

Natural Gas Vehicle Market in 2010-2020

Trends of Strategic Development

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Patron



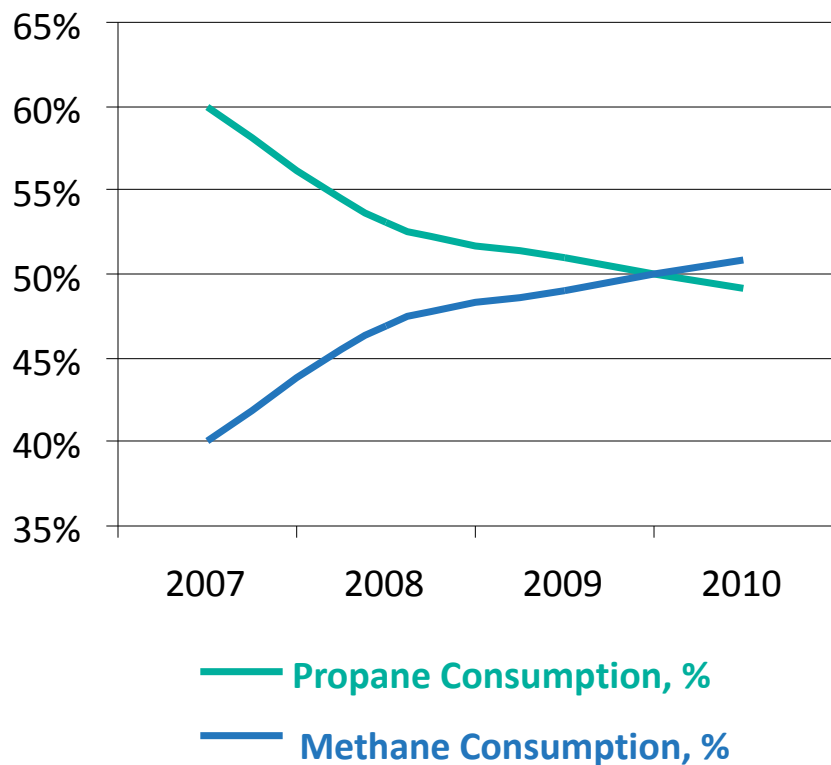
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World NGV Market



- LPG accounted for 60% of the oil fuel alternatives, whereas natural gas (and biomethane) made up 40% in the sector of gaseous alternatives to diesel and gasoline.
- The share of LPG keeps shrinking while that of Natural gas / Biomethane is growing.

Northern America

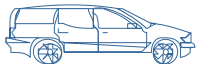


Factors to Boost NGV Market:

- New supplies of shale gas.
- Oil-supply vulnerability.
- Environmental imperatives.
- Major advances in NGV technologies.
- Supportive policy measures.
- Positive response from major private and government fleet operators.
- Expanding trucking corridors and urban fleets.



1 181 - Number of filling stations
(5.7% of global)



126 205 - Number of NGVs
(0.87% of global)

Central & Southern America

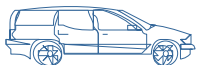


Factors to Boost NGV Market:

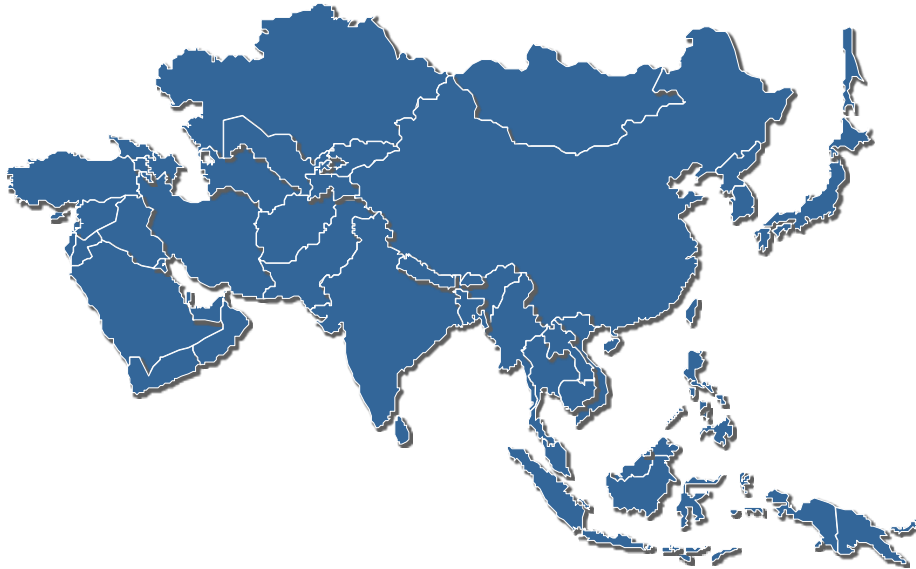
- Governmental policies.
- Support of major stakeholders.
- Promotion programs:
 - Financial support for conversions (Bolivia).
 - Required percentage of NGVs (Venezuela).
 - Municipal politics (Argentina, Brazil).
 - Developed conversion industry.



