

# CNG as a Transport Fuel - Economic Benefits

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*Fingleton White*



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## Our scope of work for BGN

- ✓ Establish the scale and potential for CNG in the Irish commercial transport market
- ✓ Consider the economic case for switching to CNG
  - Evaluate and develop Financial Model
- ✓ Address the technical issues from a fleet management perspective
- ✓ Look at policy recommendations



## Focus of today's presentation

- ✓ The policy environment for alternative transport fuels
- ✓ The benefits of switching to CNG for commercial fleets
- ✓ The project economics for a fleet manager
- ✓ The development of CNG in some European countries
- ✓ The potential market for CNG in Ireland
- ✓ Making it happen – the policy response



# Policy Environment for Alternative Transport Fuels - EU



Focus is on GHG reduction (also security of supply).

## “20-20-20” targets by 2020:

- ✓ A cut in GHG emissions by at least 20% of 1990 levels  
[Long-term: 80-95% reduction by 2050]
- ✓ Improved energy efficiency → 20%
- ✓ Renewables' share of energy market → 20%

## Specifically on transport:

- GHG emissions cut by 10% vs. 2005 levels
- 10% of energy used to come from sustainable biofuels and other renewable fuels
- ❖ Transport generates ~ 25% of all EU GHG, +36% since 1990
- ❖ Range of policy instruments in place for the transport sector.



# Policy Environment for Alternative Transport Fuels - Ireland



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Reflects EU priorities...

- ✓ Reduce GHG emissions by 13% above 1990 levels in 2008-'12 period.
- ✓ Transport emissions to be cut by 20% vs. 2005 levels.
- ✓ Overall target of 16% of all energy from renewables.
  
- ❑ **Smarter Travel: A Sustainable Transport Future (2009-2020)**
  - ✓ 10% of transport energy renewable by 2020.
  
  - ✓ Biofuel Obligation Scheme (BOS):  
4% of fuel put on market is biofuels → 10% renewables penetration by 2020  
*Transport 21* funding for pilot projects to support biofuels uptake by public transport, haulage industry and taxi fleet.
  
  - ✓ Support for other alternative transport technologies.
  
  - ✓ Incentives for electric vehicle technology → 10% market share by 2020.
  
  - ✓ Public sector fleet replacement based on the most sustainable vehicle and fuel type.

## Why use CNG in transport?

- CNG already used worldwide as a transport fuel. Many countries across Europe are significant users of CNG in transport. Many examples of major companies/utilities which have adopted NGVs.
- The key benefits comprise
  - ✓ Lower fuel costs compared with diesel or petrol,
  - ✓ Its low carbon content and vehicle emissions (CO<sub>2</sub> production per unit of energy is about 25% lower for natural gas compared with diesel), and
  - ✓ Natural Gas Vehicles (NGVs) are a well proven technology.
- Technical considerations for Fleet Manager: purchase of equipment, vehicles, type of fuel used, maintenance costs, safety and reliability factors – will all determine the operational success of the fleet.



# 1. CNG enjoys a very significant price advantage over diesel

Fuel Price (VAT excl.)				
	Diesel € per litre (Wholesale)	Diesel € per kWh (Wholesale)	CNG €/kWh	Electricity €/kwh
Price ex tax	0.59788	0.05973	0.03615	0.11520
Mineral Oil Tax non-carbon element	0.42572	0.04253	0.00000	0.00000
Mineral Oil Tax carbon element (carbon tax)	0.03998	0.00399	0.00277	0.00000
<b>Total VAT Excl</b>	<b>1.06358</b>	<b>0.10625</b>	<b>0.03892</b>	<b>0.11520</b>

- Diesel price is based on a retail price of €1.399 per litre (VAT incl.) (March 2011 price).
- It is assumed that the non-carbon mineral oil tax on CNG is NIL.
- Gas and electricity prices are based on average user volumes.
- Carbon tax on electricity is NIL, as electricity generators are part of the emissions trading regime, the cost of which is included in the ex tax price.

