Final Report of the PROCURA Project

“Hitting the Road in Green Mode, tools for successful procurement of alternative fuelled vehicles for public and private car fleets”

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On behalf of the PROCURA consortium
Acknowledgements

This report has been written by NTDA Energía from the outputs of the PROCURA project and in consultation with the PROCURA consortium. The views expressed in this manual, as well as the information included in it, may not necessarily reflect the opinion or position of all project partners.

The layout has been designed by FAST.
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1. Introduction

PROCURA – Green Fleet Procurement Models

The Commission Green Paper ‘Towards a European Strategy for the Security of energy supply sets the objective of 20% substitution of conventional fuels by alternative fuels in the road transport sector by the year 2020. The project PROCURA was designed to facilitate the large-scale procurement of Alternative Fuel Vehicles (AFV) by identifying traditional market barriers and furthermore, promoting guidance for their mitigation. In addition, the project also aims to contribute to intermediate EU goals to substitute 2% of conventional fuels with biofuels in 2010. It aims to do this by providing guidance to potential clients willing to adopt AVF to their fleets.

The use of alternative fuels can contribute to the decrease of the emissions of pollutants, noise and ultimately to the reduction of oil dependency and CO₂ well to wheel emissions. The main obstacles for the adoption of these fuels are due to the fact that these types of fuel and vehicles imply different degree of modification in the system (which can go from fuel production, fuel distribution and vehicles availability to the maintenance chains).

The economics of alternative fuels have proven challenging for several reasons. To achieve immediate gains in petroleum replacement, investments in alternative fuel (including hydrogen compatible) infrastructure are needed now, to ensure that alternative fuel solutions are available today and hydrogen-ready infrastructure is in place for the future.

PROCURA’s strategy consists of developing and testing models for AFV-procurement through:

- buyer pools (permitting centralized infrastructure and servicing),
- focusing on private fleet owners (e.g. Greenlease), and
- starting up the development of 2nd-hand markets
- Certification systems for AFVs.

In addition, the project PROCURA also includes the development of manuals and guidelines for the introduction of these new technologies and fuels as well as pilot case studies in Netherlands, Italy, Portugal, Poland and Spain.

Public authorities play a very important role in the adoption of the AFV market as they can offer incentives and disincentives to accelerate the market introduction. Moreover, public authorities are obligated to have a long-term perspective for their communities and country. They need to understand the benefits that might be gained from overcoming barriers for the local / national community. In this sense the main driving forces to the introduction of AFV cover three important areas that are directly related: political, economic and environmental.
The Target Groups

**Local authorities:** form an important target market for applying the guidelines, manuals and procurement models developed in PROCURA.

**Private fleet owners:** form another major target market for applying the developed procurement models. This target market is particularly related to the PROCURA actions related to GreenLease and second-hand markets of AFVs.

**Regional and national agencies:** form supporting actors in providing incentives for AFV procurement, as well as procure AFVs themselves.

**Maintenance and repair shops:** are responsible for maintenance and repair activities for AFVs, and will be the target market for requiring training related to AFVs.

**Infrastructure developers:** are responsible for developing infrastructure for AFVs.

**Branch organisations (automotive):** form an important stakeholder given their strong network in the fleet market and consumer market in the automotive industry; branch organisations will be target for disseminating knowledge developed in PROCURA.

**Automotive manufacturers:** play an important role in providing AFVs.

The overall understanding of Alternative Fuel Vehicles (AFVs) includes all vehicle types presented in the below diagram. However, the PROCURA projects dealt only with vehicles running on natural gas, bioethanol and Biodiesel and hybrid vehicles.

**1. Overview Alternative Fuel Vehicles (NTDA)**
The European Union has made a commitment to achieve at least a 20% reduction of greenhouse gas emissions by 2020 compared to 1990 (EU Green Paper, 2007). In addition to the emission of greenhouse gasses, there are problems regarding the availability of fossil fuels. The earth’s natural resources of fossil fuels are exhaustible, which means fossil fuels will become scarcer in the future. Besides this, only a limited number of countries have significant oil reserves. As a result, the world depends largely on politically unstable areas for its oil supply.

2. Current EU policy promoting alternative fuels

<table>
<thead>
<tr>
<th>EU Directives</th>
<th>Brief descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directive 2003/96/EC</td>
<td>Aims at modifying minimum taxation levels for energy products introduced in 1992 by Directive 92/81/EC. Allows Member-States to exempt bioenergy products from energy taxation, but not over-compensating the cost disadvantage of biofuels. Duty reductions schemes may be implemented only after EC approval.</td>
</tr>
<tr>
<td>Directive 2003/30/EC</td>
<td>Promotion of biofuels and other renewable use for EU transport. Suggestion to Member States (MS) to assure minimum proportion of alternative fuels is placed on their markets. EC evaluates MS progress reports every 2 years, and if reference targets are missed, EC can recommend adoption of national mandatory targets to European Council / Parliament</td>
</tr>
<tr>
<td>Directive 1999/94/EC</td>
<td>Availability of consumer information on fuel economy and CO2 emissions in respect of the marketing of new passenger cars)</td>
</tr>
</tbody>
</table>
Moreover, a Proposal for a European Directive on the promotion of clean road transport vehicles has been issued in December 2007, but has not yet passed the legislative process. This proposal promotes clean passenger vehicles through the setting of emission performance standards for new passenger cars as one way of reducing pollutant emissions by the transport sector.

