Natural gas station networks

Factors supporting and hindering
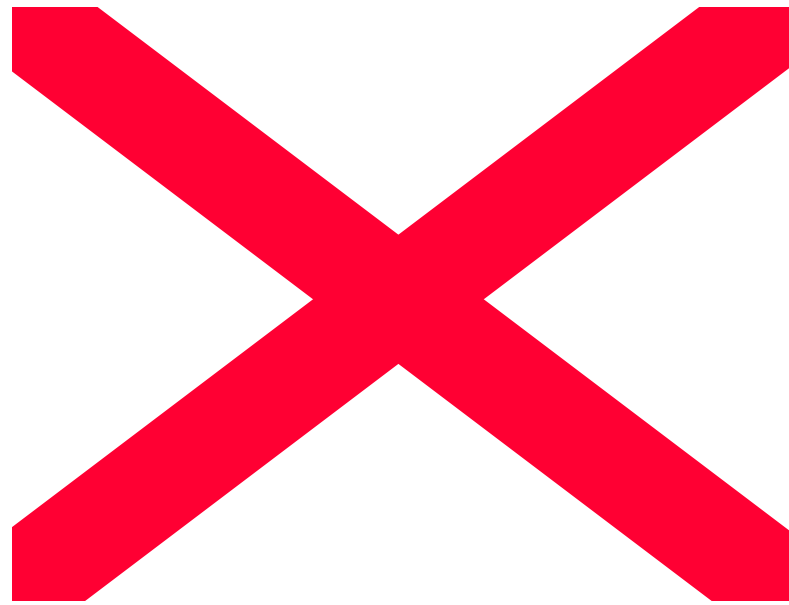## their development

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Agenda

- Natural gas as a fuel
- Development of networks in the world
- Influencing factors on density of network
- Obstacles to network evolvement
- Solutions to overcome this problem
- Reasons for success in Argentina and Italy

Natural gas reserves   *in trillion m^3*

Drillable reserves of natural gas: 140 trillion m^3

1m^3 = 11,5 kWh   1.1.2001   2001

Natural gas as a fuel - Natural gas

- Beginning as a fuel for vehicles at the beginning of the last century
- 85% methane, 10% N2 and CO2, rest higher hydrocarbons
- two types of NG: L and H (99% methane)
- more than 2 million vehicles today

Natural gas as a fuel - Natural gas supply

- Genuine energy alternative (methane)
- Liquefied form(-162°C/-259°F) or as compressed gas
- caloric value equal to that of Diesel
- mainly used as compressed gas

Natural gas refueling stations
- *elements for a system of stations*

- National gas pipeline supply network
- local filling stations comprising storage, gas compression and refueling pipes
- high pressure gas storage tanks suitable for attachment to vehicles and capable of withstanding crash impact forces

