

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

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.

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 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.

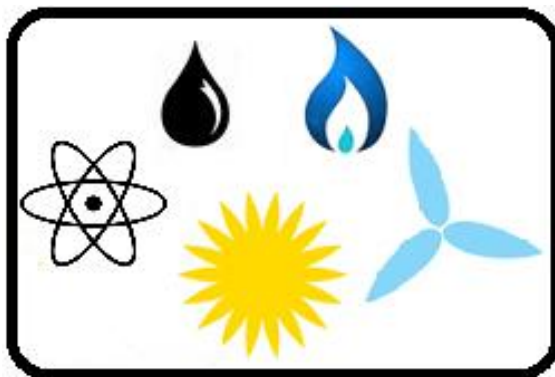


- NGV Profile
- Motivation
- Energy Profile (oil & gas/imports & exports)
- Vehicles
- Fuelling Infrastructure
- Government Support
- Gas Industry Support
- Conclusions

- Number of NGVs: 192.000
 - NGVs are 43,5% of total vehicle population
 - 58,7 NGVs per 1000 population
 - CNG fuelling stations: 345
 - 556 vehicles per fuelling station
 - Price differential CNG-Petrol/diesel:
 - CNG: 0,18 €/ncm
 - Regular Gasoline: 0,91 €/liter
- Natural Gas cost 60% less than Gasoline

Source (September 2011)
IGU Country Report

- Economics, driven by the cost differential between petrol/diesel and CNG



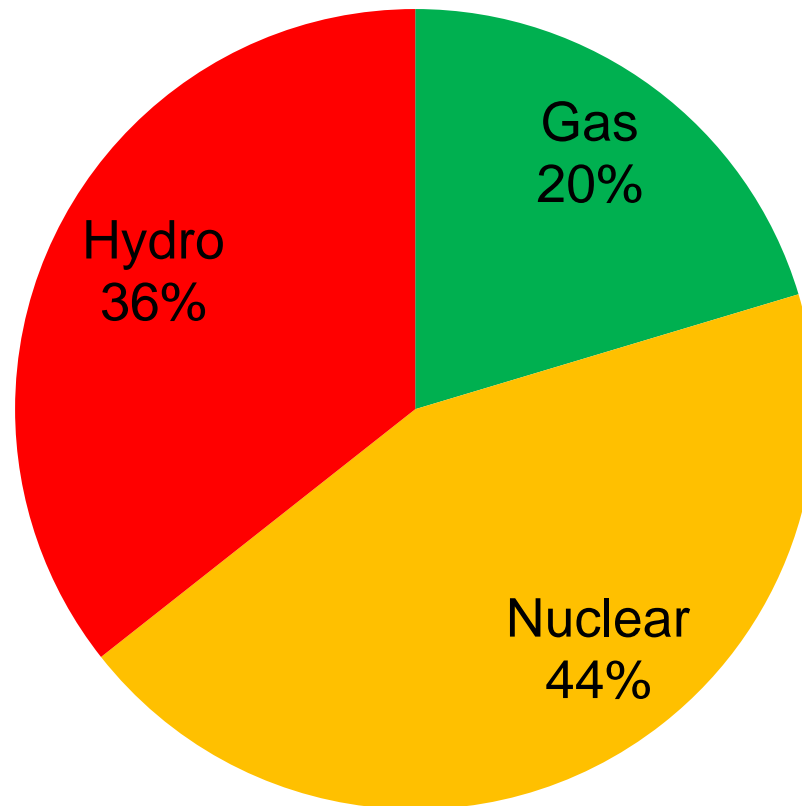
- Due to blockade imposed by Turkey and Azerbaijan, Armenia has difficulty importing oil and gas
- Armenia has one nuclear reactor in operation in Metsamor and the government has approved a joint venture to build another by 2018



- **Oil**
 - production: 0 bbl/day
 - consumption: 52.000 bbl/day
 - imports: 46.680 bbl/day
 - exports: 0 bbl/day
 - reserves: 0 bbl
- **Natural gas**
 - production: 0 m³
 - consumption: 1,86 billion m³
 - imports: 1,86 billion m³
 - exports: 0 m³
 - reserves: 0 m³