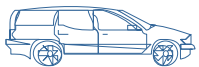
**4 872 - Number of filling stations
(23.5% of global)**



**4 334 819 - Number of NGVs
(29.8% of global)**



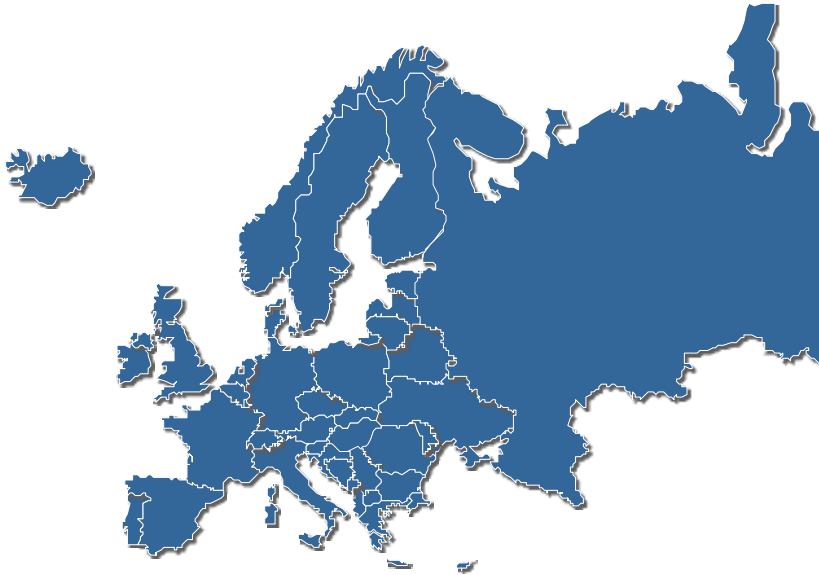
10 781 - Number of filling stations
(52.1% of global)



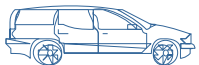
8 614 455 - Number of NGVs
(59.3% of global)

Factors to Boost NGV Market:

- Plentiful investment (China).
- Decarbonisation of economics (Japan, China, South Korea).
- CNG, LNG, Biomethane among chosen technologies.
- Gas network expansion (India).
- Government strategies towards sustainability and self-sufficiency (Iran, India, Kazakhstan, Pakistan, Thailand, Uzbekistan).
- Local production of NGV models and related components.
- World Bank, U.S DOE, EBRD, UNDP support.



**3 624 - Number of filling stations
(17.5% of global)**



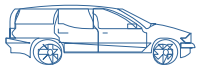
**1 293 613 - Number of NGVs
(8.9% of global)**

Factors to Boost NGV Market:

- CO₂ emissions reduction strategy.
- Methane is also part of the EU strategy of Future Transport Fuels.
- LNG and CNG Blue Corridors.
- Cooperation between NGV OEMs, fuel suppliers/distributors and fleet operators.
- Development of LNG infrastructure market for medium and long distance MD and HD NGVs.
- Steady growth and expansion of NGV industry.



158 - Number of filling stations
(0.76% of global)



162 874 - Number of NGVs
(1.12% of global)

Factors to Boost NGV Market:

- Demonstration project were success.
- Governmental support and promotion policies (Egypt, Algeria).
- Trend to utilize domestic natural gas and reduce oil (products) import (Mozambique, Tanzania, Nigeria).
- Availability of national resources of natural gas.
- Availability of affordable conversion technologies.
- Strategy to reduce emissions and oil dependence.

Light Duty NGV Trends



- Diversity of CNG light duty vehicles offered by OEM and QVM keeps broadening.
- New trends with OEM CNG models are expected to continue in the direction of downsizing and hybridization.
- Bi-fuel (NG or gasoline) OEM NGVs will be popular until gas filling network is properly developed.



Heavy Duty NGV Trends



- Dedicated and/or dual fuel OEM heavy duty CNG/LNG* urban vehicles acquired by municipalities, federal and private fleets: buses, garbage trucks, street sweepers, special purpose vehicles ...



- Dedicated and/or dual fuel OEM heavy duty long range (intercity/international) vehicles acquired by private and federal fleets: coaches, trucks.



- Conversion is still popular. Although OEM supply becomes principal source for acquisition of new NGVs.

* CNG/LNG = CH₄ based compressed or liquefied gas regardless of origin = natural gas, shale gas, biomethane, e-gas, coal bed methane

Off-Road Trends



- **Coal Mines** Super HD mine hauling trucks (dual fuel or dedicated, CNG or LNG) were successfully tested during past two decades in the USA, Ukraine and Russia.



- **Airports** have high concentration of HD & LD vehicles serving both inside and outside needs. A concentrated, emission and budget concerned, 24/7 guaranteed methane customer of CNG/LNG will tempt investment into both fleets and infrastructure.



- **Rail Road** In addition to current utilization of NG to power locomotives (U.S, Brazil) the new projects will show technical, economic and environmental viability of LNG (Russia, Canada) and CNG (India) engine technology for locomotives.

Off-Road Trends



- **Inland waterways** The rivers Amstel, Chao Phraya, Dubai Creek, Mississippi, Moscow and Neva, Seine, Yangzi have seen successful demonstration and commercial operation of different size and purpose river boats that use CNG or LNG (dedicated and dual-fuel) instead of diesel.



- **Maritime** Emission Control Areas (ECAs) in the Baltic and Northern seas, North America, the Mediterranean and Sea of Japan will require ship owners to use cleaner marine fuels with low sulphur dioxide and particle content. The most attractive option is to use LNG. It might be expected that as many as 10% short-sea ships calling at ECAs will be running on LNG by 2015.

Golden Age of Gas is coming

- The global natural gas resource base is quoted to sustain current consumption for over 250 years.
- The world population of NGVs by 2020 may reach 50 million units.
- In terms of gas consumption HD OEM NGVs may overwhelm that of the LD NGVs. By 2020 HD sector may reach annual CH₄ consumption of 200 bcm.
- LNG (LBM) may become a primary alternative for heavy duty on- and off-road applications: buses, trucks, rail road, water- and aircraft.
- Small scale LNG sector (liquefaction, storage, transportation, dispensing) will grow.
- International Blue Corridors, Green Highways, Gas Highways – and not only for on-road vehicles - will connect cities, sea- and airports, railway terminals.

THANK YOU !



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