Natural gas as a fuel -
Natural gas vehicles

- Conventional engines can be converted to run on natural gas
- level of efficiency 36-37%
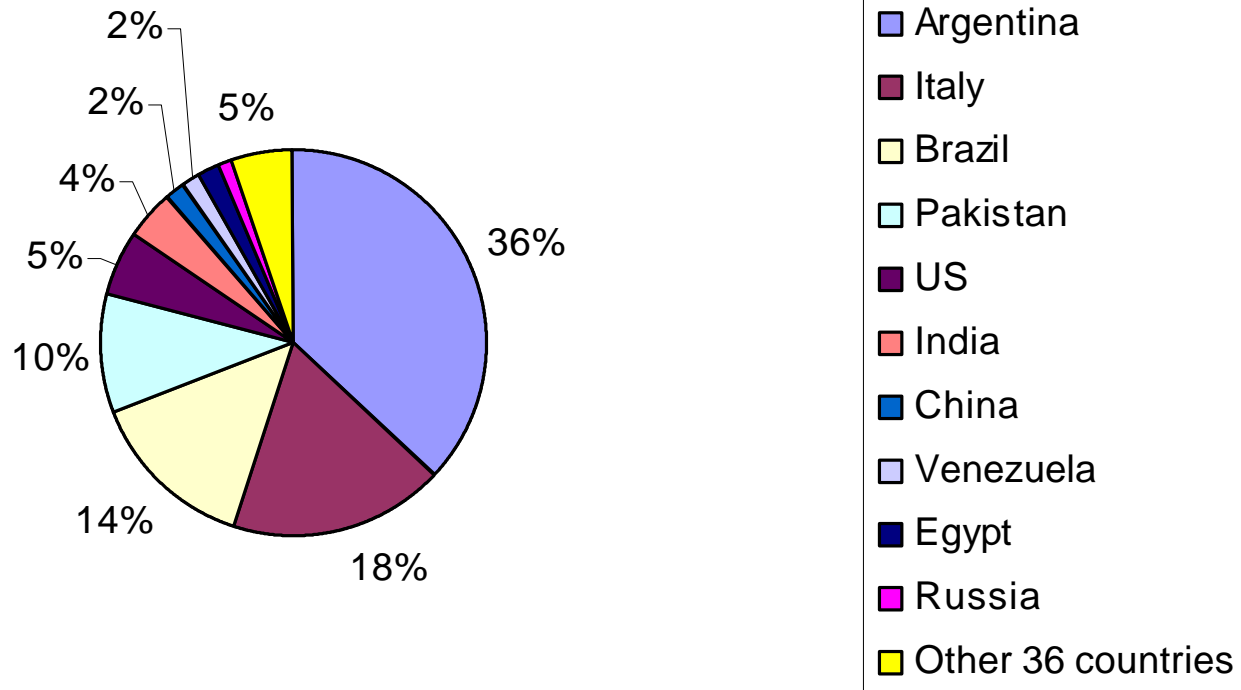- 1kg NG (H) = 1,5l gas
  (cost reduction ~50% for Germany)
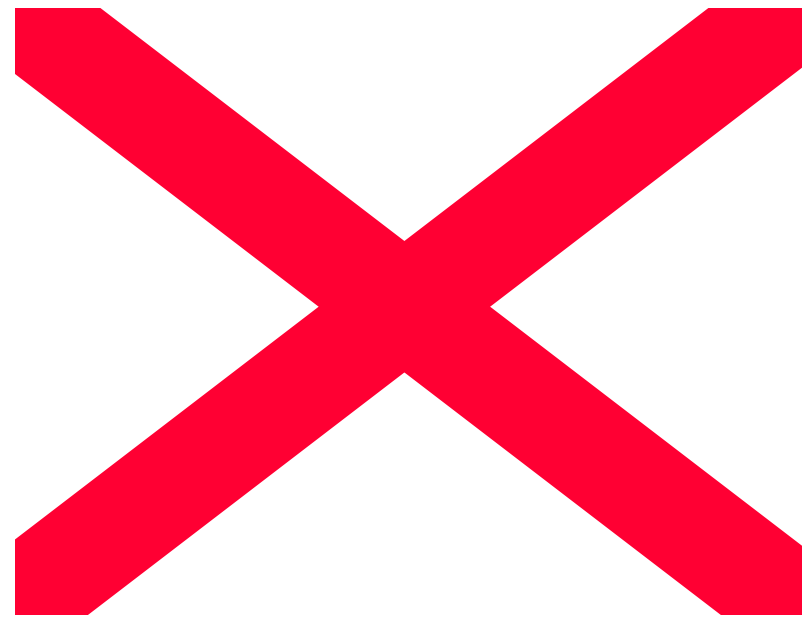
Comparison Argentina - Italy - USA

Number of NGVs and fuelling stations world-wide			
Country	Vehicles converted	Refuelling stations	Last update
Argentina	758013	1004	March 2002
Italy	370000	368	Dec.2001
US	111769	1250	Oct. 2001