**More Info:**

The full transcription of these Directives can be found in:


**Where to find updates on EU Policy information**

A description of all relevant EU directives for alternative fuels and the procurement of Alternative Fuel Vehicles can be found in chapter 4 of this document. However, as information on EU policy targets, objectives and visions tends to be of a volatile nature, it should be checked by the reader on its latest status. This is especially advisable as this document is stating the policy situation of October 2008 and won't be updated annually. Thus, the reader is advised to consult the following EC pages on the latest policy status:

1. EUR-Lex **database on European Union law**: Provides information on the Official Journal of the European Union as well as the treaties, legislation, case-law and legislative proposals and is searchable by keywords, EU Communication references etc

2. PreLex database on **inter-institutional procedures** which follows the major stages of the decision-making process between the Commission and other institutions:
   a. stage of the procedure;
   b. decisions of the institutions;
   c. persons' names;
   d. services responsible;
   e. references of documents …etc,
   and monitors the works of various institutions involved (European Parliament, Council, ESC, Committee of the Regions, European central Bank, Court of Justice, etc.). PreLex follows all Commission proposals (legislative and budgetary dossiers, conclusions of international agreements) and communications from their transmission to the Council or the European Parliament and links the user directly to the electronic source texts
   http://ec.europa.eu/prelex/apcnet.cfm?CL=en
3. The EC also provides **summaries of the current legislative situation** on a specific topic. These summaries can be found here: http://europa.eu/scadplus/scad_en.htm

### How to use this guide

This brochure provides you with a wealth of information and shows you were to find detailed information on the subjects you need more guidance on. Consider this document as a guide on reference where you can look up any issues on alternative fuels and alternative fuel vehicles which you might need more information on your day-to-day business. Thus, rather than reading the document from the first to the last page use one of these three information access strategies:

1. **“Where can I find” table**: Identify in which group of reader you fit, select the type of information you are looking for and click on the indicated chapter or page. You’ll be automatically let to this information.

2. **Key word register**: Search for the key word that best identifies the information you need and go to the indicated page

3. **Summary of content**: In order to get an overview of the information included in this guide read the chapter 2 called “Content” which presents a brief summary of each of the subsequent chapters.

At the end of each chapter you’ll find indications which PROCURA reports can provide you with more detailed information on those topics dealt within the chapter. In a second step, you can consult a summary of each deliverable and a link in order to download the document.
### 3. Where can I find ...