Sources: Fingleton White, BGN, <http://www.energy.eu/>



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## Fuel costs example



	Bus	Truck
km travelled per annum per vehicle	80,000	80,000
<b>Total Kwh Gas consumed</b>	<b>347,368</b>	<b>663,158</b>
<b>Price CNG € / kwh (VAT excl)</b>	<b>€0.033</b>	<b>€0.033</b>
<b>Total Cost of Gas pa (€)</b>	<b>€11,631</b>	<b>€22,149</b>
Total Diesel equivalent (litres)	32,000	58,400
<b>Price Diesel € / litre (VAT excl)</b>	<b>€1.06</b>	<b>€1.06</b>
<b>Cost of Diesel pa (€)</b>	<b>€34,035</b>	<b>€62,113</b>
refuelling energy costs (electricity)	€719	€1,372
<b>Annual fuel savings for fleet</b>	<b>€21,685</b>	<b>€38,592</b>
<b>% Fuel Cost Savings</b>	<b>64%</b>	<b>62%</b>



## 2. Lower vehicle emissions and an improvement in air quality

### CNG % Reduction in emissions compared to diesel (per mWh)

	Van	Bus	Truck
<b>Carbon dioxide (CO<sub>2</sub>)</b>	20.1%	20.1%	20.1%
<b>Nitrogen oxides (NO<sub>x</sub>)</b>	49.8%	32.9%	32.9%
<b>Sulphur oxides (SO<sub>x</sub>)</b>	100.0%	100.0%	100.0%
<b>Particulate matter (PM)</b>	100.0%	88.5%	51.7%

CNG is superior to diesel across a range of emissions, even after the adoption of Euro VI standards (from 2013).



## 4. Project Economics.....for Fleet Manager



- The economics indicates that switching to CNG is financially viable for even very small fleets of buses and trucks, and for slightly larger fleets of vans. We estimate the payback period as follows:
  - 2 years for Trucks (Fleet of 10),
  - 4 years for Buses (Fleet of 10), and
  - 6 years for Vans (Fleet of 30).
- The financial viability varies depending on the number of vehicles in the individual fleet. This is because the cost of the refuelling facilities is spread over the number of vehicles, and does not vary greatly by fleet size.
- The main implication is that the primary focus of efforts to market CNG as a transport fuel should be on buses and trucks.
- There is a significant benefit for CNG, in terms of cost per 100 km, which we estimate at just under 40% for vans and 45-50% for buses and trucks. This is **the compelling rationale for a fleet manager to switch to CNG-powered vehicles.**



## Benefits for Ireland Inc.

- Increasing security of supply in transport
  - Adding domestically produced biomethane to the fuel mix in NGVs further assists environmental impact, and security of supply in addition to supporting local employment.
- Lower gas transportation tariffs for all gas users.
- Reduced cost of fuel for companies resulting in an increase in competitiveness.



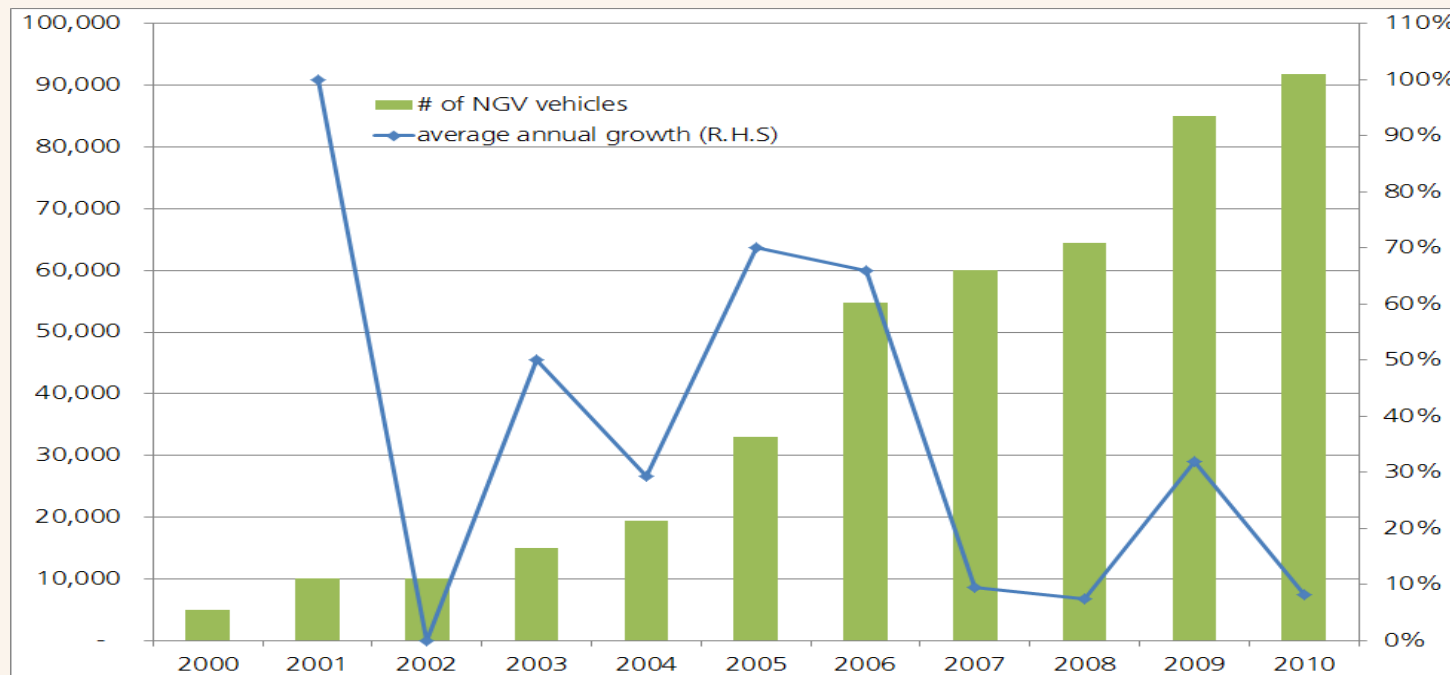
## The development of CNG in other countries

