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

European Business Congress Study - 2012

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

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- 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.

SWITZERLAND
(June 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

European Business Congress Study - 2012

- Number of NGVs: 9.279
- NGVs are 0,23% of total vehicle population
- 1,2 NGVs per 1000 population
- CNG fuelling stations: 150
- 74 vehicles per fuelling station
- Price differential CNG-Petrol/diesel:
  - CNG equivalent per liter gasoline: 1 €/liter
  - Regular Gasoline: 1,46 €/liter

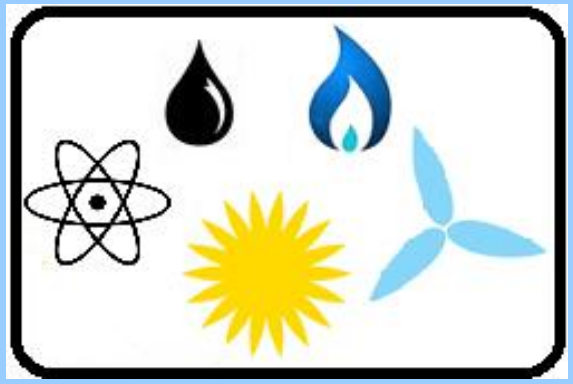
  Natural gas costs 30% less then gasoline

Source (July 2011)
www.metanoauto.it
http://www.drive-alive.co.uk/fuel_prices_europe.html

MOTIVATION

- Environmental considerations
- Businesses found that being seen to use CNG/Biogas was beneficial to consumer's perception of them as a 'green' or environmental company

ENERGY PROFILE



ENERGY PROFILE SUMMARY

- Energy policy is shared between the Federal Government and the 26 Cantons although more power has been given to the Federal level
- Switzerland is not a member of the EU or EEA but is heavily influenced by EU energy policy
- Plans to abandon nuclear power
- Very low carbon electricity sector with:
  - 56% of electricity produced from hydroelectric plants
  - 39% from nuclear
  - 5% from fossil fuel thermal plants

ENERGY PROFILE

- **Oil**
  - production: 3.488 bbl/day
  - consumption: 280.000 bbl/day
  - imports: 263.600 bbl/day
  - exports: 10.680 bbl/day
  - reserves: 0 bbl
- **Natural gas**
  - production: 0 m^3
  - consumption: 3.042 m^3
  - imports: 3.042 m^3
  - exports: 0 m^3
  - reserves: 0 m^3

Source: CIA World Factbook 2011

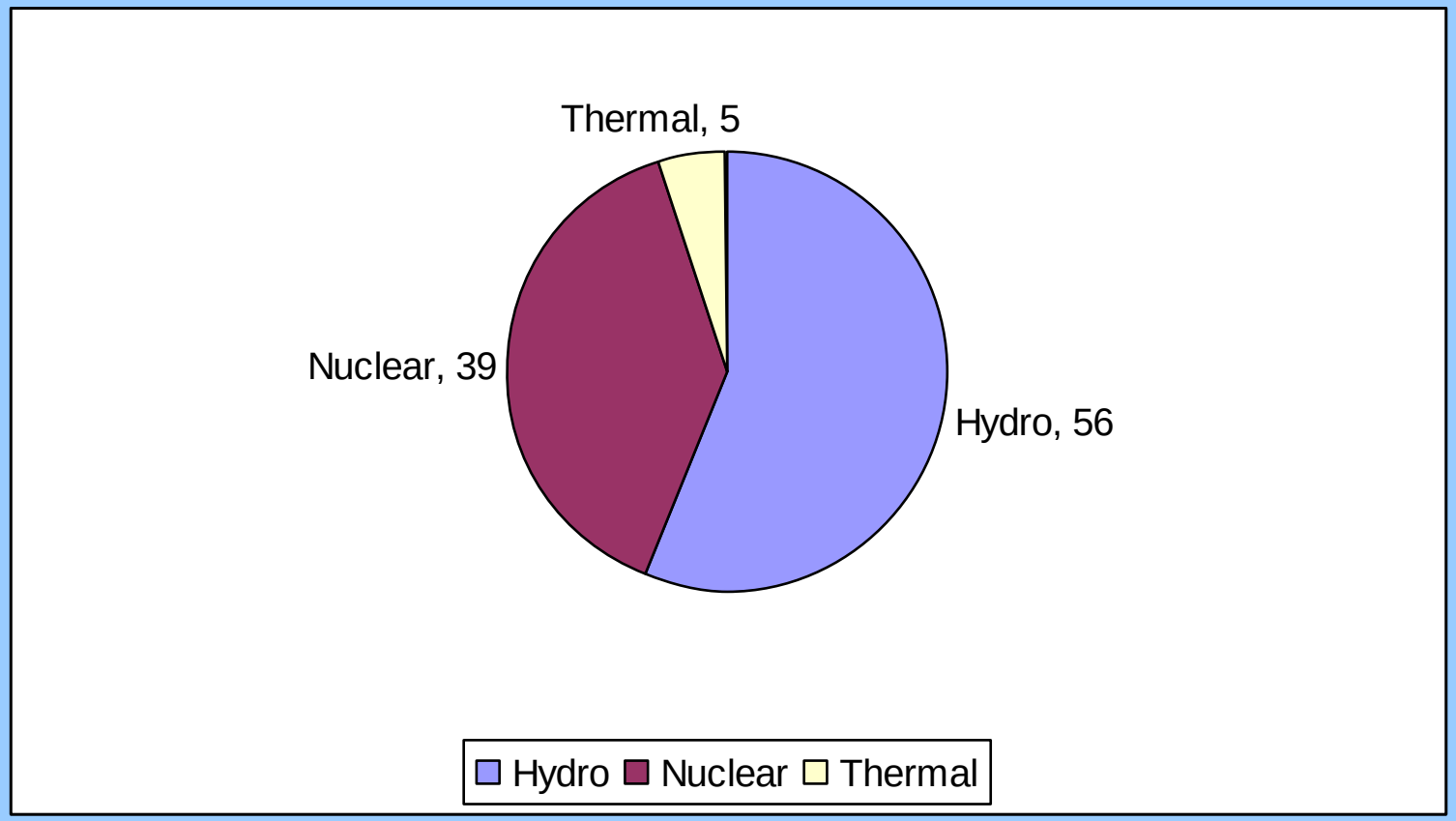
Low CO_2 Electricity Production but Facing Challenges with the Phase-out of Nuclear

