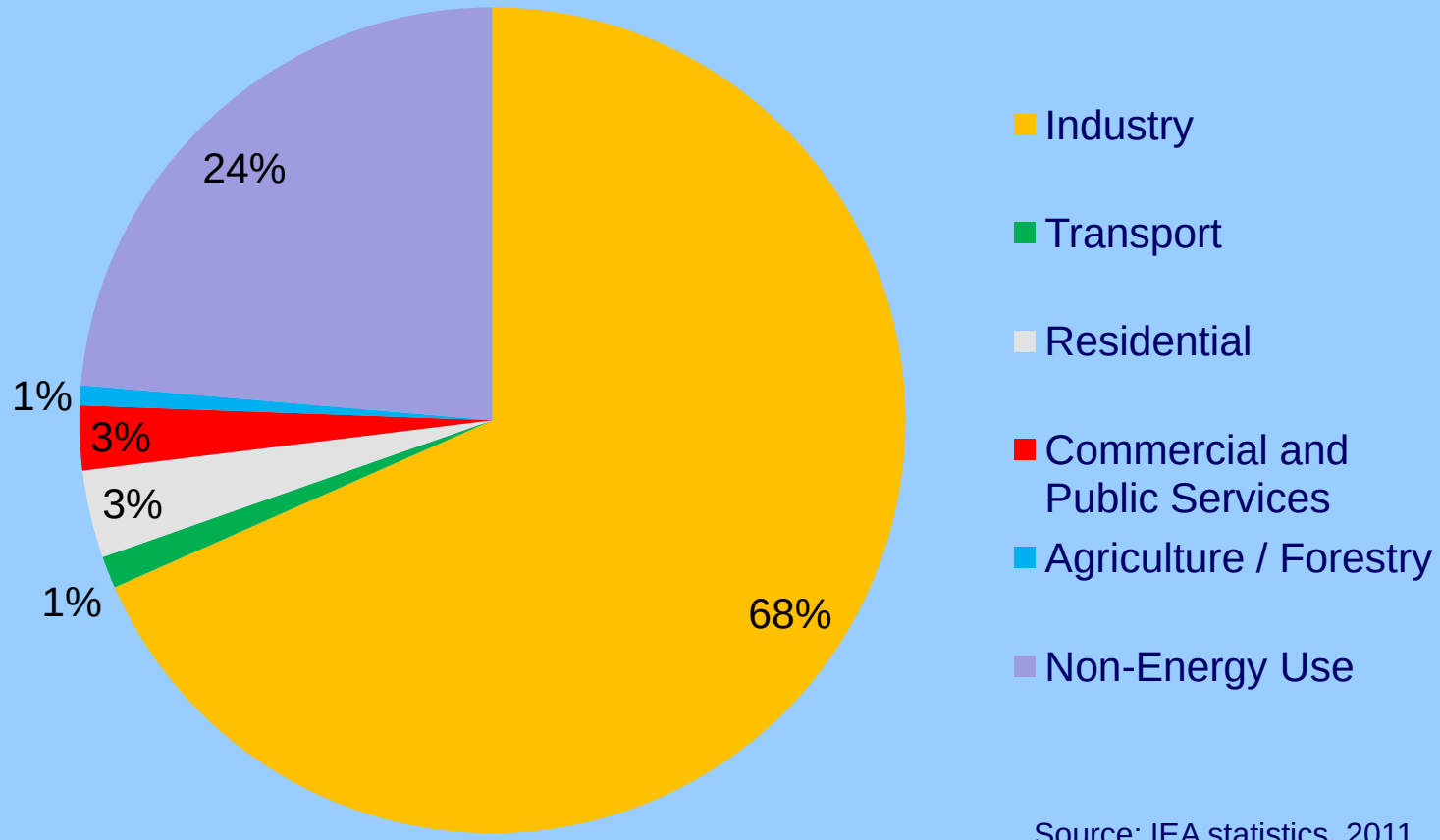
Electricity generation comes from many sources with a majority from nuclear



Finland's main Transmission System Operator is Gasum Oy with 1,190 km of transmission pipeline

