



# European Alternative Fuel Strategy

- **Case for alternative fuels**
- **EU actions on alternative fuels**
- **EU strategy development**

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# The Case for Alternative Fuels

- **Transport fuel consumption heavily dominated by oil:**  
**Current share: 96%, import rate: 84%.**
- **High oil import bill:**  
**€ 1 billion/d in 2011; trade balance deficit: ~ 2.5 % of GDP**
- **Finite range of oil reserves:**  
**New reserves become more and more costly to extract**
- **Decarbonisation of transport:**  
**Low-CO<sub>2</sub> alternative fuels can contribute significantly**
- **Competitiveness of the EU industry:**  
**Investment into alternative fuels and infrastructure helps growth and jobs**



# Energy Consumption per mode

| <b>Mtoe</b>         | Road       | Rail     | Domestic Navigation | Domestic Aviation | International Aviation | TOTAL      |
|---------------------|------------|----------|---------------------|-------------------|------------------------|------------|
| <b>Oil Products</b> | <b>287</b> | <b>3</b> | <b>6</b>            | <b>8</b>          | <b>43</b>              | <b>347</b> |
| <b>Electricity</b>  |            | <b>4</b> |                     |                   |                        | <b>4</b>   |
| <b>Biofuels</b>     | <b>13</b>  |          |                     |                   |                        | <b>13</b>  |
| <b>Natural Gas</b>  | <b>1</b>   |          |                     |                   |                        | <b>1</b>   |
| <b>LPG</b>          | <b>5</b>   |          |                     |                   |                        | <b>5</b>   |
| <b>TOTAL Fuels</b>  | <b>306</b> | <b>7</b> | <b>6</b>            | <b>8</b>          | <b>43</b>              | <b>370</b> |



# Energy Consumption per Mode

| Mode               | Road        | Rail       | Domestic Navigation | Domestic Aviation | International Aviation |
|--------------------|-------------|------------|---------------------|-------------------|------------------------|
| <b>Fuels %</b>     |             |            |                     |                   |                        |
| <b>Petrol</b>      | <b>94%</b>  | <b>40%</b> | <b>100%</b>         | <b>100%</b>       | <b>100%</b>            |
| <b>Electricity</b> |             | <b>60%</b> |                     |                   |                        |
| <b>Biofuel</b>     | <b>4%</b>   |            |                     |                   |                        |
| <b>Natural Gas</b> | <b>0.3%</b> |            |                     |                   |                        |
| <b>LPG</b>         | <b>1.7%</b> |            |                     |                   |                        |



# EU Actions on Alternative Fuels

- ◆ **Communication on alternative fuels (11/2001)**  
Biofuels, natural gas, hydrogen
- ◆ **Directive on the market share of biofuels (5/2003)**  
Market share 2% in 2005, rising to 5.75% in 2010
- ◆ **Directive on the taxation of energy products (10/2003)**  
Lower taxation of alternative fuels enabled
- ◆ **Renewable Energy Directive (April 2009)**  
Binding target: 10% renewable transport fuels by 2020
- ◆ **Technology Platforms, Joint Technology Initiatives**  
Hydrogen/fuel cells (TP: 2004; JTI: 2008), Transport (2004), Biofuels (2005)
- ◆ **Green Cars Initiative of European Economic Recovery Plan (2008)**  
Focus on electromobility (EU demonstration project Green eMotion: 2011)
- ◆ **Communication on clean and energy efficient vehicle strategy (4/2010)**  
Focus on improvement of internal combustion engine and electric vehicles



# Alternative Fuel Vehicle Projects



## BioEthanol for Sustainable Transport: **BEST**

- Over 70,000 bioethanol-powered cars
- More than 300 ethanol pumps
- Nearly 200 ethanol buses



## Biogas – Market Expansion: **BIOGASMAX**

- Biomethane contribution to the EU goal of 10% share of renewable fuels in transport
- Key characters of biomethane use in Natural Gas Vehicles (NGVs) were defined
- The project suggested framework for injection of biomethane into natural gas grids



## Hydrogen buses in **HyFleet:CUTE**

- 2.6 million kilometers travelled with 90% bus availability
- 44 hydrogen fuel cell and internal combustion engine buses demonstrated
- 555 tonnes of hydrogen produced, displacing > 1 million litres of diesel



## Battery electric vehicles: **Green eMotion**

- Connection of national and regional projects
- Market place preparation
- Interoperability and standards



# Alternative Fuels Strategy

**Comprehensive long-term fuel strategy  
All transport modes, all segments to be covered**

**White Paper on Transport - Initiative 24 - Technology roadmap:  
Sustainable alternative fuels strategy  
including also the appropriate infrastructure**