- Switzerland has been considered to have an energy sector characterized by “high quality, reliable, largely CO_2-free production and competitive prices
- 25 May 2011: Government aims “to continue to safeguard Switzerland's high level of energy security although without nuclear energy in the medium term”
- All nuclear power stations are to be decommissioned at the end of their useful life and replaced by non-nuclear plants
- Projection: Energy demand, currently at 60bn kWh could rise to around 90bn kWh a year by 2050 if tighter measures are not taken

Current Problems and Ambitious Aims

- Meeting electricity demand becoming difficult as long term contracts with France are ending and neighbouring countries have less spare capacity
- In 2007 government outlined plans to become more energy efficient and to increase the share of renewables
- Reduce CO_2 and fossil fuel demand by 1.5% each year
- Stabilise electricity demand at the 2006 level
- Double the share of renewables in total primary energy supply by 50% from 16.2% level in 2007 to 24% 2020
- Movement to renewables is favourable for expanded biogas production and use in vehicles

Electricity production in Switzerland dominated by hydro power



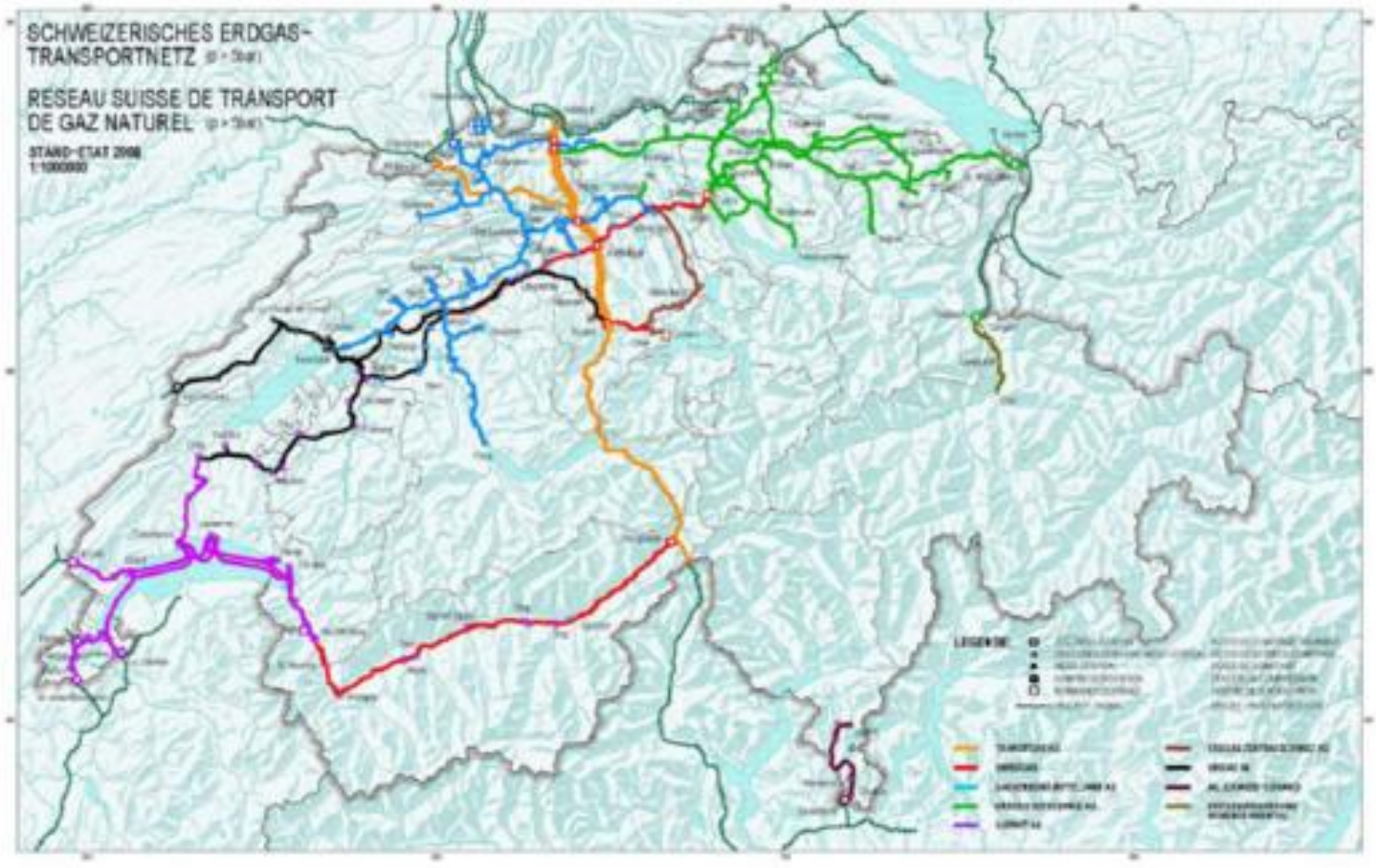
Dealing with nuclear phase out energy strategy 2050

- Improve energy efficiency
- Increase both hydropower and new renewable energies
- If necessary increase reliance on fossil fuel-based electricity production and imports (also potentially important for the gas sector)
- Expand and invest in electricity grid due to immediate necessity but also to allow for the introduction of more electricity production from renewables

NATURAL GAS

- Switzerland has no natural gas production. Natural gas is imported: 70% from EU & Norway, 20% from Russia
- Natural gas sector is highly fragmented, supplied to cities and cantons by over 100 companies, most enjoying a local or municipal monopoly
- Natural gas consumption increased by 11,7% between 2009 and 2010 reaching 38,9 billion kWh (Due to cold weather, more municipalities connected to the grid, and saw an increase in NGV usage)
- No LNG trading currently is done
- Government predicts natural gas demand to grow by 7% presuming that no new natural gas power stations are built, which will increase the forecast