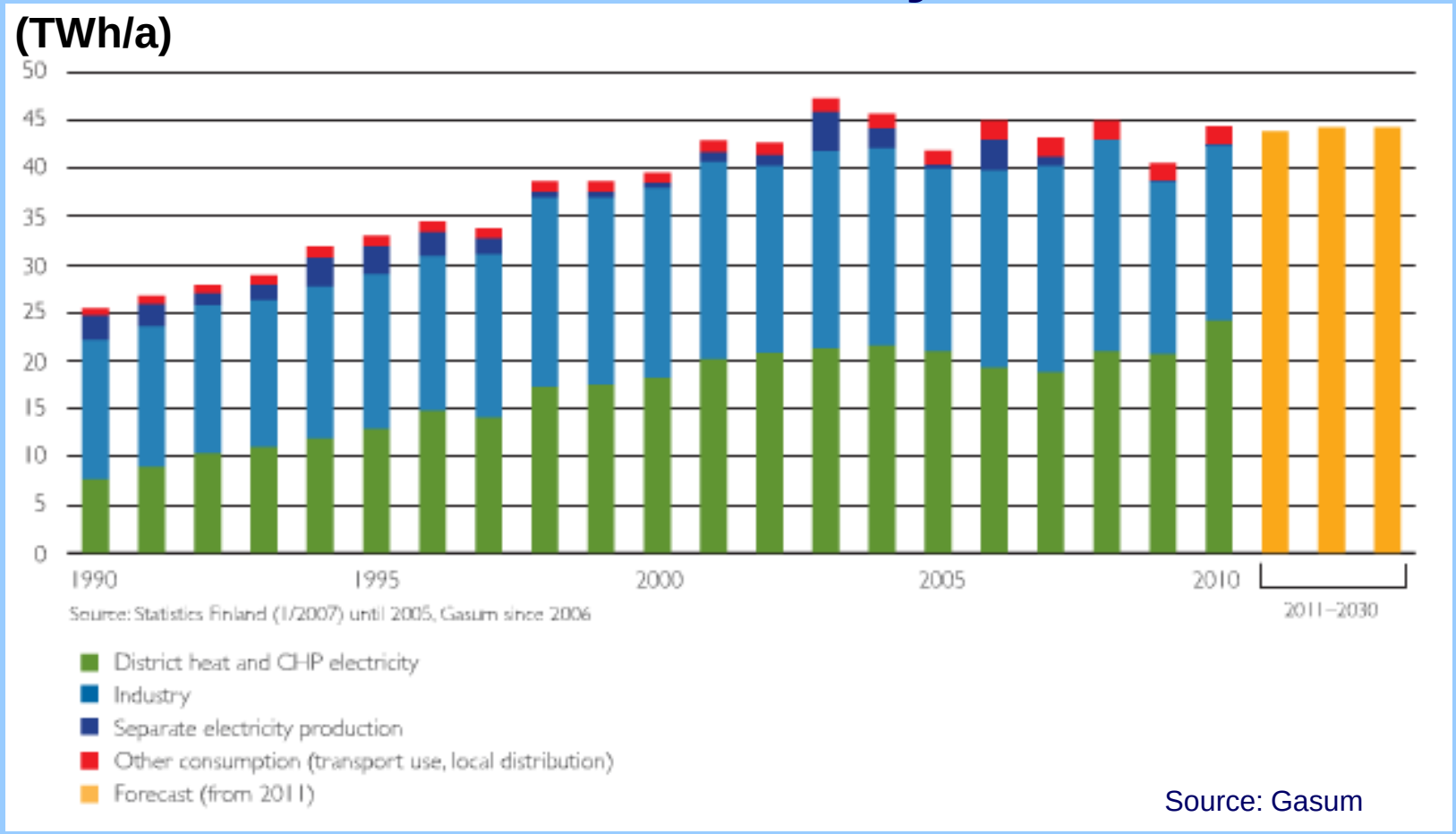
Source: Gasum

Natural gas consumption is focused mostly on large-scale industrial sites



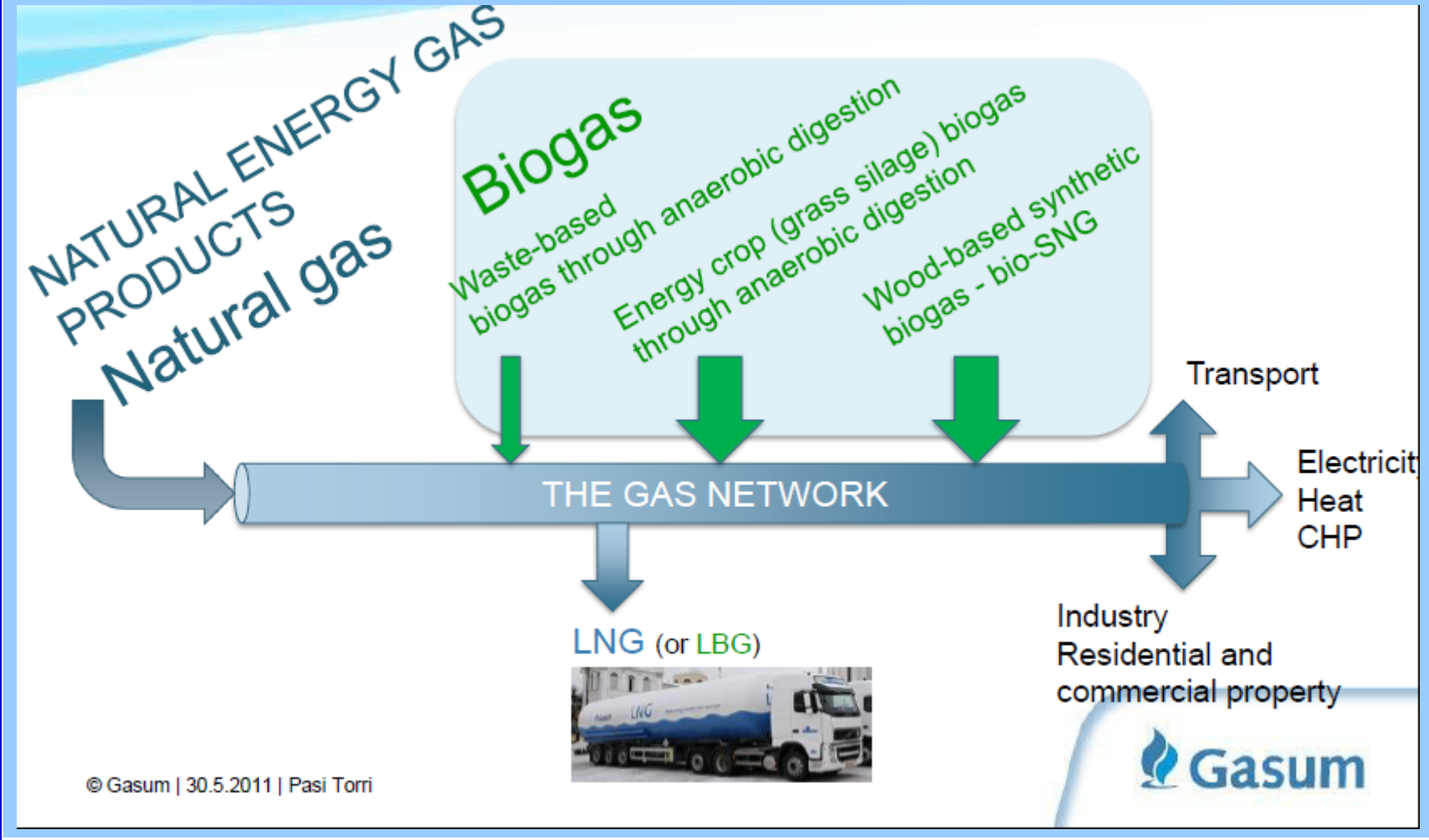
Source: IEA statistics, 2011

Gasum expects stable consumption of gas over the next 20 years



Source: Gasum

Gasum has a vision of diversification of their gas technologies and markets



The natural gas market is open access and regulated by the Energy Market Authority(EMA)

- Obligation to connect customers who will bear the cost of connection
- The users or retailers of natural gas, who:
  - purchase over five m3 of natural gas annually
  - whose metering takes place via remote reading
  - whose pricing has been agreed upon after the Natural Gas Market Act entered into force can participate in the operation of the secondary market
- EMA does not have any strict rules concerning the methodology or revenue level, but monitors the tariffs

Source: Resource Center for Energy Economics and Regulation, Finland natural gas market

Gasum has an LNG production plant in the Kilpilahti industrial area in Porvoo since 1996

- Completed in June 2010, the facility produces around 20,000 tonnes of LNG a year
- Two LNG terminals are planned by Gasum in Turku (2015) and in Provoo (2017)

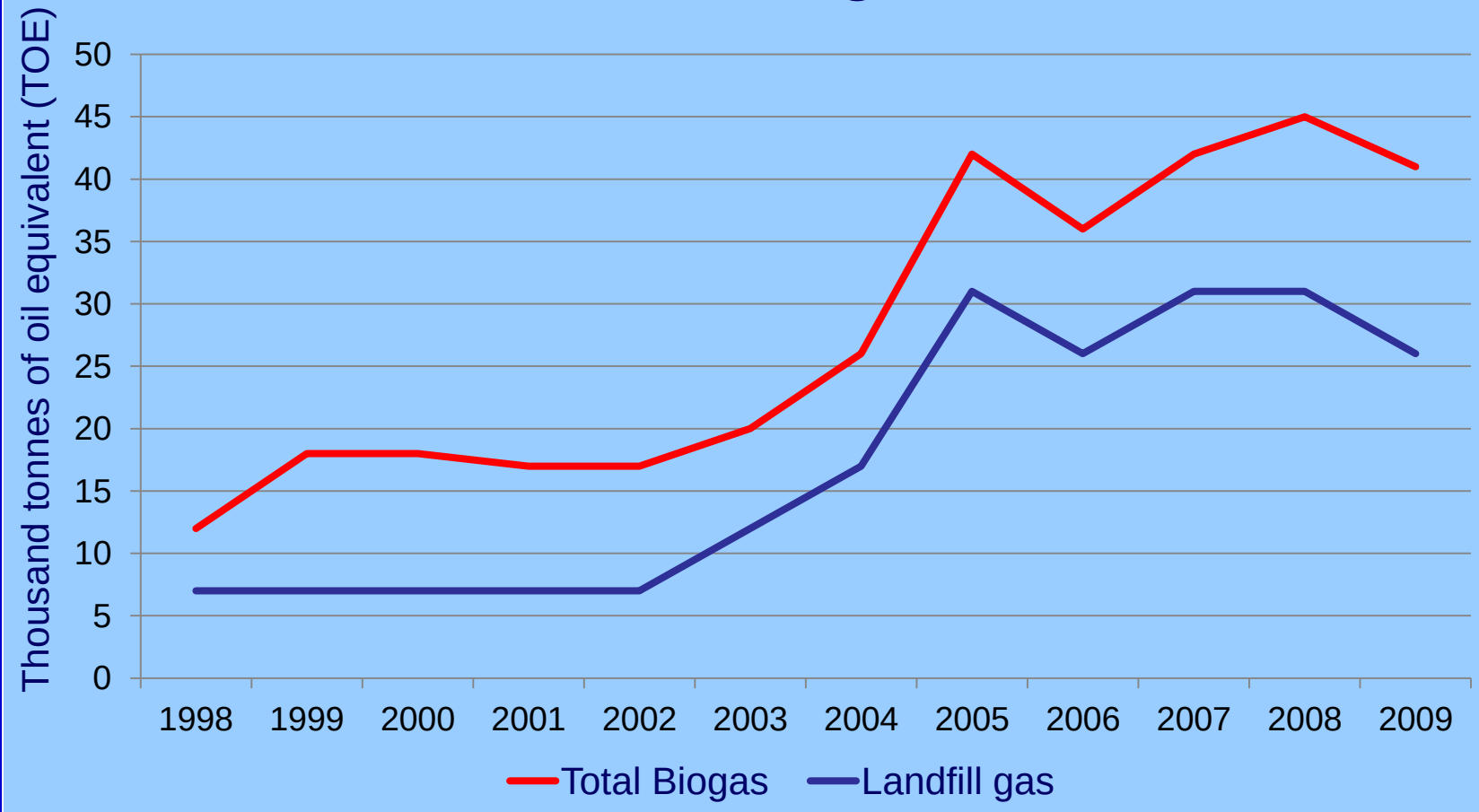
Source: Gasum

Gasum also sells liquefied natural gas (LNG)

- For gas engine product development and testing purposes, industrial uses, for use as a vehicle and marine fuel as well as a reserve fuel for biogas and natural gas
- LNG is transported in cryogenic tank trailers, so the usage sites do not need to be located in the vicinity of the natural gas network
- Gasum also exports LNG to Sweden and Norway