Source: CIA World Factbook 2011

Nuclear energy, with a capacity of 376 Mwe, supplied 44% of electricity demand in Armenia

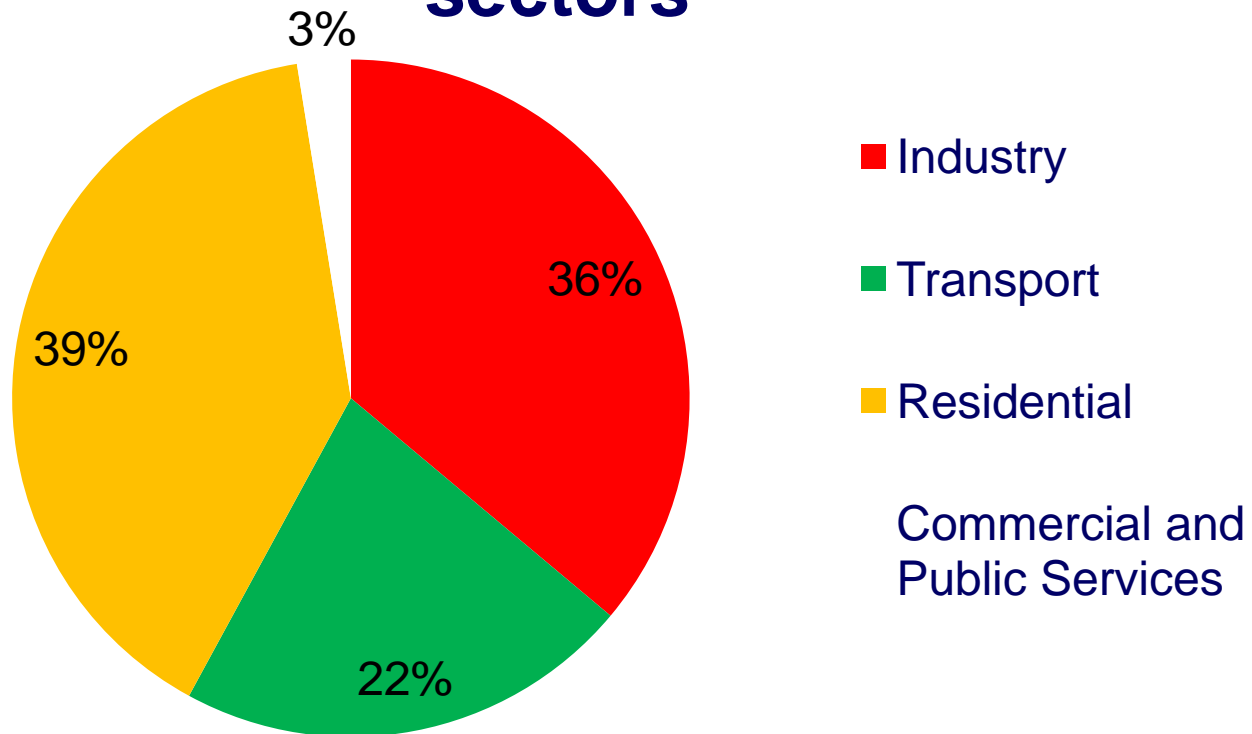


Source: IEA statistics

There are about 2,000 kilometers of gas transmission pipeline and 11,000 kilometers of gas distribution pipelines in Armenia



Natural gas consumption in the transport sector (22%) represents a strong market along with the industrial and residential sectors



Source: IEA statistics, 2011

Geopolitics affects the potential gas supply in Armenia

- To avoid a higher prices level for natural gas, the Armenian government had to make some concessions putting Iran-Armenia Natural Gas Pipeline under control of ArmRosGazprom
- Armenia got petrol from its oil-rich neighbor Azerbaijan, but after the two countries plunged into a war, Armenia cut ties with both Azerbaijan and Turkey

Source: armenialiberty



Generation of energy from biogas in Armenia is in its initial stage

- According to the 2007 USAID program, the biogas potential for 2006-2020 is estimated that an investment of \$34.17 million would provide for generation of 38.34 million m³ of biogas annually, which will reduce greenhouse gas emissions by 544.6 thousand tons per annum in CO₂ equivalent
- A number of foreign companies are involved in some projects, but no vehicle-grade biogas is available at the moment