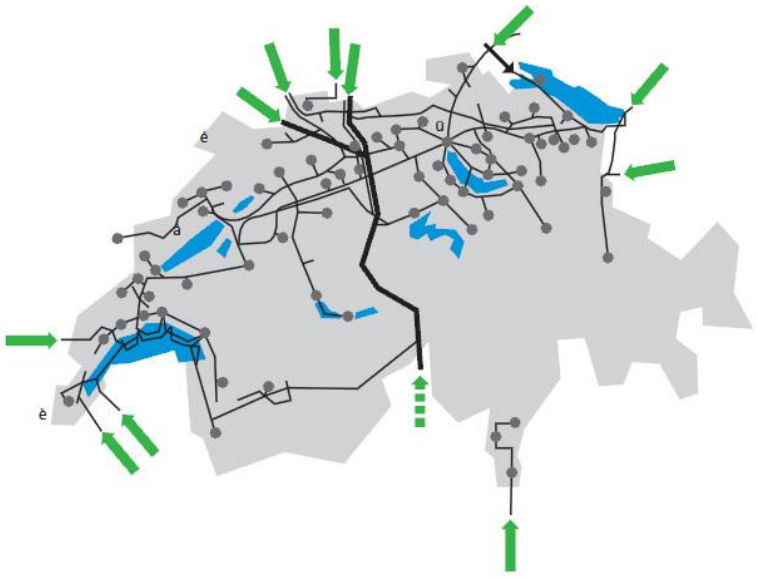
Pipeline network actually covers only the North part of the Country



Source: “Département fédéral de l'environnement, des transports, de l'énergie et de la communication”

NATURAL GAS PIPELINE MAP

NATURAL GAS PIPELINE



European pipeline
National pipeline
Entry points
Planned entry points
Entry points in the local network
CNG stations

CNG fueling stations	120
Connected cities to national network	869
Total pipeline	17'954 km
– Transport network (> 5 bar)	2'151 km
– Distribution network (< 5 bar)	15'803 km

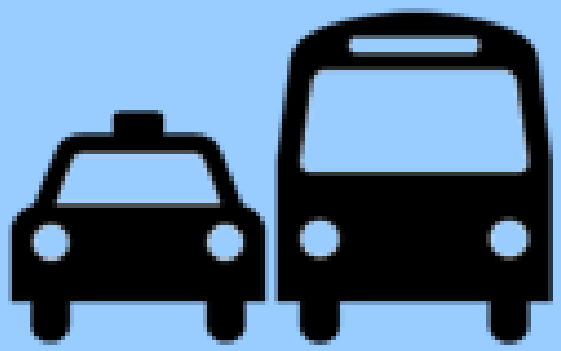
ALTERNATE NATURAL GAS SOURCES

Biogas is injected into the grid at 13 injection stations

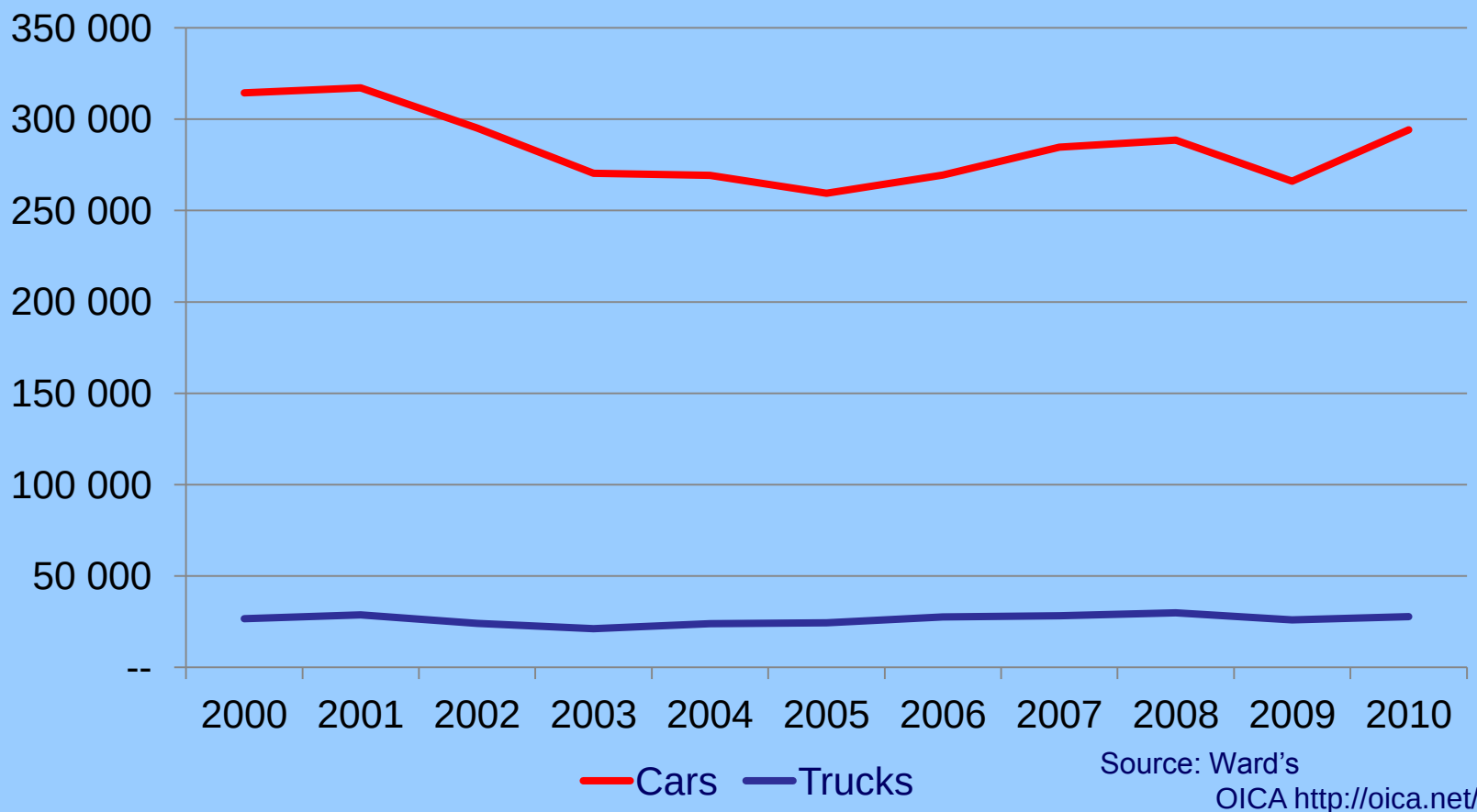
- Agreement between government and gas industry for 10% of CNG sold to be bio-methane
- Two different quality standards for biogas injection for either “limited” or “unlimited” injection
- Unlimited standard: >96% methane, Limited: >50% methane
- Aim to increase biogas injection into the grid by 600% in the next six years
- Gas distributors to invest CHF 3 million per year (based on their capacity) into a “Biogas fund” to increase biogas production six fold through financial support for new biogas facilities and installations