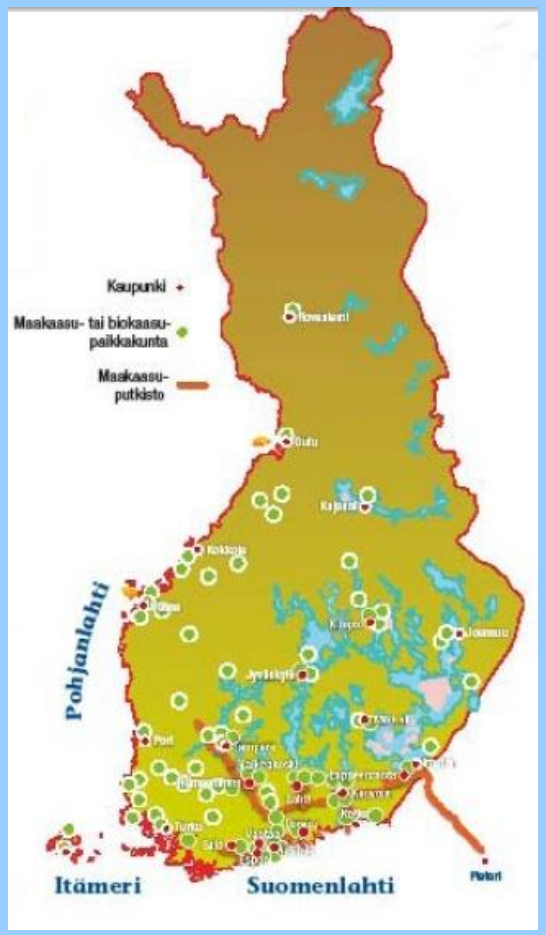
Source: Gasum

Around 60% of total biogas produced is landfill gas



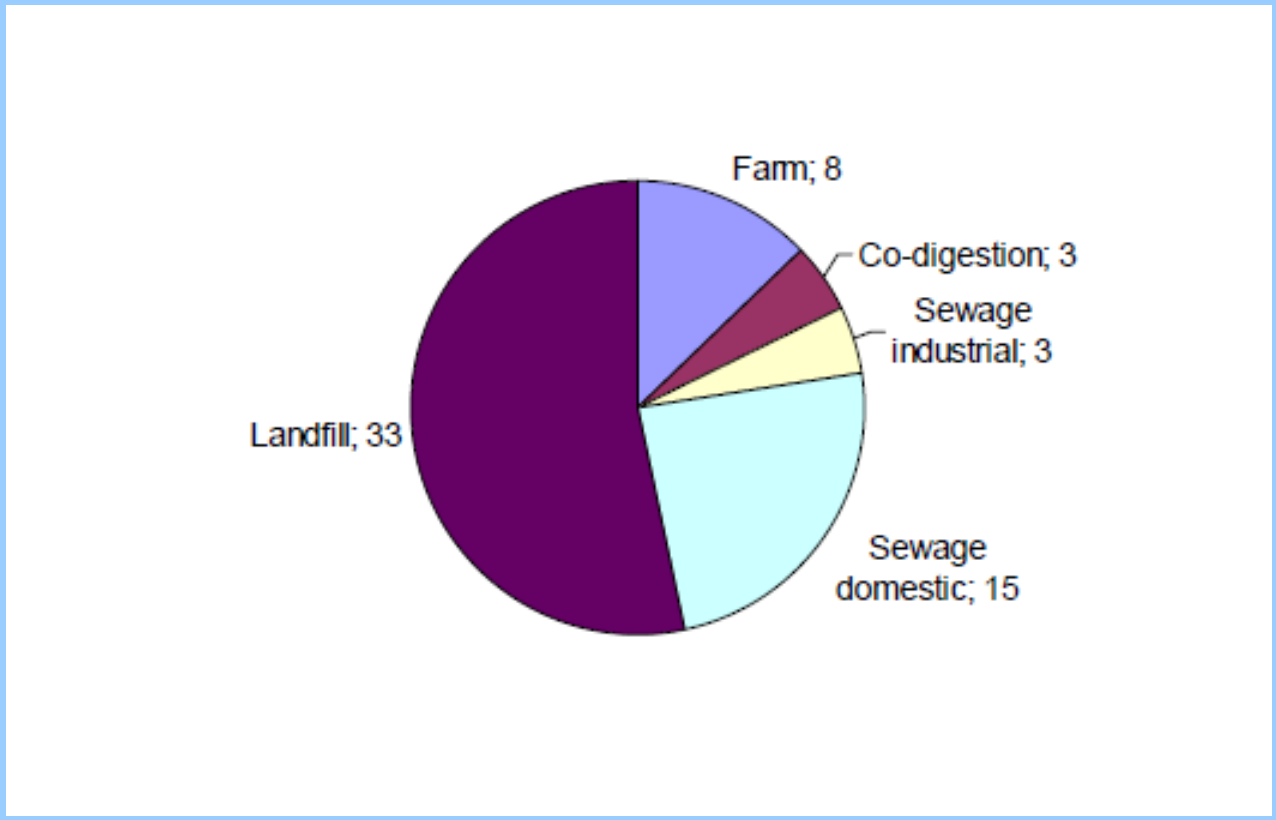
Source: Eurostat

Currently 62 biogas production units are present in Finland, mostly in the south



Source: Jyvaskyla Innovation, Optimal locations for new gas filling stations by 2020

Landfills currently are the largest biogas producers in Finland



Source: Finland Country Report, IEA Bioenergy Task 37, 2009

Gasum to become a major developer of biogas in Finland

- Gasum's objective is to produce biogas, particularly for use as a vehicle fuel
- Gasum aims to introduce biogas production facilities in conjunction with the natural gas transmission network
- This year (2011) will see the completion of Finland's first biogas production plant (in Kouvola). Gasum is implementing the project in cooperation with power and district heat producer KSS Energia Oy

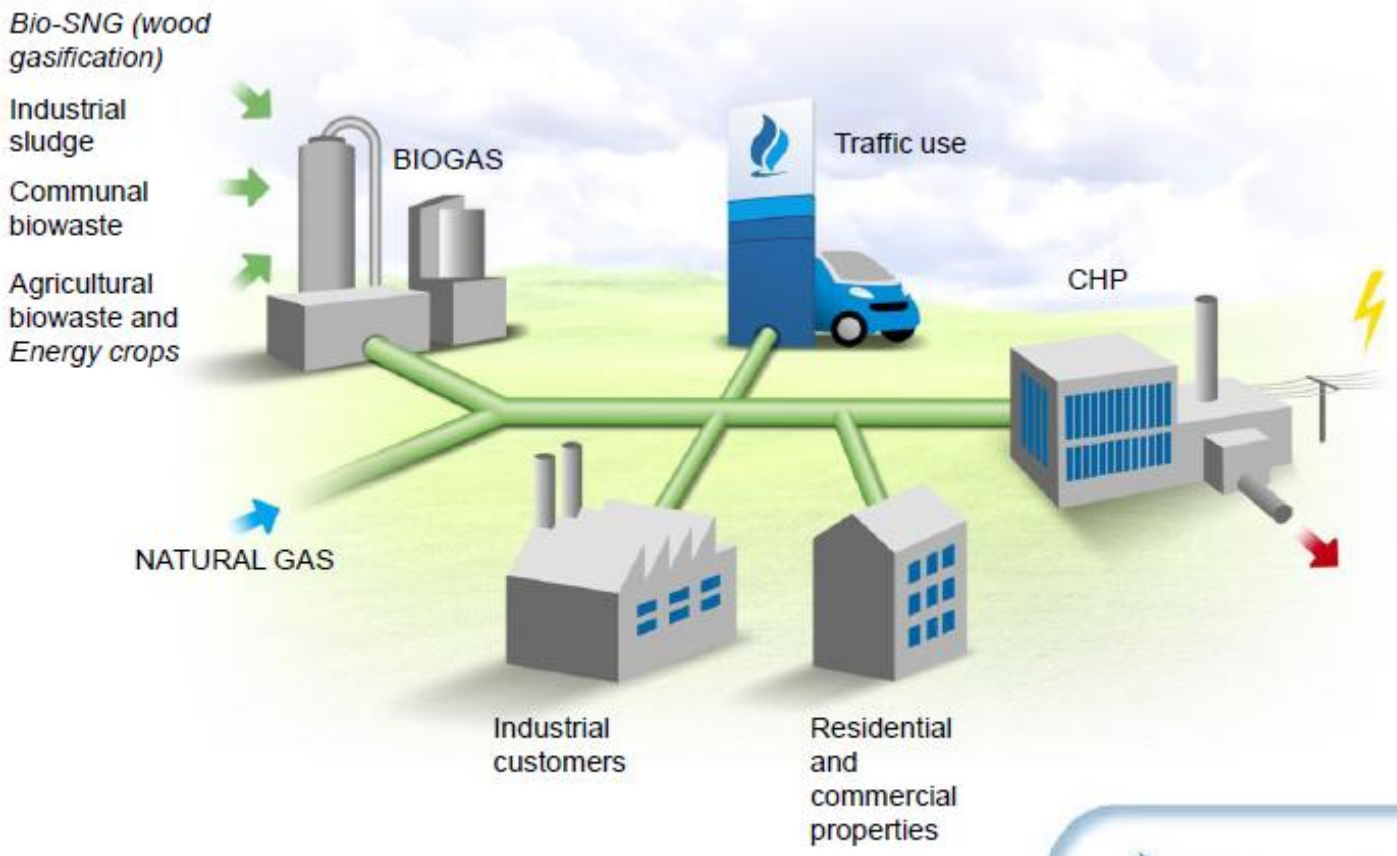
Source: Gasum

Biogas Transport Network Development Project

- This development project creates conditions for production and delivery of renewable biogas for North Karelian traffic: liquefied biogas will be used by heavy trucks and compressed biogas by vans and passenger cars
- 3-year project started in March 2010 and will last until the end of 2012
- Managed by Joensuu Region Waste Management Ltd, a municipal company owned by five municipalities in Joensuu region