**White Paper on Transport - Initiative 26 - Regulatory framework:**

- **Appropriate standards for CO<sub>2</sub> emissions of vehicles in all modes**
- **Requirements on energy efficiency for all types of propulsion systems**
- **Rules on interoperability of charging infrastructure for clean vehicles**
- **Guidelines and standards for refuelling infrastructures**



# Steps to an EU Alternative Fuels Strategy

- **European Expert Group on Future Transport Fuels**  
Future Transport Fuels Report: 25 January 2011  
Alternative Fuels Infrastructure Report: December 2011
- **Joint Expert Group Transport & Environment**  
European Alternative Fuel Strategy Report: May 2011
- **Conference on Future Transport Fuels**  
13 April 2011 (European Sustainable Energy Week)
- **Public Consultation**  
11 August – 20 October 2011
- **Studies, including stakeholder consultation**  
Clean Transport Systems study: final report November 2011  
Implementation study: final report August 2012
- **Impact Assessment**  
Final adoption 6 November 2012





# Future Transport Fuels Expert Group - Reports -

## Future Transport Fuels



## Infrastructure for Alternative Fuels



[http://ec.europa.eu/transport/urban/cts/future-transport-fuels\\_en.htm](http://ec.europa.eu/transport/urban/cts/future-transport-fuels_en.htm)



# Alternative Fuels

- **Electricity**

*Universal energy carrier using all primary energy sources*

Stored in batteries on board of vehicles; propulsion with electric motors;

- **Hydrogen**

*Universal energy carrier using all primary energy sources*

Stored in tanks on board of vehicles; electricity production in fuel cells

- **Biofuels**

*Wide feedstock range with renewable low-CO<sub>2</sub> sources*

Substitution of fossil fuels in present propulsion technology

- **Synthetic fuels**

*Production from fossil and renewable sources with synthetic technologies*

Substitution of fossil fuels in present propulsion technology

- **Methane**

*Fossil (natural gas) and renewable sources (biomethane; "solar/ wind" gas)*

Substitution of fossil fuels in present propulsion technology

- **LPG**

*Fossil (oil, natural gas) and renewable sources (bio-refineries)*

Substitution of fossil fuels in present propulsion technology



# Renewables Based Transport-Energy System

- **Electricity**

Storage of fluctuating renewable electricity production in batteries of electric vehicles

Electric grid stabilisation with feed-in from batteries

- **Hydrogen**

Storage of fluctuating renewable electricity production in hydrogen produced from water through electrolysis

Use of hydrogen in fuel cells for electromobility

- **Methane**

Production from biomass: biomethane

Production from hydrogen through methanisation with CO<sub>2</sub>



# Alternative Fuel Options

| Fuel              | Mode<br>Range | Road-passenger |        |      | Road-freight |        |      | Air | Rail | Water  |           |          |
|-------------------|---------------|----------------|--------|------|--------------|--------|------|-----|------|--------|-----------|----------|
|                   |               | short          | medium | long | short        | medium | long |     |      | inland | short-sea | maritime |
| LPG               |               |                |        |      |              |        |      |     |      |        |           |          |
| Natural Gas       | LNG           |                |        |      |              |        |      |     |      |        |           |          |
|                   | CNG           |                |        |      |              |        |      |     |      |        |           |          |
| Electricity       |               |                |        |      |              |        |      |     |      |        |           |          |
| Biofuels (liquid) |               |                |        |      |              |        |      |     |      |        |           |          |
| Hydrogen          |               |                |        |      |              |        |      |     |      |        |           |          |



# Cost of Fuels



Speculative bubble 2007/8: Cost for EU transport: 90 b€  
 North-Africa unrest 2010/11: Cost for EU transport: 40 b€

## Alternative fuels

*Infrastructure costs  
for full EU coverage*

### Electricity

20 million charging posts  
40 b€

### Hydrogen

100.000 filling stations  
50 b€

### Methane

100.000 filling stations  
40 b€



# Clean Power for Transport Package

## **Communication:**

**European alternative fuel strategy**

## **Legislative proposal:**

**Infrastructure build-up and standards**



# Summary

- ◆ **Oil dependence major issue for transport**  
Oil supplies 96% of energy to transport; 84% imported
- ◆ **CO<sub>2</sub> and pollutant emissions mainly from oil combustion**  
Transport: 25% of CO<sub>2</sub> emissions, 70% of urban pollution
- ◆ **Comprehensive long-term European fuel strategy**  
Substitution of oil for all transport modes
- ◆ **Future transport fuel mix**  
Different fuels for different transport modes
- ◆ **Alternative fuel infrastructure**  
EU-wide coverage important



# Contact

**Clean Transport and Sustainable Urban Mobility:**

**[http://ec.europa.eu/transport/urban/index\\_en.htm](http://ec.europa.eu/transport/urban/index_en.htm)**

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