Source: Renewable energy in the republic of Armenia, 2008



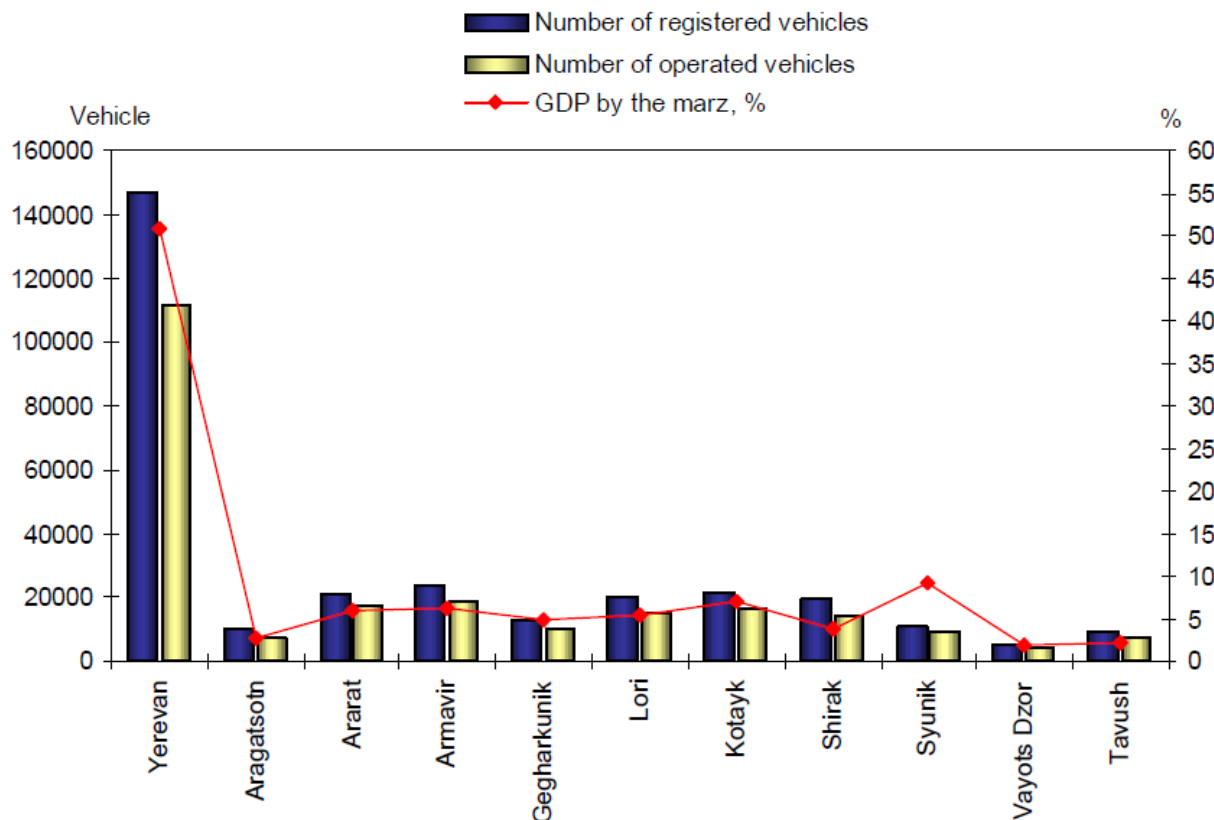


- The majority of passenger and freight transportation is done by over-the-road motor transport. The lack of water ways and the blockade by the neighboring countries (Azerbaijan and Turkey) makes road transport an imperative
- The motor vehicle fleet of the country is aged, resulting in an overconsumption of fuel and considerable emissions
- The majority of vehicles operated in Armenia were manufactured in Russia in the 80-90s

Source: United Nations Development Programme, Greenhouse Gas Emissions Reduction and Energy-Efficiency Potential in Transport Sector in Armenia, 2006



48% of vehicles operated in the country are located in Yerevan; 52% are in the ten marzes (regions) of Armenia