Source: Swiss Gas and Water Industries Association

VEHICLE PROFILE

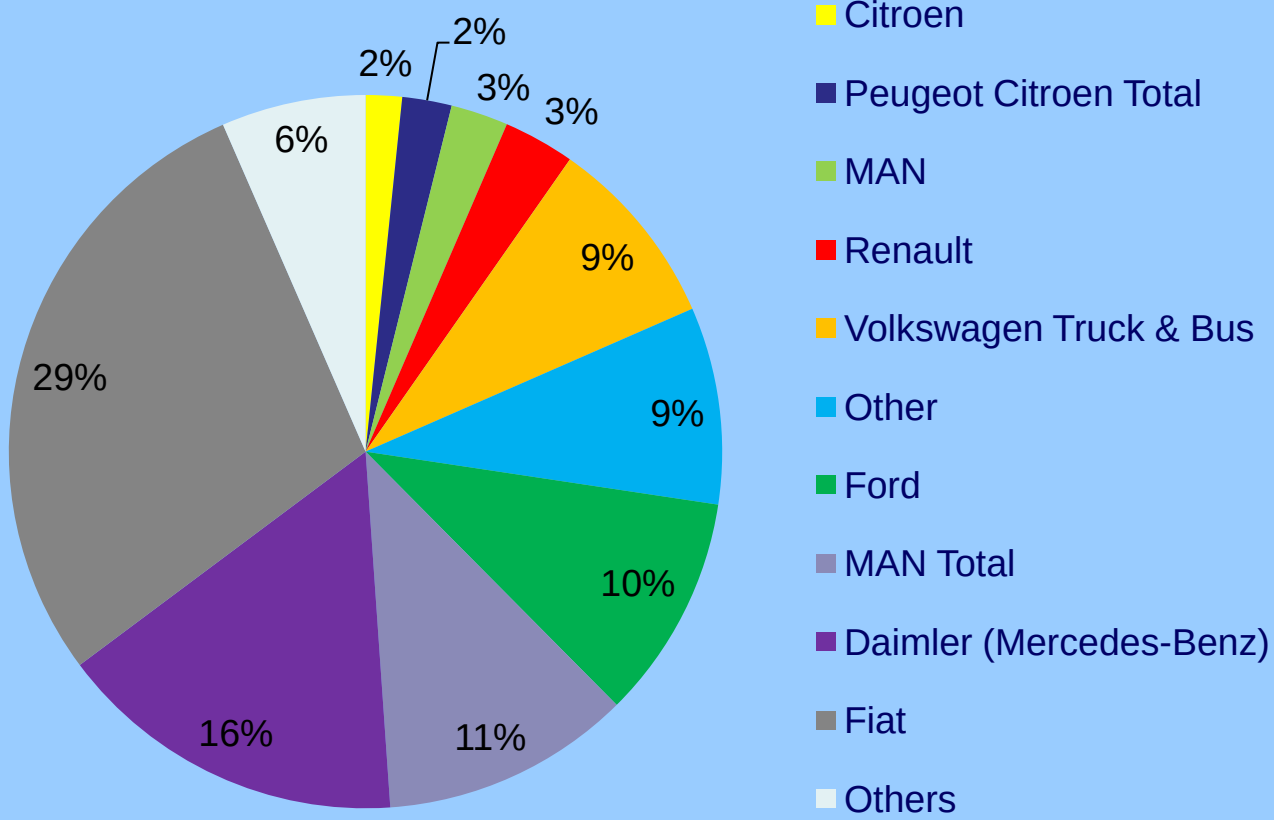


Truck sales remained more constant than car sales during the past decade



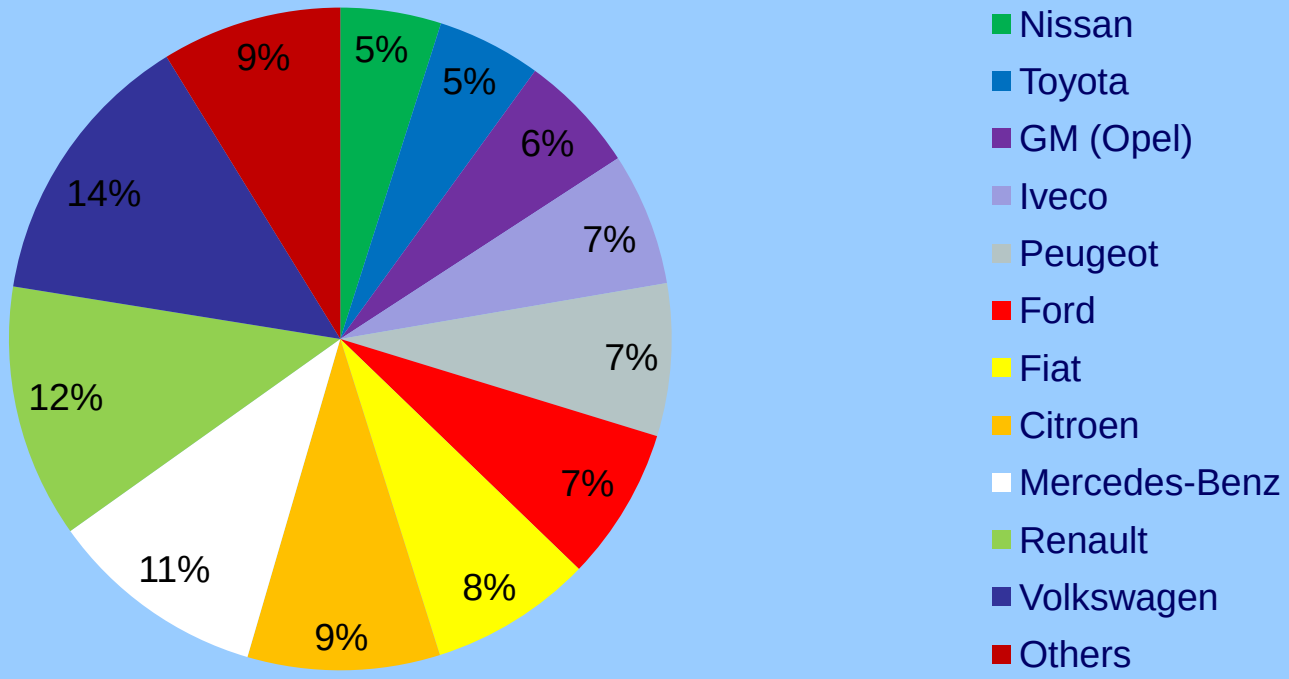
Source: Ward's
OICA http://oica.net/

FIAT and Daimler dominate the bus sales in 2010



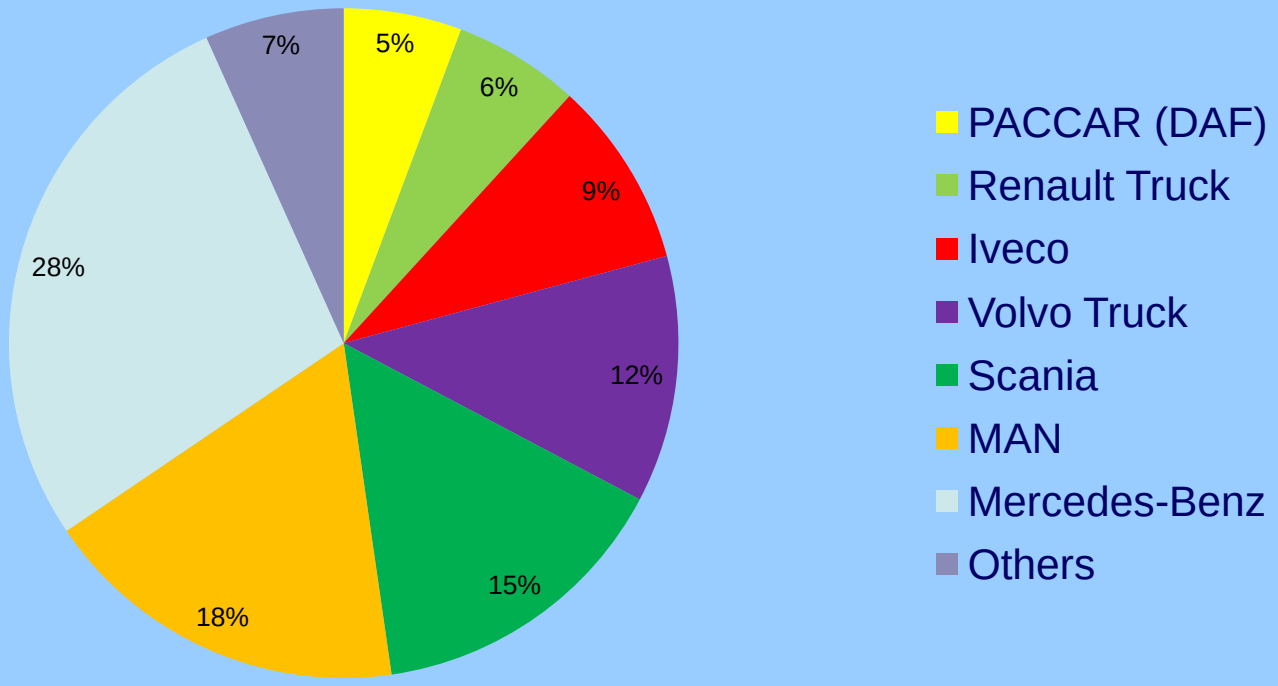
Source: Ward's

Light commercial vehicles are well distributed by different OEMs with a slight preference for Volkswagen



Source: Ward's

Mercedes, MAN and Scania are the top OEM in the high duty truck sales in 2010

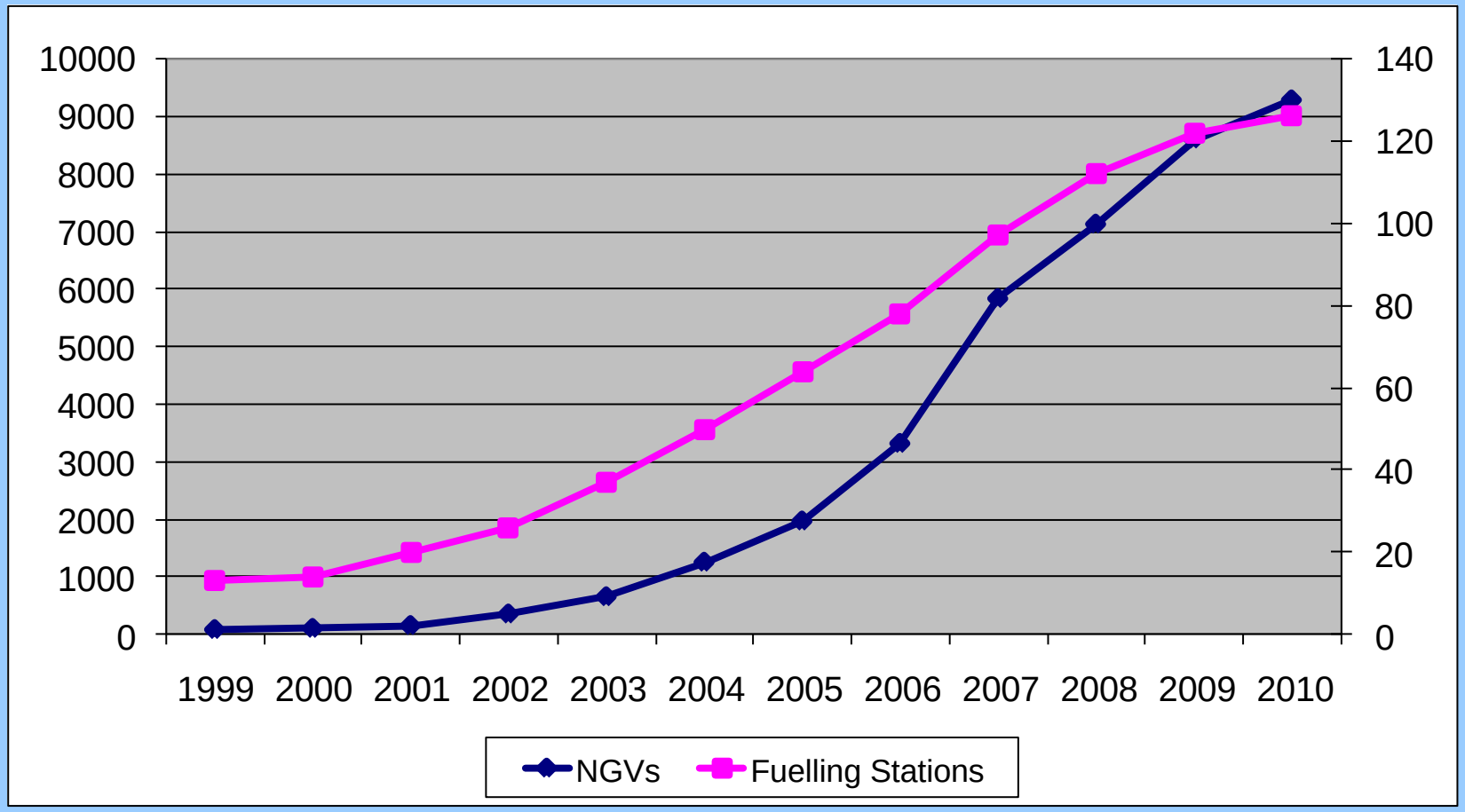


Source: Ward's

NGV

- In 1992 Switzerland introduced one of the strictest air pollution laws in Europe
- Until 1996 Switzerland used US Federal Test Procedure (based on Chassis) until it adopted EU directives on road transport
- In 1992 Swiss gas companies began NGV pilot schemes, largely on their own initiative
- Natural gas industry actively promotes use of NGVs, pays for construction of fuelling stations and injects biogas into the grid
- Industry overcame government scepticism of NGVs when biogas was combined
- Gas industry launched pilot program in 2000 with 12 fuelling stations