*In Europe, average growth of 11.2% per annum 2000-2010*

**Incentives** for CNG usage in other countries include one or more of the following:

- Reduced taxes on CNG compared to conventional fuels
- Exemptions from or reductions in annual road tax on NGVs
- Lower taxes on or tax credits for the purchase of new NGVs
- Tax credits for scrappage of older vehicles and replacement by NGVs
- Grants for infrastructure provision
- Other “soft” benefits (e.g. free car parking, access to priority lanes).

# Germany



91,890 NGVs

Incl. 1,590 buses

1,200 MD and HD trucks

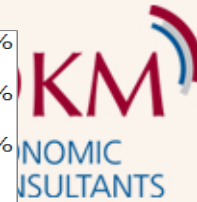
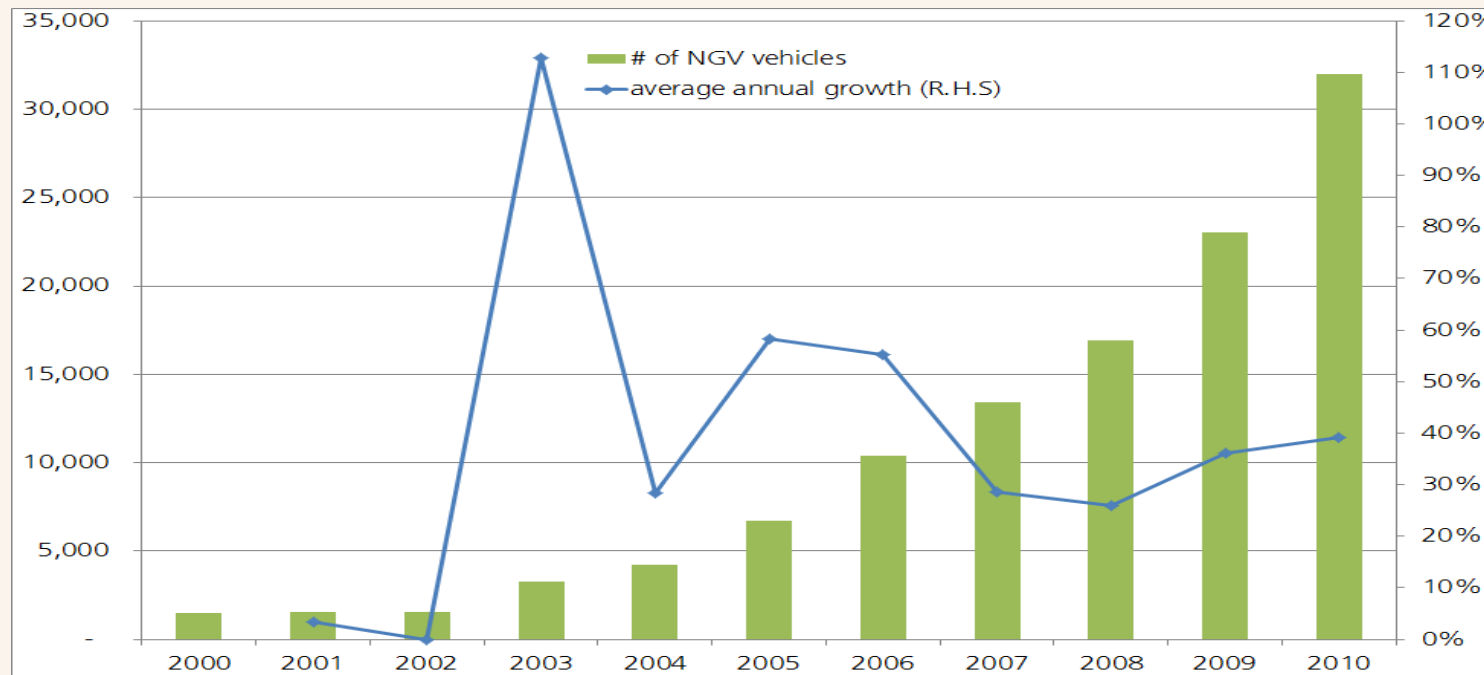
Source [www.iangv.org](http://www.iangv.org)