Source: United Nations Development Programme, Greenhouse Gas Emissions Reduction and Energy-Efficiency Potential in Transport Sector in Armenia, 2006



Conversion of vehicles from liquid fuel to natural gas has obvious benefits

- Main reasons:
 - Increase in international oil prices
 - Natural gas prices are considerably lower
 - Increasing number of CNG refueling stations throughout the country
- All taxi cabs and light duty buses (minivans) use CNG
- 192,000 cars (60% of total cars) and 52,000 trucks/buses (65% of total high duty vehicles) run on natural gas

Number of NGVs have doubled in 3 years. LDVs are the majority of total NGVs

2005			2008			% Increase from 2005 to 2008	Average Annual Increase by Year From 2005 to 2008
NGV Type	Number	% of Total NGVs	NGV Type	Number	% of Total NGVs		
LDVs	28,231	63	LDVs	69,971	70	147	35
H DVs	8,835	20	H DVs	20,000	20	126	32
Buses	7,968	18	Buses	10,000	10	25	8

Source: 2005 from the United Nations Development Program Armenia
2008 from The GVR June 2008



In 2004 majority of OEM vehicles came from the East Europe

- Minivans: YerAZ, RAF, and GAZel
- Buses: KavZ, PAZ, and LAZ models
- GAZ models and VAZ models with varying modification are engaged in taxi transportation
- Light trucks: IJ, YerAZ, GAZel, UAZ

Source: United Nations Development Program, Natural gas as motor fuel in Armenia, 2004



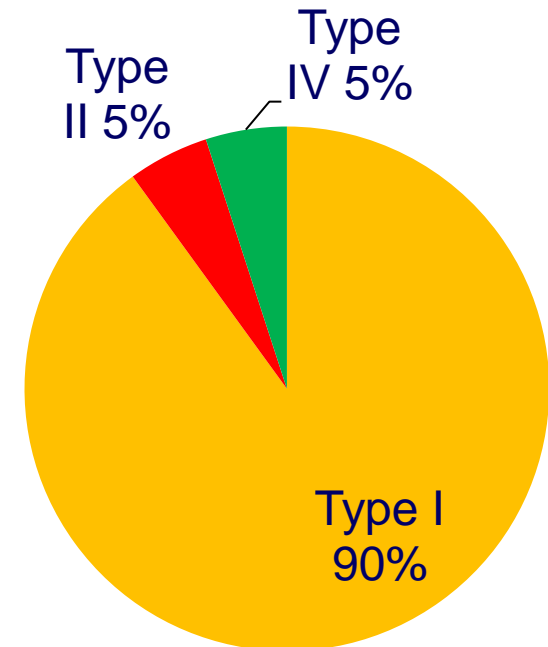
Almost all NGV equipment must be imported since there is no domestic production of NGV-related equipment

- The gas containers usually are imported from Russia or Italy and are installed in the car's trunk at licensed centers - an operation that costs the equivalent of €530-760
- The only supplier in the NGV industry in Armenia is 'Golden Field' LLC, a company that manufactures CNG cylinders

Source: Armenialiberty

Three types of cylinders are used in Armenia

- Cylinder Type I: 100%, all metallic
- Cylinder Type II: Metal liner, hoop-wrapped fiberglass
- Cylinder Type IV: 100% composite