Top 10 Countries NGVs

2%
2%
5%
4%
5%
36%
10%
14%
18%

Legend:
- Argentina
- Italy
- Brazil
- Pakistan
- US
- India
- China
- Venezuela
- Egypt
- Russia
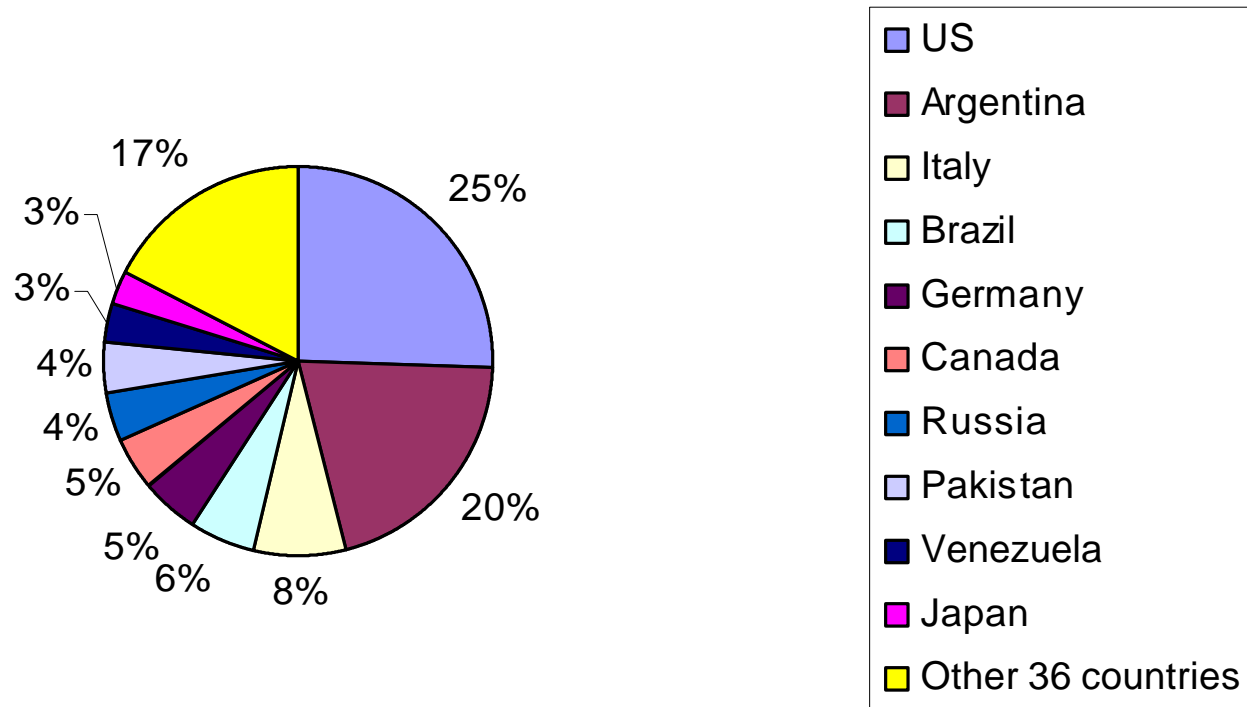- Other 36 countries

Importance of Argentina
Role of small countries

High concentration of NGVs
Low importance in the US

Top 10 Countries Refuelling stations

Legend:
- US
- Argentina
- Italy
- Brazil
- Germany
- Canada
- Russia
- Pakistan
- Venezuela
- Japan
- Other 36 countries

Pie chart values: 25%, 20%, 8%, 6%, 5%, 5%, 4%, 4%, 3%, 3%, 17%

Well developed industry nations improve their position -
Importance of degree of development

Influencing factors on density

- We conclude from our observations so far that the density of the network of natural gas stations is influenced by two factors:

    - By the amount of NGVs

    - By the general degree of development of infrastructure in a country

Main Obstacle to the Creation of Natural Gas Station Networks

No NGVs without fuelling stations - no fuelling stations without NGVs

How to break this cycle

- **Public policy**
  - Financial support for buying NGVs
  - Tax reduction on natural gas
  - Taxing more the classic fuels
  - Financing compressor stations
  - Allowing only "green" cars in the cities
  - Requiring a percentage of "green" vehicles
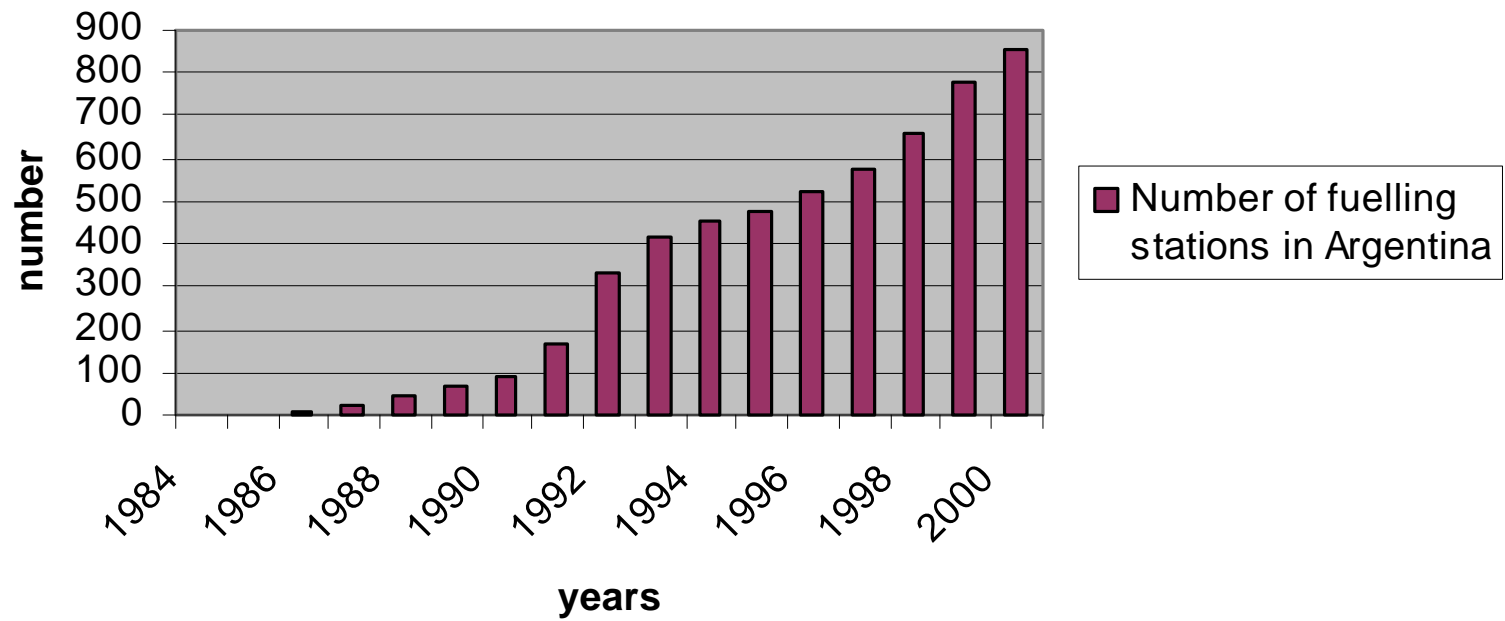
How to break this cycle 2

- Focusing on large fleets:
  - Transport companies
  - Postal services
  - Urban goods distribution firms
  - Taxis
  - Communal business services

Argentina

- NGVs since the 80ies

- Reasons for success:
  - Abundant resources of natural gas
  - Obstacles to energy export
  - Strong support by the Argentinean government
    - Tax reduction
    - Special programs

Italy

- NGVs since the 20ies

- Reasons for success
  - Strong support by the Italian government
  - Early use of natural gas as a fuel
  - Less strict rules concerning changes of cars
  - Many different types of NGVs offered
  - Reduction of damages inflicted by urban traffic pollution to the artistic and archaeological urban patrimony (Ravenne, Pavie, Padoue,...).

Conclusion

We strongly recommend that other countries follow the example of Argentina and Italy!