Source: liikennebiokaasu.fi

Biogas & SynGas will create synergies in supply and in the demand sectors



ALTERNATE NATURAL GAS SOURCES

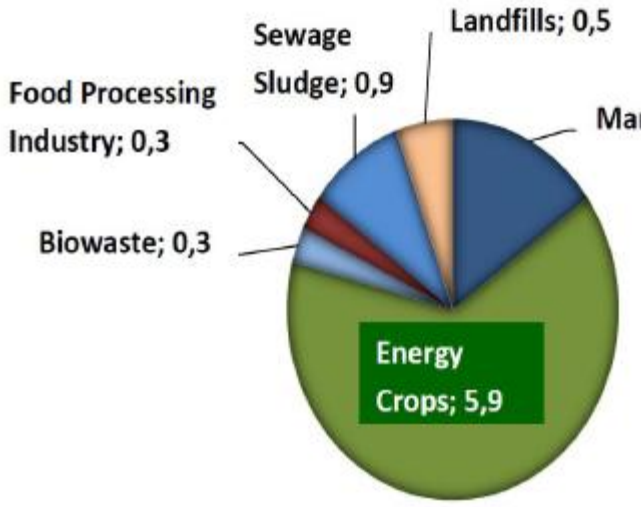
- Bio-based gases (anaerobic digestion and synthetic gas) has the *potential* to deliver 15 TWh of energy, which is about one third of the current natural gas consumption
- Conservatively, 9.2 TWh can be produced from various feedstock; about 21% of gas consumption

The techno-economic energy potential available from biomass fractions exceeds 9 TWh/a.

- The highest production potential can be found in energy crops.
- The estimate is based on sustainable use of field areas and fractions outside the food chain (i.e. grass silage).

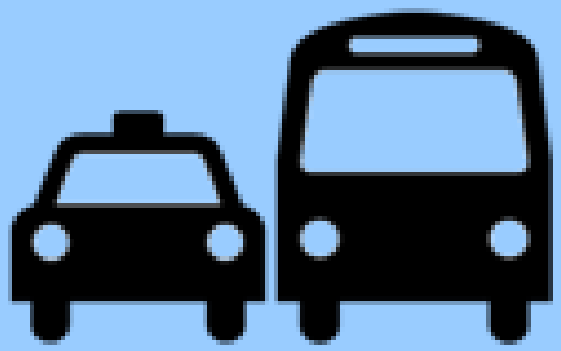
© Gasum | 30.5.2011 | Pasi Torri

The Techno-Economic Energy Potential of Biomass Fractions in Finland (used as Biogas Feedstock) 9, 2 TWh



University of Jyväskylä, H Tähti & J Rintala, 2010

VEHICLE PROFILE

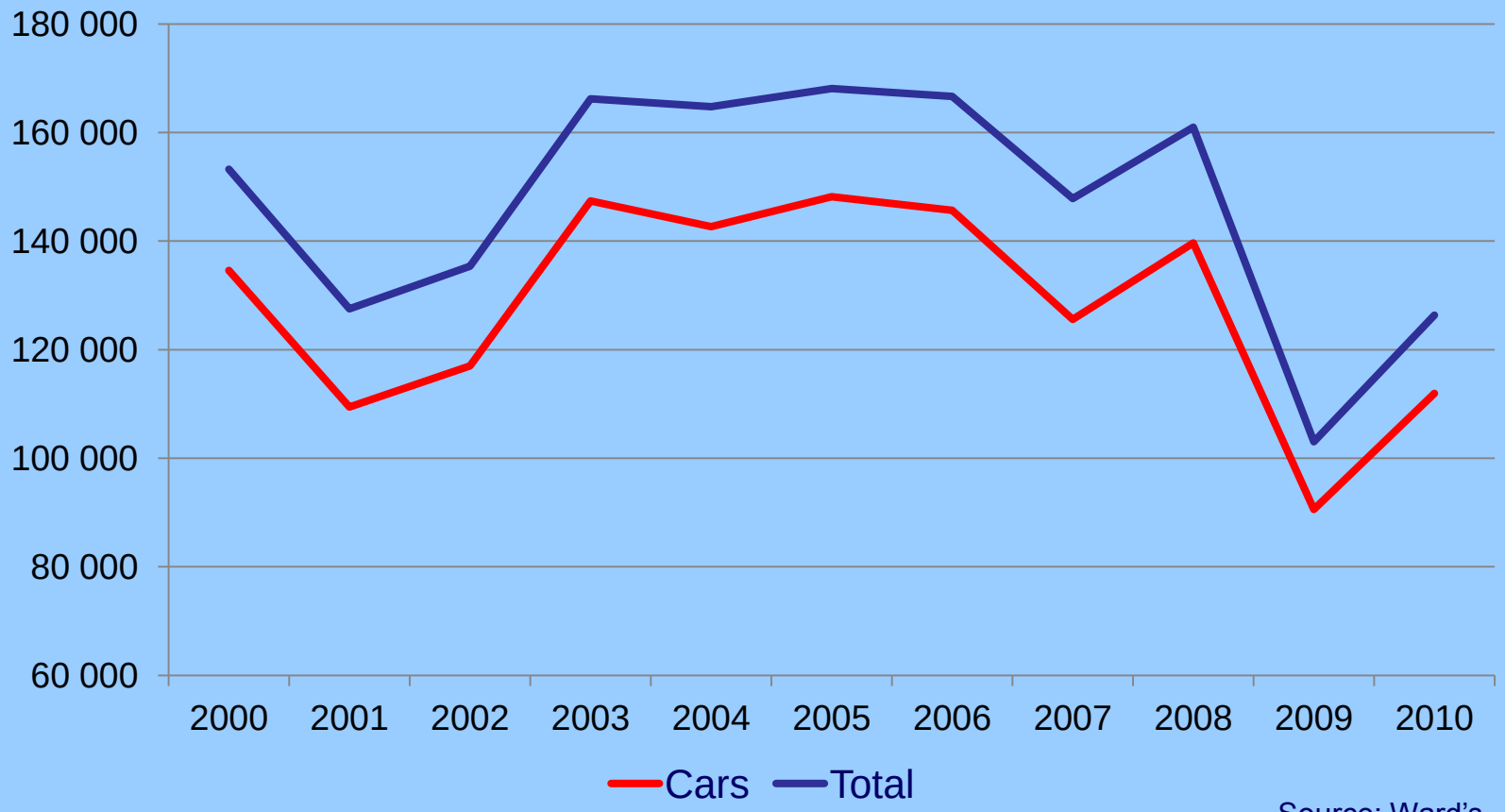


Automotive industry in Finland is very small

- Only 6.400 vehicles were produced in 2010
- Two automotive manufacturing plants currently are operating in the country:
  - Valmet Automotive, a contract manufacturer of passenger cars (Porsche)
  - Sisu-Auto, a truck manufacturer