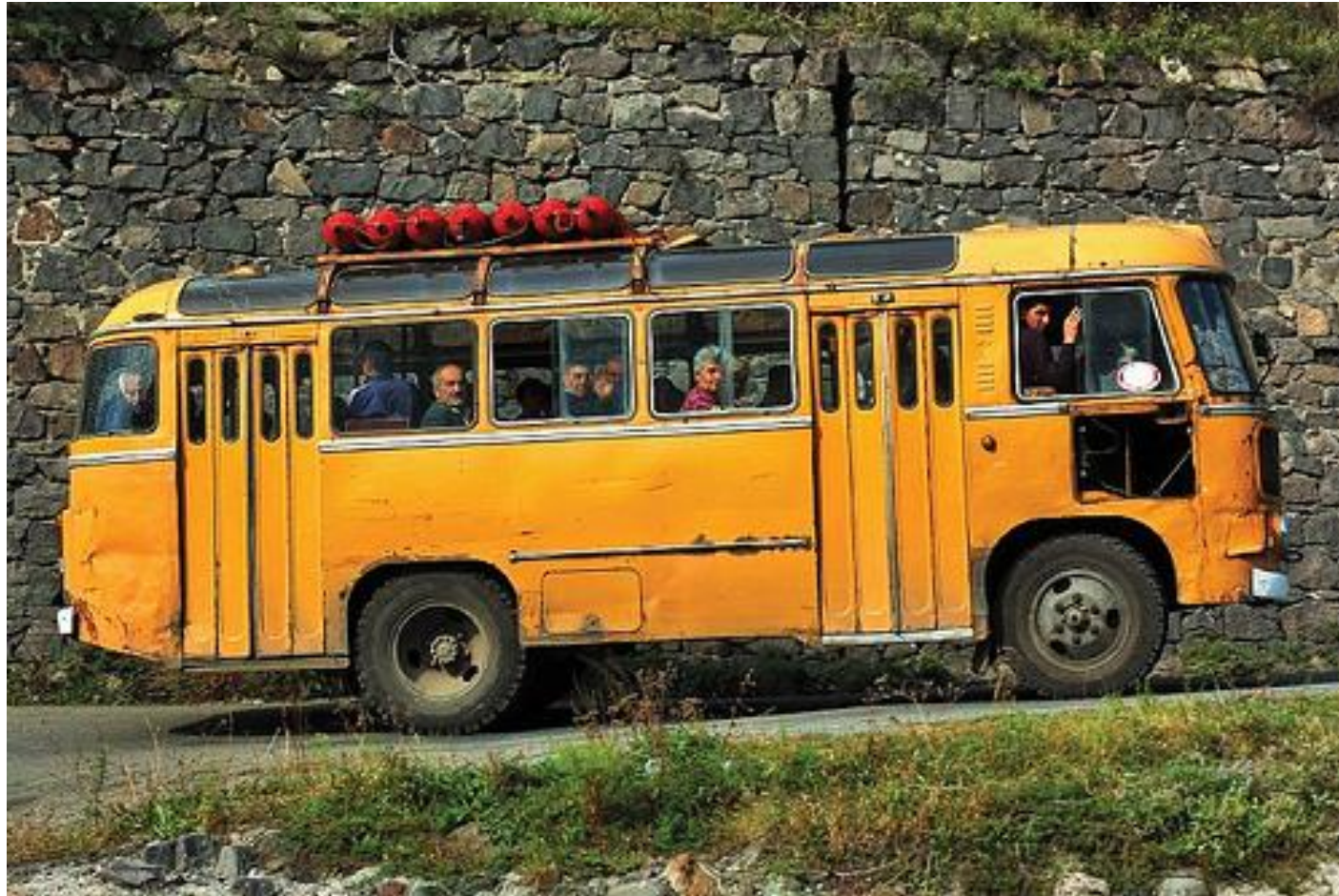
Source: United Nations Development Program, Natural gas as motor fuel in Armenia, 2004

Type I cylinders are worrisome, because they are mostly second-hand cylinders

- Majority are imported to Armenia from the CIS and foreign states
- Most of them are imported without technical 'passports' or recertification; often rusty
- Once they are cleaned and painted, they look like new but, if not recertified, present a major potential hazard

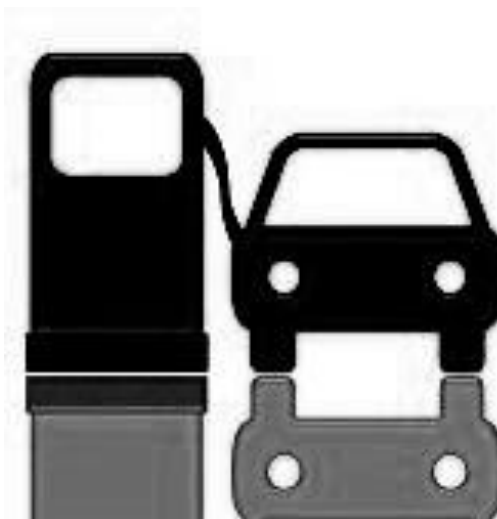
Source: United Nations Development Program, Natural gas as motor fuel in Armenia, 2004