CNG stations started to increase since 2000, while NGV development started few years later



Source: The GVR, June 2011

NGV OEM AVAILABILTY

There are a wide variety of light-to-heavy duty passenger and commercial NGVs -- OEM and QVM/retrofits -- available for many types of individual and commercial customers

OEM	LDVs	Light Commercial	Medium Commercial	HDVs	Buses
Fiat	6	4	1		
Ford	9*				
Mercedes	2		1		3
Opel	1	1			
Peugeot			3+		
VW	5		2+		
Iveco			1	2	2
Scania				1	2
Volvo (Renault)				1	2
TOTAL	14(23)*	5	8	4	9

Great variety of passengers cars available

FIAT
- Doblò
- Punto
- Qubo
- 500
- 500C
- Panda

Opel
- Zafira

Mercedes-Benz
- B Class 180
- E 200

Volkswagen
- Caddy
- Caddy Maxi
- Passat
- Touran
- Passat Variant

Ford QVM(Qualified Vehicle Modified)
- Focus
- Focus SW
- Ka
- Mondeo
- Fiesta
- Mondeo SW
- C-Max
- Fusion
- Kuga

Source: www.vehiculeagaz.ch

Light duty vehicles for commercial use dominated by FIAT

Volkswagen
- Caddy maxi
- Caddy

Peugeot
- Bipper
- Expert
- Partner

FIAT
- Doblò Cargo
- Doblò Cargo Maxi
- Ducato
- Fiorino
- Panda Van

Mercedes-Benz
- Sprinter

IVECO
- Daily

Opel
- Combo Van

Source: www.vehiculeagaz.ch

5 OEM present High Duty Trucks and Buses on the market

IVECO
- EuroCargo
- Stralis
- Irisbis Citelis

Volvo
- 7700
- 7700G

Source: www.vehiculeagaz.ch

Renault
- Premium Distribution

Merceds
- Econic
- Citaro

Scania
- P-serie
- Omnilink
- Omnicity

Some companies have Light Duty NGV in their fleet

- IKEA
- Ligue Pulmonaire Suisse
- Police St. Gall
- La Poste
- Taxi33 Bale
- TCS (Driving Club)
- Lyreco / Nespresso
- APG Affichage
- Armasuisse
- Hertz
- Swisscom
- Modex
- DHL Express
- TNT Swiss Post

Some companies have High Duty NGV in their fleet

- Bernmobil Berne
- BOGG Olten
- Aigle / Lausanne
- Gerber Langenthal
- Langenthal Municipality
- Wädenswil Municipality
- Migros Zurich
- Mc Donalds
- BGU Granges

NGV FUELLING INFRASTRUCTURE

NGV fuelling station network in line with the natural gas grid

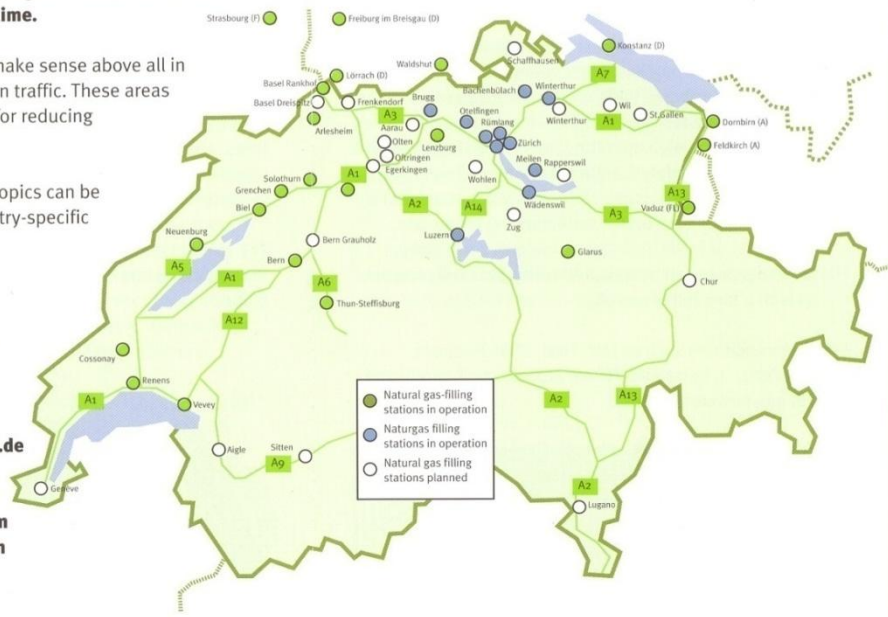
natural gas mobile in Switzerland

The network of filling stations is continually increasing so that owners of natural gas vehicles can refuel more conveniently all the time.