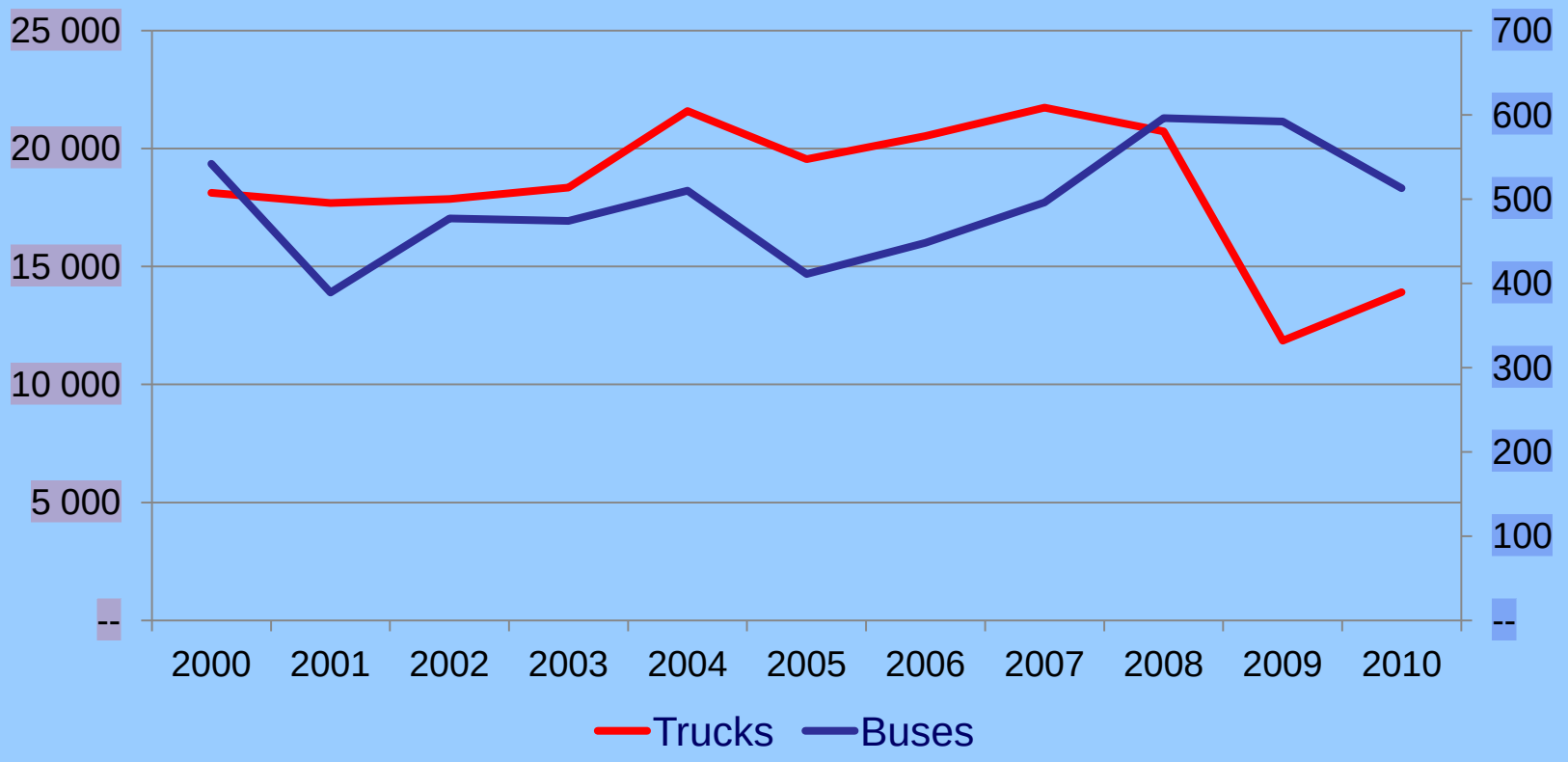
Source: ACEA

Passenger cars sales drive the total sales of vehicles in Finland



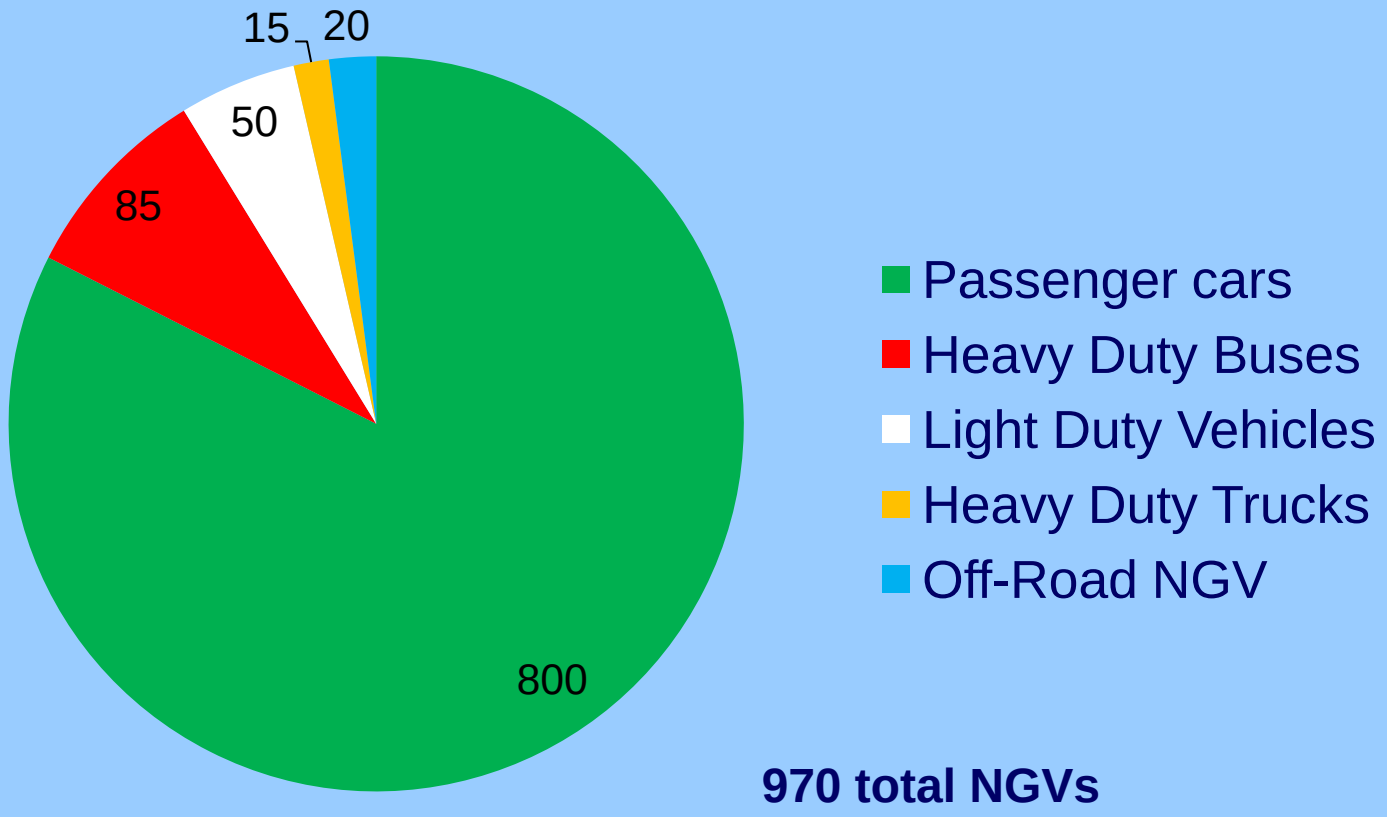
Source: Ward's

Economic crisis in 2009 decrease trucks sales, while bus sales remained quite constant



Source: Ward's

More than 80% of NGVs are passenger cars



970 total NGVs

Source: IGU NGV Final Report Country Profile

NGV OEM AVAILABILTY

Vehicles availability is improving but still is limited

FIAT
- Doblò

OPEL
- Combo
- Zafira

IVECO
- Eco Daily

MERCEDES
- E 200 NGT
- Sprinter

VOLKSWAGEN
- Passat EcoFuel
- Touran EcoFuel
- Caddy

Source: IGU NGV Final Report Country Profile

Only 3 OEM are selling Heavy duty NGVs

Heavy Duty Buses:

- MAN
- IVECO
- Mercedes-Benz

Heavy Duty Trucks:

- Mercedes-Benz Econic
- IVECO

Source: IGU NGV Final Report Country Profile

NGV OEM AVAILABILTY

Due to distances travelled, Finland has special requirements for the buses, which limits gas bus availability

- The distances are longer in Finland so more seats are required. This increases the price of the vehicle
- Diesel bus prices are clear
- Operators are used to using diesel and are not favorable (yet) to CNG

Source: Gasum stakeholder

Conversions and modification kits are possible thanks to few companies

- Terra Gas Ireland Ltd.
- Car Maintenance J. Autto
- Gas Corner
- Oragas
- CNG House Oy
- Gas Power