Main public transport



Typical Minibus





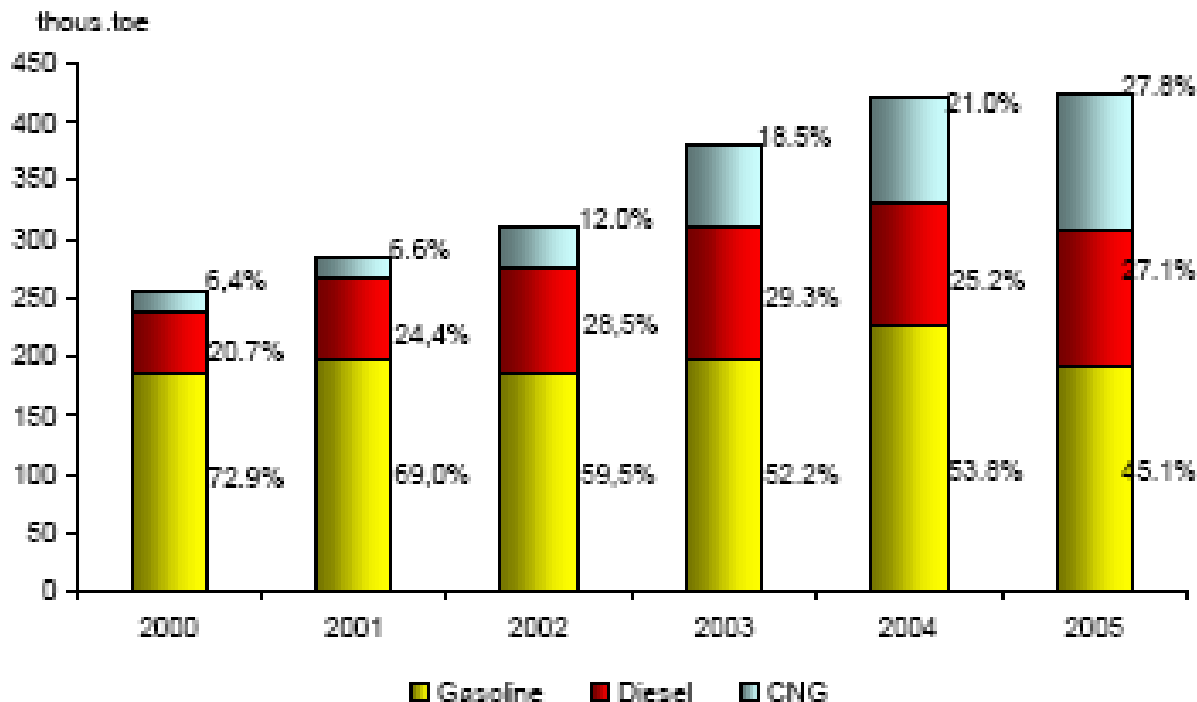


The gas company does not support the construction of fuelling station

- The stations are built by private investors
- Many Armenian CNG filling stations violate the rules and fill vehicles to 300 bar instead of 200 bar, according to national law
- Old gas cylinders are used and fire safety at fuelling stations is not respected which has led to accidents that has undermined confidence in NGV safety



Gasoline, diesel, compressed natural gas (CNG) and limited amounts of liquid petroleum gas (LPG) are used in Armenia as motor fuel. Demand for motor fuel is filled by imports from other countries



Source: United Nations Development Programme, Greenhouse Gas Emissions Reduction and Energy-Efficiency Potential in Transport Sector in Armenia, 2006

Number of fuelling stations is increasing of 30% every year

2005		2008			
Number of Fuelling Stations	Ratio Fuelling NGVs to Fuelling Stations	Number of Fuelling Stations	Ratio Fuelling NGVs to Fuelling Stations	% Increase from 2005 to 2008	Average Annual Increase by Year From 2005 to 2008
93	484	206	492	121	30



Refuelling station in Sevan city

Source: 2005 from the United Nations Development Programme Armenia. 2008 from The GVR June 2008