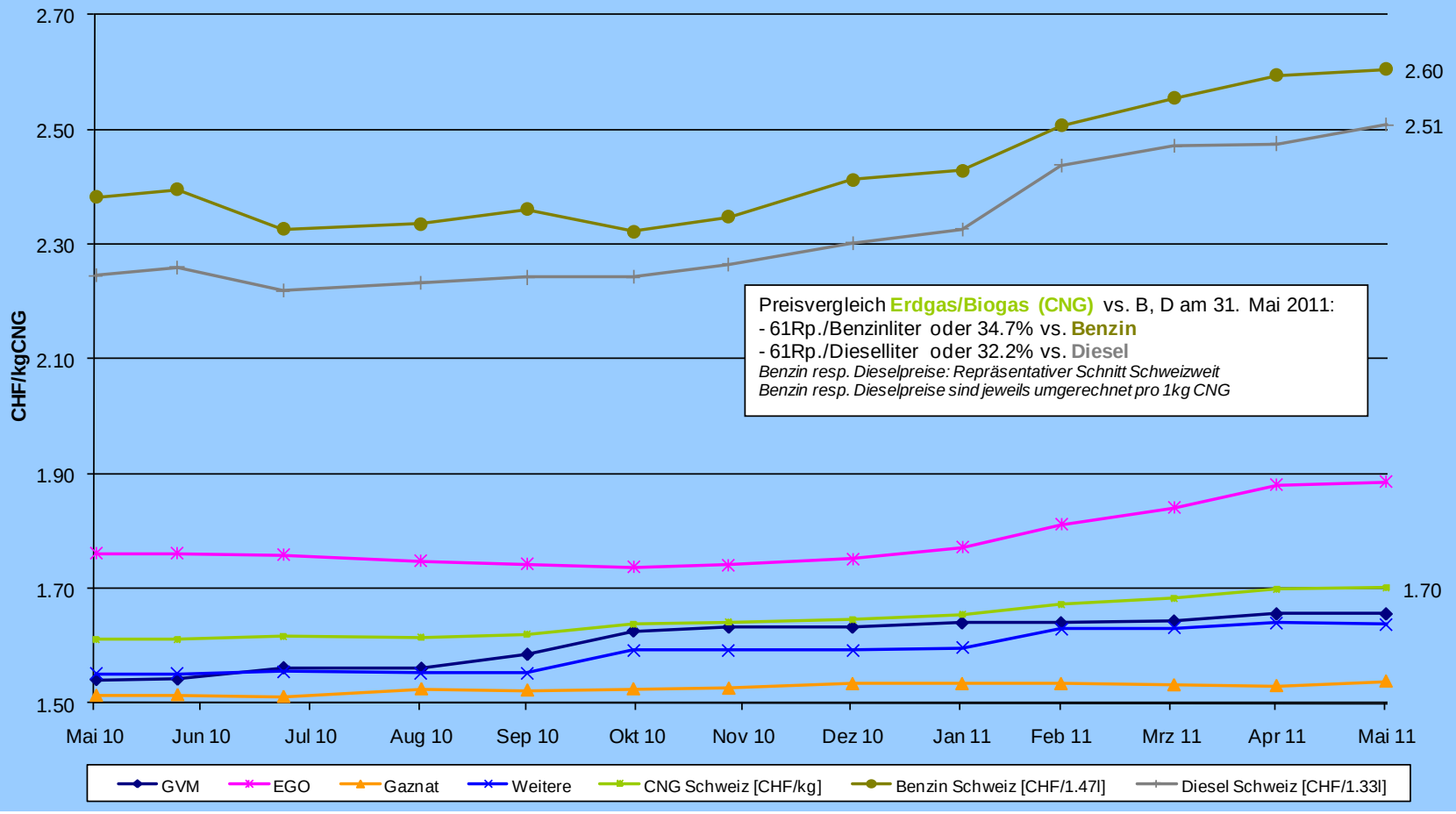
Natural-gas filling stations make sense above all in city centres with dense urban traffic. These areas offer the greatest potential for reducing pollutant emissions.

More information on these topics can be found on the following country-specific internet sites:

CH www.erdgas.ch
CH www.erdgastanken.ch
CH www.erdgaszuerich.ch
CH www.gvm-ag.ch
CH www.kompogas.ch
CH www.biogas.ch
D www.erdgasfahrzeuge.de
D www.gibgas.de
A www.erdgasinfo.at
I www.metanautista.com
I www.guidametano.com
NL www.engva.org



CNG is 34.7% less than gasoline and 32.3% less than diesel



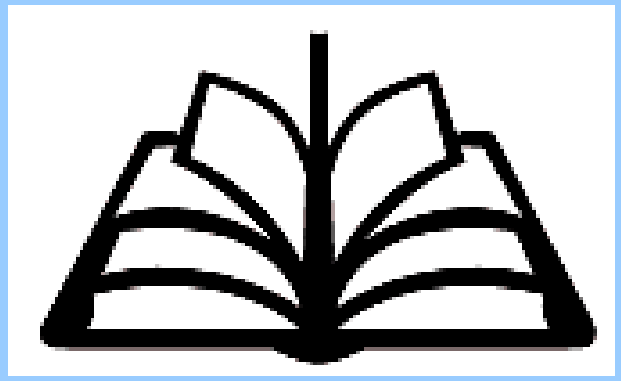
NGV FUELLING INFRASTRUCTURE

129 public fuelling stations; approximately 20 private fleet stations*

- Stations usually are small and have limited compression capacity, around 100 m2 per hours
- HDVs refuel at public stations, which helps increase favourable economics of the station
- Most stations lose money due to lack of NGV population and compression capacity sometimes being insufficient for consumers
- Gas industry slow to increase capacity at stations that are unable to keep up with demand as the NGV market grows
- Needs of buses taken into account by well designed public stations at depots
- Station owners often need financial incentives from gas companies to sell CNG

*SVGW indicates 129 public stations and approximately 20 at private fleet operators. GVR (June 2010) indicates 123 stations of which 3 are private.

STANDARDS & REGULATIONS



Switzerland generally follows European standard (prEN 13638)

- As CNG from fuelling stations contains 10% biogas the stations must also meet biogas fuel quality regulation
- Policy starts with basic natural gas directives and rules outlined in regulation G1, Installation of Gas Appliances Subjected to Pressures up to 5 Bar:
- **G8** Guidelines for the Construction, Maintenance and Operation of Small Filling Stations for Compressed Natural gas (CNG)
- **G9** Directive for Construction, Maintenance and Use of Large Scale Natural Gas Stations (CNG)

Sources: Swiss Gas & Water Industries Association; details elaborated and compared to prEN 13638 in, "Synthesis Report on Normative Regulatory Requirements," William Miermont, etc., European Commission funded Biogasmax,RTD project 019795, January 2008

Requirements for Gas Compressor and Electrical Equipment

- **Gas Compressors**: A non-return system shall be fitted as near as possible to the station. Must have a non-return device and a pressure operated "slam-shut" switch (emergency shut-off)
- All **electrical equipment** in the compression station must comply with the ASE (Swiss Electrician Association) guidelines

Sources: Swiss Gas & Water Industries Association; details elaborated and compared to prEN 13638 in, "Synthesis Report on Normative Regulatory Requirements," William Miermont, etc., European Commission funded Biogasmax, RTD project 019795, January 2008