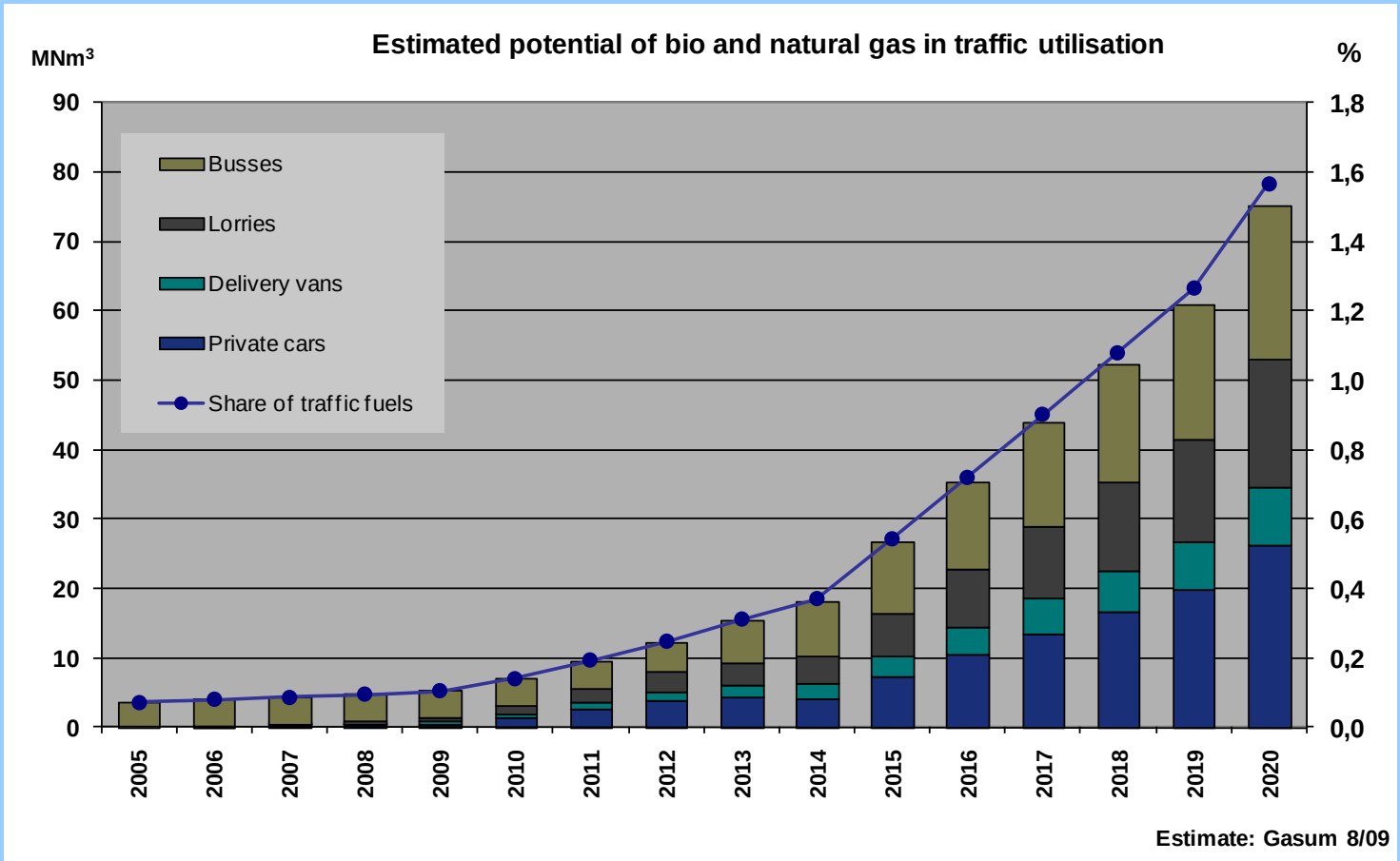
Source: liikennebiokaasu.fi

Gasum is committed to develop NGV business in Finland and is investing heavily in refueling station network, biogas and marketing

- The goal is to have adequate refueling station infrastructure within natural gas network and to have satellite stations in strategic locations in future (biogas and/or L-CNG)
- The number of NGVs will continue to increase and will reach 6 000 NGVs by the end of 2015 (continuous strong growth after that)

Source: IGU NGV Final Report Country Profile

Biggest potential for CNG will be buses and passenger cars



Source: Gasum, NGV/CNG market Finland, January 2011

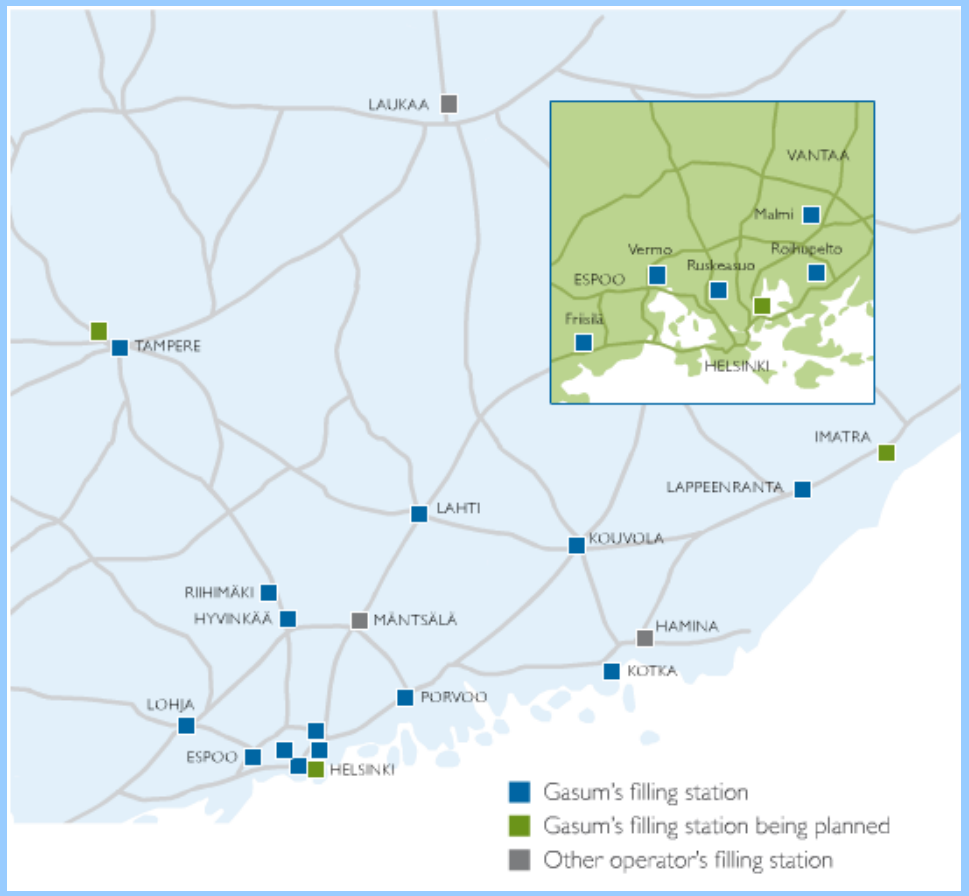
Gasum donates a biogas car to Finnish National Traffic Police

- Passat Variant TSI EcoFuel to demonstrate the benefit of biogas

Source: Gasum

NGV FUELLING INFRASTRUCTURE

17 CNG filling stations in Finland, all of them located in southeastern and southern Finland in the area covered by the natural gas network



Source: Gasum

NGV FUELLING INFRASTRUCTURE

- The petrol and diesel refuelling station network is dense in Finland
- The existing gas distributing companies have co-operated with the traditional fuel distributing companies and there are already gas filling stations on the same refuelling sites with diesel and petrol pumps
- The co-operation will be more widespread in the future, and some traditional fuel distribution companies might also start distributing biogas and natural gas

Source: Jyvaskyla Innovation, Optimal locations for new gas filling stations by 2020

The network of filling stations is expanding slowly

- CNG fuelling infrastructure started to develop in 2003 when changes in political regulations made it possible to use methane as traffic fuel
- Gasum owns 14 of the stations and new ones are constructed every year
- Gasum's stations sell only CNG. LPG is not sold at their stations

Source: Gasum

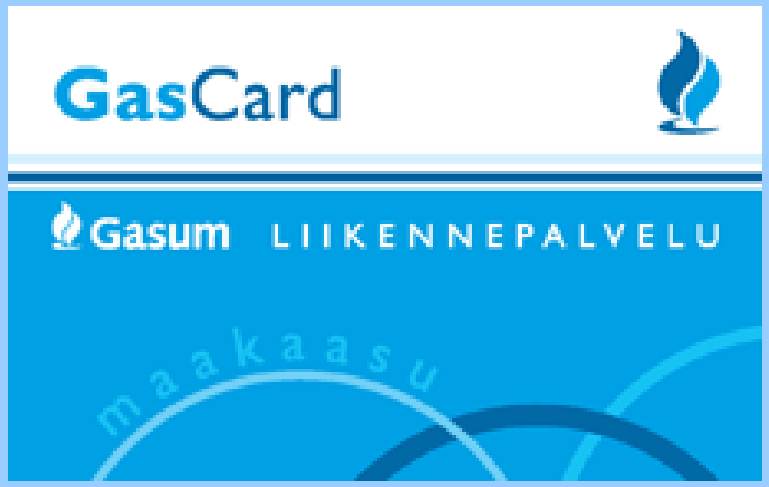
The CNG stations are stand-alone because it has not been easy to motivate the cooperation of the oil companies

- Two oil companies are cooperating: ABC and Deboil, a Lukoil subsidiary
- They have a couple of stations that are in connection with their petroleum stations
- Gasum pays them ‘rent’ for the land
- The gas company does all the investment and maintenance and makes the profit. But the gasoline companies get positive public relations