- ✓ NGV numbers trebled in last five years to over 90,000.
- ✓ 900 refuelling stations – largest number in Europe.
- ✓ NGVs are subject to 50% of mineral oil taxation for conventional fuels until 2018.
- ✓ Regional incentives vary for the purchase of NGVs from €200 to €2,000.
- ✓ Government recognises that biomethane could make a real contribution



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# Sweden



32,000  
NGVs

incl. 1,400  
buses

500 MD and  
HD trucks

Source [www.iangv.org](http://www.iangv.org)

- ✓ 155 refuelling stations .
- ✓ 0.64% of car and van fleet; 10.39% of bus fleet; and 0.63% of truck fleet.
- ✓ Subsidy of c.€1,000 for new green vehicles.
- ✓ In many cities bus fleets run on biomethane.
- ✓ 40% reduction in income tax paid for the use of a CNG car up to 8,000 SEK annually (approx €900).
- ✓ All EEVs (incl NGVs) are exempt from annual road tax for first 5 years after registration.
- ✓ Free municipal parking permits for NGVs in many cities.
- ✓ Low fuel tax on CNG; zero fuel tax on biomethane.



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## The potential market in Ireland

- Most viable where return to depot for refuelling at least once per day – strong potential to replace significant numbers of diesel-fuelled vehicles.
- ❖ The target market is 353,500 commercial vehicles
- ❖ Expected market share assumed after 20 years:
  - ✓ 5% for vans
  - ✓ 10% for buses
  - ✓ 10% for trucks
- ❖ Potential for 20,650 vehicles after 20 years = 0.74% of total fleet incl. cars
  - ✓ 16,800 vans
  - ✓ 1,130 buses
  - ✓ 2,720 trucks
- ❖ Total gas demand for NGVs in Year 20 equivalent to 110m therms or 0.28 MTOE



## Making it happen – the policy response....

- 1) A more balanced transport policy - ensure a level playing field with other alternative vehicle technologies

Current Policy fails to recognise that:

- ✓ NGVs can contribute substantially towards GHG and renewable targets.
- ✓ NGVs have a superior environmental profile to EVs.
- ✓ Further improved if the natural gas includes a % of biomethane
- ✓ NGVs an already market-proven and available technology.
- ✓ CNG for transport can be made operational in the short term.

- 2) Establish target for the penetration of CNG in commercial market.
- 3) Gas Connection Charge Policy should be modified to include the cost of the refuelling facility.
- 4) Semi-state companies and public bodies, including local authorities, should be encouraged to include NGVs in their fleets, as in other countries.
- 5) A collaborative approach should be adopted, involving participation by all stakeholders.





*“You don’t often get a hat trick in politics.  
Natural gas vehicles solve three problems:  
the environment, the economy and energy security”*

Rahm Emanuel Mayor of Chicago and  
formerly White House Chief of Staff to President Obama  
[http://www.cngnow.com/EN-US/Media/Documents/CHK\\_Economy.pdf](http://www.cngnow.com/EN-US/Media/Documents/CHK_Economy.pdf) and  
<http://seekingalpha.com/article/90330-study-u-s-has-118-year-supply-of-natural-gas>



Thank you