Mobile Refuelling





- Multi-fuel stations: (no information available)
- Limits on opening hours: (no information available)
- Self service: (no information available)
- Payment practices at the pump: (no information available)

Stations are based on Russian standards, based on Italian standards have concrete barriers between dispensers



CNG use as motor fuel described in Decision No. 1582-N , Adopted on 19.10.2006

- Regulation of the process of retrofitting motor vehicles to use CNG or liquid petroleum oil
- Testing Gas Fuel Supply Systems of Motor Vehicles Using Gas Cylinders
- Ensuring safety of operation of gas cylinders for motor vehicles

Source: United Nations Development Programme, Greenhouse Gas Emissions Reduction and Energy-Efficiency Potential in Transport Sector in Armenia, 2006

- Refueling station design, construction, connection, safe operation, and supervision are performed on the basis of Soviet regulations and technical specifications**
- Republic of Armenia has still not adopted legal and regulatory technical standards
 - Only two regulations come from Armenian Government
 - Decree 539 of 27 November 1997, concerning mobile refueling stations of liquid gas
 - Design and Exploitation Regulation 2-04-08-87 concerning gas supply

Source: United Nations Development Program, Natural gas as motor fuel in Armenia, 2004



There are no specific programs from the government to support the development of NGVs

- The only initiative is the difference between gas prices and petroleum: this makes it affordable for people to convert gas vehicles
- No government subsidies on fuels





Natural Gas Pipeline Infrastructure

- National gas company is the Russian and government owned ArmRosGazprom
- Gas imports from Russian, via Georgia, grew by 20% in 2007, totaling 2.054. billion m³
- Pipelines constructed to import natural gas from Iran
- Gazprom bought the pipelines to prevent competition
- 84% of the population have access to gas in their homes, 95% of country is served by CNG fuelling stations



- The gas company is not building fuelling stations, which is done primarily by the private sector
- The stations' capacity has doubled recently
- The current fuelling station capacity is sufficient throughout the country to serve the current population of NGVs



The overall regulatory framework remains efficient, facilitated by streamlined business procedures and competitive tax rates

- A number of business reforms have been implemented in recent years
- Government subsidies distort prices in some sectors such as public transportation, electricity, and gas

Source: The Heritage Foundation, 2011 Index of economic freedom



Foreign and domestic investors are treated equally and have the same right to establish businesses in nearly all sectors

- The minimum capital requirement for establishing a business has been eliminated
- Licensing requirements have been reduced
- The bankruptcy procedure has been modernized

Source: The Heritage Foundation, 2011 Index of economic freedom





- “NGV use is due to the fact that Armenia, which has no energy resources of its own, is trying to use the most affordable alternative fuel” (Ministry of Transport official)
- "Switching to gas has been a real salvation for Armenia, whose forests suffered very much during the energy crisis” (Ministry of environment official)
- “The capacity of the stations are twice as big as they were. The capacity is enough at this time throughout the country” (Free expert from USAID)

Source: Armenialiberty

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

Energy Environment

- Armenia does not produce oil or gas, so all mineral fuels are imported and CNG price is stimulating: 61% of diesel and 53% of gasoline
- Due the absence of sources, renewables could be a good solution for the future but are not developed at the moment
- Development of biogas is a potential for an indigenous source of gas for vehicles but there must be a commitment by some investor (likely private sector)

Gas Industry Support

- There is no support from the gas industry for natural gas vehicles
- Armrosgazprom is the principal subject in the gas sector but is investing only in the gas pipeline network, not in fuelling stations

Government Support

- Lack of any support from the national government or from the municipalities leaves the NGV market without a major public sector champion
- Further development of standards and regulations to control safety does not seem to be forthcoming



NGV Market Development

- Due to the low CNG price and a good refueling network, almost 60% of total vehicles are NGVs with a majority being retrofit vehicles
- Main problem is the safety because fuelling stations are developed by private investors without following the safety regulations



Legal and regulatory framework for CNG station development

- Lack of government support in the regulatory sector: Armenia is using old standards and regulations coming from Russia
- The lack of regulations will continue to impact the disregard for safety

Investment Environment

- Policies that support open markets are firmly in place, making the country's investment and trade regimes competitive