Source: Gasum

Currently, to fill up at a Gasum station a specific GasCard payment card is required

- Cards can be orderd easily on the Gasum website
- The card is free
- Customer is bill every month



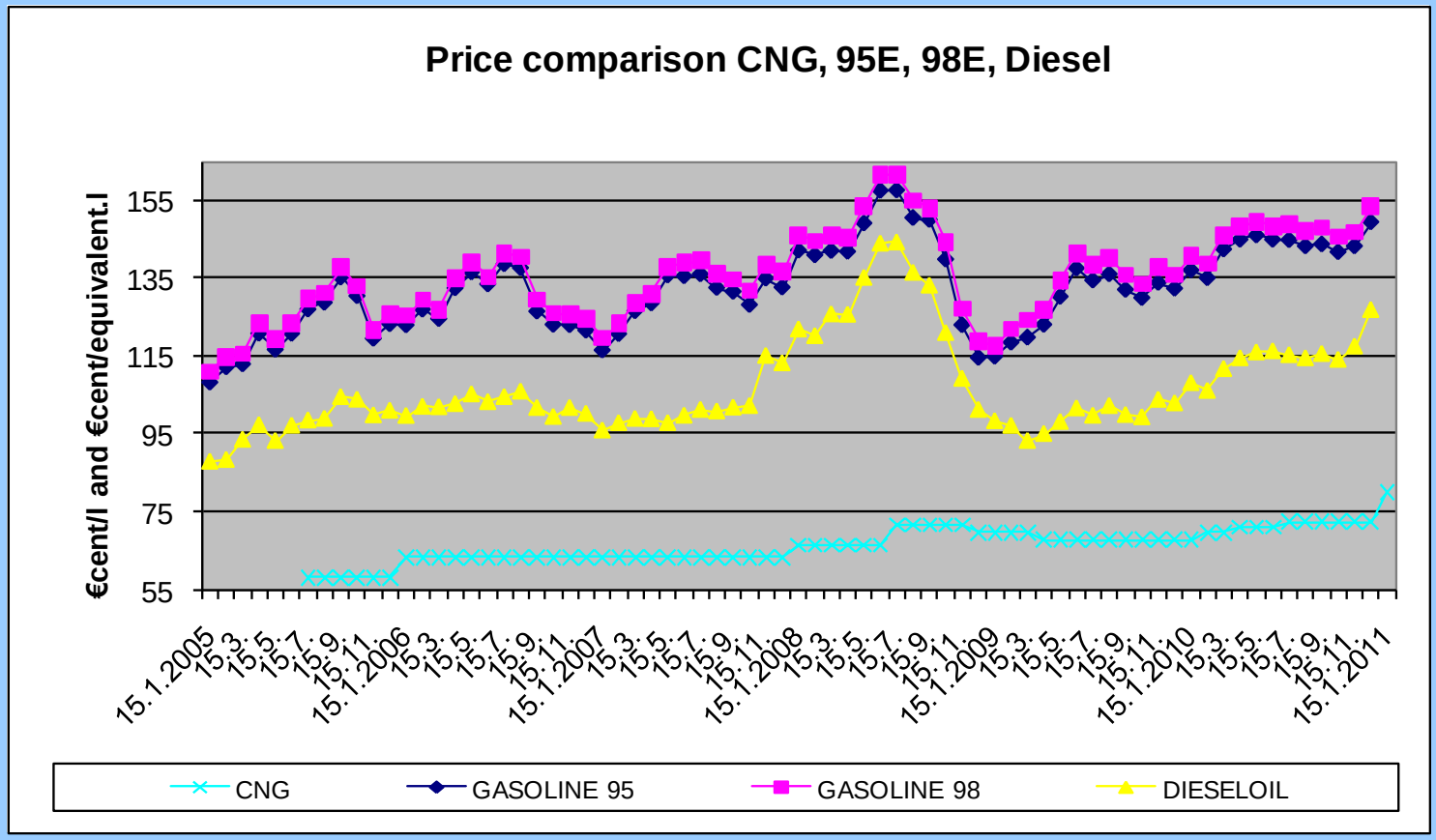
Source: Gasum

At the moment there is only one biogas filling station operating outside the natural gas pipeline network in Laukaa

- In 2012 one more biogas station is planned
- GASUM is now starting the first clean up facility for biogas
- Ultimately they want to supply all the gas for vehicles from biogas

Source: Gasum

CNG price is increasing but it always costs 50% less than Gasoline



Source: Gasum, NGV/CNG market Finland, January 2011

Gasum's target 2010 is not reached today

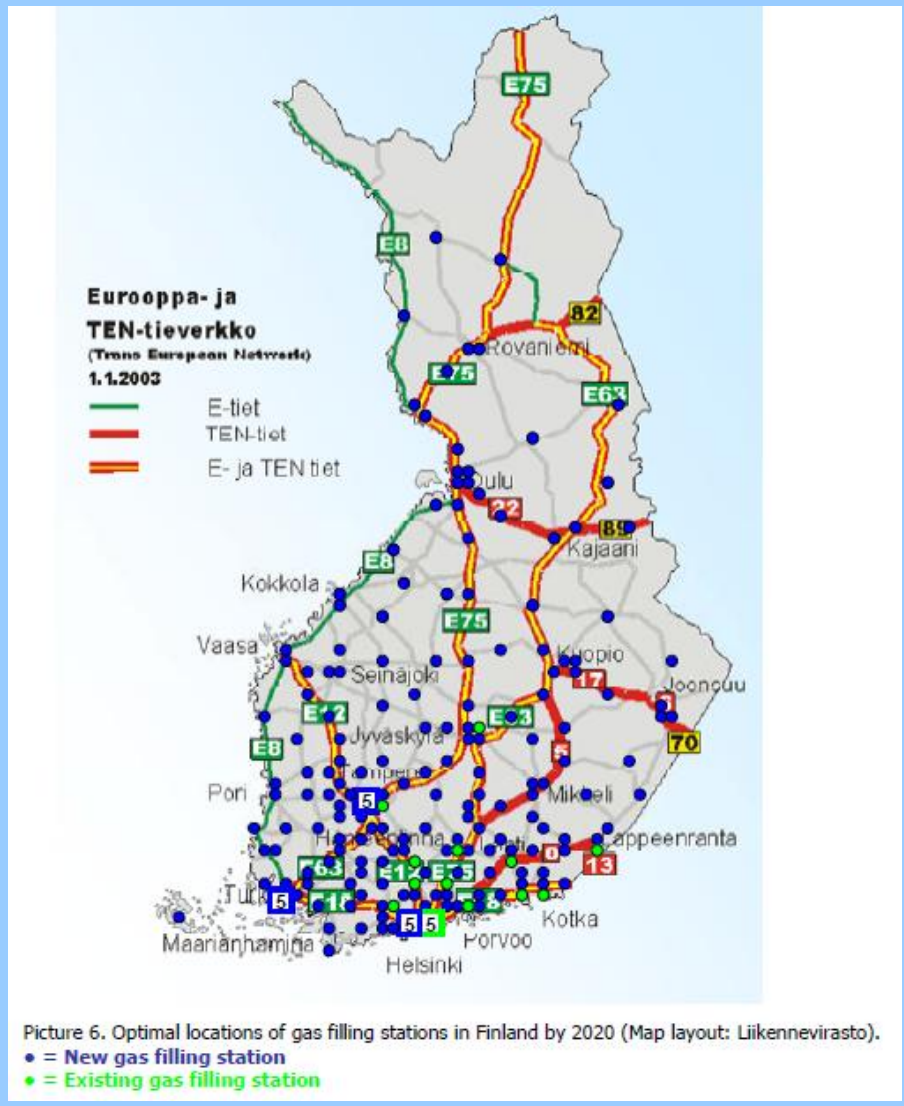
- Gasum planned to build 30 public natural gas fuelling stations by 2010
- Today only 17 stations are opened in Finland

Source: Finland Country Report, IEA Bioenergy Task 37, 2009

NGV FUELLING INFRASTRUCTURE

In 2020 there could be about 200 gas filling stations in Finland

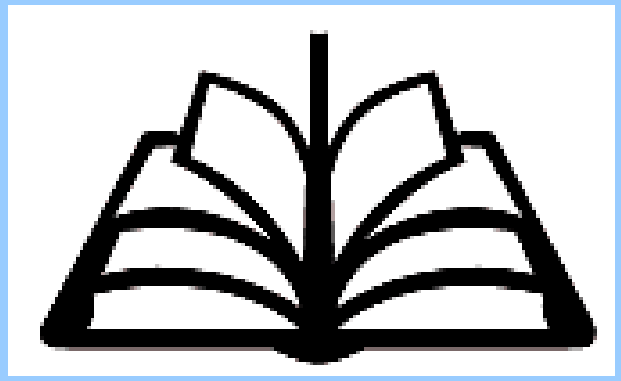
The optimal locations of the future filling stations are shown in the map:



Picture 6. Optimal locations of gas filling stations in Finland by 2020 (Map layout: Liikennevirasto).
• = New gas filling station
• = Existing gas filling station

Source: Jyvaskyla Innovation, Optimal locations for new gas filling stations by 2020

STANDARDS & REGULATIONS



All stations are “stand-alone”/unmanned and open 24/7

- Multi-fuel stations: allowed
- No limits on opening hours: all station are opened 24/24
- Self service: allowed
- Payment practices at the pump: to fill up at a Gasum station you need a specific GasCard payment card

- The nozzles used are of the NGV 1 type which is standard in Europe
- NGV 2 nozzles for heavy vehicle refuelling are also available at Ruskeasuo and Malmi filling stations in Helsinki

Source: Gasum

European standards are accompanied by few national standards

SFS-EN 1594: The gas pipelines. Maximum operating pressure over 16 bar. Functional requirements

SFS-EN 12 327: The gas pipelines. Pressure test, commissioning and decommissioning. Functional requirements

BS EN 12007: The gas pipelines. Maximum operating pressure up to 16 bar

BS 2897: Natural Gas Pipeline. Pressure test

BS 3179: Gas Pipeline and the use of equipment investment, installation, equipment, pressure and leak testing and deployment

SFS-EN 12 186: Transmission and distribution pipelines, pressure reduction stations. Functional requirements

SFS-EN 12 583: Compressor Stations. Functional requirements

BS EN 1918: Underground gas storage

There are no regulations to build the stations

- There is one guideline with the Finnish gas association and regulatory authorities
- Right now the CEN prEN 13638 form the basis of the CNG construction guidelines

Source: Gasum

Biogas-biomethane is seen as a future for Finland's NGVs but current regulations are not favorable

- There is a feed-in tariff for biogas as an electric generation fuel but no feed-in tariff for biogas as a vehicle fuel
- This is a major barrier at the moment for biogas as a vehicle fuel
- This is a major contradiction to Finnish government CO2 reduction policy since biogas is not taxed as a vehicle fuel

GOVERNMENT SUPPORT

Fuel taxation is the only incentive for NGV

Vehicle tax (new vehicle, depends on the vehicle's output of CO_2 emissions)

- Tax rate: min 10%…max 40% @ retail price
- Calculation: CO_2-emission divided by 10 plus 4 = tax-%(e.g. 140 g/km → 18% (140/10 + 4 = 18 %))

Annual vehicle tax

- Base (depends on the vehicle's output of CO_2 emissions, 20-600 €/year)
- Fuel & weight related (€cent / day / every 100kg of the total vehicle weight) “tax on the propelling force” (e.g. NGV 3,1 €cent, diesel 5,5 €cent)

Source: Gasum, NGV/CNG market Finland, January 2011

Fuel taxation for CNG is lower than taxation for diesel and gasoline

- 2011: 9,024 eur/MWh(excluding VAT 23%)
- 2013: 11,524 eur/MWh(excluding VAT 23%)
- 2015: 13,724 eur/MWh (excluding VAT 23%)

- **Biogas has an exemption from fuel tax**

"Tax on the propelling force" will be introduced for NGVs in 2013

- This tax will depend on the 'propelling force' and the total weight of the passenger car
- e.g. for methane: 3,1€ cent/day every 100kg of the total vehicle weight and for diesel 5,5 € cent/day every 100kg of the total vehicle weight

The city of Turku is working hard to promote climate-friendly use of biogas as a transport fuel

- The aim is to have the first biogas buses in Turku in the next few years (2014)
- In Spring 2012 there will be a more detailed explanation and a plan about the use of biogas as a fuel in the city organized by the public transport services

Source: liikennebiokaasu.fi

In January 2011 new Finnish target to use 20% of energy in transport produced from renewables

- They don't want to import 20% biofuels from other international sources: good possibility to use wood-based biomass
- First plants are anticipated to be on line by 2014
- The wood-produced synthesis fuel would be potentially for diesel, but there is some discussion about producing synthetic methane (syngas)

Source: VTT

Ministry of Employment and Economics has funding for liquid biofuels for transport

- Synthetic gas for transport would be acceptable also
- Funding instrument through the Commission Emissions Trading System
- Money from emissions trading can be applied to new technology development

Source: VTT

GAS INDUSTRY SUPPORT

Gasum is expanding and developing the Finnish natural gas transmission network

- Construction of new pipelines around the Helsinki Metropolitan Area, in municipalities surrounding Tampere and in Kangasala, central Finland)
- Development of the existing network to ensure sufficient transmission capacity and supply reliability for current users

Source: Gasum

There are lots of biogas projects but Gasum is the only one with large-scale projects

- They are injecting biogas from only one project into the gas grid
- Gasum is buying upgraded biogas, about 7 GWh/year, from a separate production company
- New project near Helsinki with a target of 20 GWh/year of biogas
- There is another project planned for 2013 for about 60 GWh/year

Source: Gasum

Gasum is a supporter of GasHighWay (EU-project)

- Objective: promoting the uptake of gaseous vehicle fuels, namely biomethane and CNG, and especially the realisation of a comprehensive network of filling stations for these fuels spanning Europe from the north, Finland and Sweden, to the south, Italy

GASHIGHWAY

Participation of Finnish national oil company NESTOR in projects on synthesis gas

- NESTOR wants to become the world leader in biodiesel
- NESTOR's support for biodiesel may overshadow the use of gas as a vehicle fuel
- But it could mean that there also could be enough synthesis gas to support the NGV industry since the population of NGVs is not very large

Source: VTT

NATIONAL LAWS & REGULATIONS

Finland is a world leader in economic freedoms, including business freedom, property rights, and freedom from corruption

- A modern regulatory environment strongly facilitates business formation, dynamism, and competition
- The efficient business framework is conducive to innovation and productivity growth

Source: The Heritage Foundation, 2011 Index of economic freedom

Finland is open to foreign direct investment

- Foreign acquisitions of large companies may require follow-up clearance from the government
- Regulation is relatively transparent and efficient
- There are no exchange controls and no restrictions on current transfers or repatriation of profits, and residents and non-residents may hold foreign exchange accounts
- Restrictions on the purchase of land apply only to non-residents purchasing land in the Aaland Islands

Source: The Heritage Foundation, 2011 Index of economic freedom

COMMENTS BY STAKEHOLDERS

COMMENTS BY STAKEHOLDERS

- The future is biogas and not natural gas.
- The only opportunity to reduce gas imports will come from biogas
- Regarding the European Commission's proposals to tax natural gas at levels similar to petroleum fuels: The Minister of Finance in Finland is trying to convince DG Taxation that the Finnish program would not survive if the new proposals on minimum taxation of fuels would go into force

CONCLUSIONS

European Business Congress Study - 2012

- Energy environment
- Gas industry support
- Government support
- NGV market development
- Legal and regulatory framework for CNG station development
- Investment environment

Energy Environment

- With100% of natural gas imported Finland is working to become energy self-sufficient, through nuclear energy and renewable fuels
- The future use of biogas has great potential to solve the problem of gas imports (energy security) and to achieve ambitious CO2 reduction targets
- Synfuel from wood pulp could become a major source of fuel domestically and, potentially, for export

Gas Industry Support

- Gasum is investing in natural gas infrastructures and biogas production plants as a strong future business that ultimately can replace imported natural gas from Russia
- Gasum will likely build and thereby capture a large portion of the biogas-biomethane market in Finland as a major part of its future business plan
- Whether or not the ambitions to create a nationwide CNG fuelling network remains to be seen (mostly due to lack of vehicles)

Government Support

- The only support for NGVs is through the favorable fuel tax structure
- The government tax policies are favorable toward biogas as a vehicle fuel due to its low CO2 reduction potential
- The government recognizes that their plans for increased use of biogas could be under threat by the EU's minimum fuel tax proposals

NGV Market Development

- Expansion of the market is slowed by a limited natural gas network, limited refuelling infrastructure, limited availability of vehicles and customer's lack of knowledge
- Outside of Gasum there are few supporting stakeholders from municipalities or private companies that would have interest to invest in refuelling stations and NGVs
- There is a potential for NGVs so long as the favorable tax advantage remains

Legal and regulatory framework for CNG station development

- Current use of prEN 13638 standard are adequate but likely will be replaced by the ISO standards once they are complete
- The clear regulatory environment and transparent standards make Finland an ideal location to invest

Investment Environment

- The regulatory environment encourages entrepreneurial activity and innovation
- The regulations are clear and transparent
- The open economy tends to be an incentive for foreign investment

FINLAND
(November 2011)