Requirement for Storage Facilities

- Storage facilities must be fitted with security devices capable of preventing increased pressure
- A manometer must be fitted on each storage facility and must be able to operate independently
- Each storage facility must be isolated with an appropriate device

Sources: Swiss Gas & Water Industries Association; details elaborated and compared to prEN 13638 in, "Synthesis Report on Normative Regulatory Requirements," William Miermont, etc., European Commission funded Biogasmax, RTD project 019795, January 2008

Requirements for Natural Gas and Biogas Dispensers

- An automatic shut-off device must be installed between the dispenser and the compressor
- The steel protection must be at least 1.5 mm thick with 1 mm being steel and 0.5 being stainless steel
- A glass pane that has a surface greater than 0,12 m2 or is illuminated from within must be more than 4,5 mm thick
- A glass pane which is 0,12 m2 or less must be 4 mm thick

Sources: Swiss Gas & Water Industries Association; details elaborated and compared to prEN 13638 in, "Synthesis Report on Normative Regulatory Requirements," William Miermont, etc., European Commission funded Biogasmax, RTD project 019795, January 2008

Refuelling Station Requirements

- Buildings with openings must be at the minimum at 3m of the station
- Refuelling station's open venting area must measure at least 30% of the building's floor surface
- "Swiss requirements appear to be significantly less demanding than those of France and Sweden." (Biogasmax Synthesis report)

Sources: Swiss Gas & Water Industries Association; details elaborated and compared to prEN 13638 in, "Synthesis Report on Normative Regulatory Requirements," William Miermont, etc., European Commission funded Biogasmax, RTD project 019795, January 2008

Hazardous Areas (Anywhere and explosion can occur)

Device	Explosive Area
Compressor, Gas Storage	1 Meter (outside station)
Dispenser	1 Meter
Fuel Connector and Nozzle	1 Meter
Exhaust Valve	3 Meters on the sides and above; 1 meter below

Sources: Swiss Gas & Water Industries Association; details elaborated and compared to prEN 13638 in, "Synthesis Report on Normative Regulatory Requirements," William Miermont, etc., European Commission funded Biogasmax, RTD project 019795, January 2008

GOVERNMENT SUPPORT

Biogas is exempt from tax while CNG and LPG enjoy reduced tax levels. To continue until at least 2018

- Federal government appeared sceptical about NGVs until biogas was incorporated
- Some Cantons reduce or have no road tax for NGVs (15 out of 26 offer reduced rates for NGV while 25 out of 26 have reduced rates for hybrid-electric vehicles)
- Some Cantons and municipalities view CNG as another polluting fossil fuel
- Some government fleets run on CNG such as Post Office, however they tend to opt for hybrid vehicles

GAS INDUSTRY SUPPORT

GAS INDUSTRY SUPPORT

There is very strong support from the fragmented/diversified Swiss gas industry for NGVs

- There are four regional gas companies that supply approximately 130 local gas companies, many owned by municipalities
- Municipalities run the gas importation services

Swiss gas companies have almost entirely funded the development of the CNG fuelling station network

- NGV program began with pilot projects in 1992, organised and funded by the gas industry
- Gas industry funds nationwide advertising campaigns for NGV and invests in research for cleaner engines
- Some gas suppliers give up to CHF 1000 (€840) for the purchase of an OEM NGV
- Some natural gas suppliers use NGVs in their fleet
- Gas industry has won the support of eight insurance companies that now give reductions to NGVs

Example of Gas Industry Support: HOLDIGAZ

- For each NGV purchased Holdigaz gives the owner CHF 1,500 (€1260) in cash and in vouchers for free gas
- If 3 or more NGVs are purchased the incentives increase to CHF 2,500 (€2100) per vehicle
- A company purchasing 10 or more NGVs are offered even more beneficial deals.
- In the Holdigaz network CNG is 40% cheaper than petrol
- Its fuelling stations have a mix of 80% CNG and 20% biogas
- Gas company installs PHILL units at a cost of CHF 500 to CHF 1'500 (€420 to €1260)

NATIONAL LAWS & REGULATIONS

Switzerland is one of the world's richest and most investment-friendly destinations

- Foreign investment receives national treatment, and most sectors are open to private investment
- The investment code and its implementation are generally transparent and efficient
- Residents and non-residents may hold foreign exchange accounts. There are no restrictions on repatriation of profits or current transfers

Source: The Heritage Foundation, 2011 Index of economic freedom

Switzerland's competitive and transparent regulatory framework

- Strong supports to commercial activity, allowing business formation and operation to be efficient and dynamic
- *Taxation* is more burdensome at the cantonal levels than it is at the federal level. The top federal income tax rate is 11.5 percent. Combined it can be as high as 41.5%
- *Inflation* has been extremely low, averaging 1 percent between 2007 and 2009

Source: The Heritage Foundation, 2011 Index of economic freedom

COMMENTS BY STAKEHOLDERS

COMMENTS BY STAKEHOLDERS

- "Municipalities are not at all supportive of natural gas vehicles. The (gas) industry has not been able to make their point (about NGVs) as the next generation fuel. It's a fossil fuel and cities are not so positive for it. They think the tax exemption is enough of an incentive."
- "Government fleets run some of their vehicles on gas but in general they are favoring electric mobility, modal splits in different segments of the market."

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

- Since Switzerland is 100% reliant on imported energy, with the exception of small amounts of biogas that can be domestically generated, NGV market growth can have a positive impact on the low CO2, diversified fuel-balance that the country wishes to achieve in the long term

Gas Industry Support

- The strength and commitment of the collective gas industry is one of the most important factors keeping the Swiss NGV market moving forward

Government Support

- Apart from a no-tax policy for biogas use in NGVs, government support favors non-fossil-based electro-mobility

NGV Market Development

- The growth rate of OEM NGVs in the first part of decade was strong (57-100%+ annually) although vehicle numbers remained relatively low. Since 2007 NGVs expanded 60% but yearly growth has slowed
- Fuel stations installed has kept good pace with vehicle growth although gas throughput remains inadequate to make a strong economic case to install a CNG station
- OEM vehicle availability to suit varied needs of customers is adequate to grow a sustainable market, with HDVs and buses providing the best case to improve the fuelling station through-put and economics

Investment Environment

- *Legal and regulatory environment* for CNG station development is positive, with few impediments to building high quality facilities
- The environment in Switzerland is very favorable toward investors, be they internal or external to Switzerland

SWITZERLAND
(June 2011)