<table>
<thead>
<tr>
<th>General Topics, of interest to all readers</th>
<th>Where to find information …</th>
</tr>
</thead>
<tbody>
<tr>
<td>How to use this guide?</td>
<td>See <strong>How to use this guide</strong> section on page 9</td>
</tr>
<tr>
<td>What other results, tools, models have come out of PROCURA?</td>
<td>ANNEX – Overview of PROCURA reports and tools (p.129)</td>
</tr>
<tr>
<td>How can I get in contact with PROCURA Partners?</td>
<td>Page 115 in chapter 11</td>
</tr>
<tr>
<td>How to find the latest information on regulation?</td>
<td>See “<strong>Where to find updates on EU Policy information</strong>” on page 7</td>
</tr>
<tr>
<td>Background information on the PROCURA project</td>
<td>See <strong>Introduction</strong> &amp; list of reports in the annex on p. 129</td>
</tr>
<tr>
<td>What is an alternative fuel vehicle (AFV)?</td>
<td>See introduction up from p. 5</td>
</tr>
<tr>
<td>This document uses abbreviations I don’t know</td>
<td>Check the abbreviation in the nomenclature on p.137</td>
</tr>
<tr>
<td>What fuel independent market barriers exist for AFVs?</td>
<td>See table 19 in chapter 5</td>
</tr>
</tbody>
</table>
| Step to Step Guidelines | Maintenance (chapter 5)  
Procurement (chapter 7)  
Plan of action on CNG (page 69) |
<p>| Financial Support in substituting existing fleet vehicles with alternatives | See financial &amp; Procurement Schemes up from page 72 |
| What is the point of view of vehicle manufacturers on AFVs? | See information provided by FORD on page 91 |
| What does the term “Vehicle Classification System” stand for? | See chapter 7 |</p>
<table>
<thead>
<tr>
<th>Of interest to Public Authorities to stimulate their local AFV situation</th>
<th>Where to find information …</th>
</tr>
</thead>
<tbody>
<tr>
<td>What does EU policy on alternative fuels look like?</td>
<td>See EU Policy promoting alternative fuels on p. 7 and chapter 4</td>
</tr>
<tr>
<td>In the future, will my country / region have to fulfil any emission targets?</td>
<td>See chapter 4</td>
</tr>
<tr>
<td>What policy measures can I introduce that favour AFV introduction?</td>
<td>See Policy recommendations (p.103) and the Example of Policy measures in Sweden (p.105)</td>
</tr>
<tr>
<td>What steps should I pursue to introduce a CNG in my municipality</td>
<td>Look at the Plan of action on CNG introduction (p 69) the Municipality of Nijmegen has created based on their experience</td>
</tr>
<tr>
<td>Is there an example for a successful AFV market?</td>
<td>Example of Policy measures in Sweden (p.105)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Of special interest to maintenance services</th>
<th>Where to find information …</th>
</tr>
</thead>
<tbody>
<tr>
<td>All I have to know about the maintenance of an AFV</td>
<td>Maintenance guide for biodiesel, CNG &amp; bioethanol vehicles Chapter 5</td>
</tr>
<tr>
<td>When it comes to repairing services, what is different about AFVs?</td>
<td>Maintenance guide for biodiesel, CNG &amp; bioethanol vehicles Chapter 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Of special interest to fuel provider and fuel logistic companies</th>
<th>Where to find information …</th>
</tr>
</thead>
<tbody>
<tr>
<td>How much does it cost to produce biodiesel, bioethanol of natural gas??</td>
<td>See chapter 6</td>
</tr>
<tr>
<td>Of special interest to Fleet Owners (Public/Private)</td>
<td>Where to find information ...</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Frequently asked questions (FAQ) on different fuels</td>
<td>Chapter 10, p. 109</td>
</tr>
<tr>
<td>How can I know which fuel is the best choice for my fleet?</td>
<td>See information on Fleet Scan Tool in chapter 4, p. 25</td>
</tr>
<tr>
<td>Which fuel saves most emissions?</td>
<td>It depends on the make-up and the current emission performance of your fleet – check with a fleet scan (Fleet Scan Tool Chapter 4, p. 25)</td>
</tr>
<tr>
<td>Which fuel allows me to save most on fuel expenses?</td>
<td>Depends on the make-up and current emission performance of your fleet – check with a fleet scan (Fleet Scan Tool Chapter 4, p. 25)</td>
</tr>
<tr>
<td>What challenges, barriers will I have to face if I want to integrate AFVs in my fleet?</td>
<td>See chapter 3</td>
</tr>
<tr>
<td>What benefits can I expect if I integrate AFVs in my fleet?</td>
<td>See chapter 3</td>
</tr>
<tr>
<td>What do I have to take into account when fuelling a CNG vehicle?</td>
<td>Guide on CNG filling (page 45)</td>
</tr>
<tr>
<td>What types of AFVs are available?</td>
<td>See subchapters on Vehicle Availability in chapter 5</td>
</tr>
</tbody>
</table>
# Chapter Summaries

## Chapter 3: Why Procurement of AFV?

**Summary:** This chapter is directed primarily towards Fleet Owners and shows them the potential benefits and/or drawbacks of getting engaged in procuring alternative Fuel Vehicles.

**Keywords:** environmental benefit; financial benefit; emissions decrease; company image; fuel costs; premium price; reliability; efficiency; vehicle availability.

## Chapter 4: How can my fleet contribute to emission reduction?

**Summary:** This chapter comments on the impact of transport on EU emissions, introduces the PROCURA fleet scan tool and shows results from fleet scans conducted within the PROCURA project.

**Keywords:** Transport emissions; EU figures; fleet experiences; fleet scan tool; fleet scans.

## Chapter 5: Hitting the roads: AFV availability, cost and maintenance, second hand markets

**Summary:** This chapter is particularly directed towards Private and Public Fleet Owners. The aim is that they have an overview of the different technologies that can be adopted by their fleets and the necessary supporting infrastructure. However, it can be also be of use to Maintenance and Repair Shops currently with limited experience on these types of vehicles, but who may be intending to become a certified and specialised entity in repairing and maintaining AFV.

**Keywords:** Maintenance costs, oil, fuel filter, exhaust valve storage, Alternative fuels, filling stations, vehicles availability, maintenance, safety, costs, regulations.
Chapter 6: Hitting the roads: Infrastructure build up

**Summary:** aimed to Private and Public Fleet Owners who are interested in achieving better environmental local conditions at the fleet operation level, private fleet owners willing to address the possibility of introducing AFV, car makers and also fuel providers.

**Keywords:** Fuel production, production procedure, feedstock, production costs, materials, filling station, logistics,

Chapter 7: Hitting the roads: Smart incentives, procurement models

**Summary:** This chapter presents available European incentives in form of fiscal measures but also strategic (like reserved parking spots for AFVs). Additionally, it shows a number of procurement models, i.e. financial schemes with the objective of reducing the financial burden of AFV acquisitions.

**Keywords:** Fiscal measures, procurement schemes, joint procurement, buyer pool, bulk procurement, shared savings, progress payment.

Chapter 8: Street wise: experiences in the Procura Pilots projects

**Summary:** This chapter provides more information on the national pilot cases and the lessons learned by the PROCURA partners.

**Keywords:** lessons – learned, pilot cases, recommendations

Chapter 9: Policy Recommendations

**Summary:** Based on the three year experience of the PROCURA team, this chapter provides a number of policy recommendations for the EU level, but also for a national approach.

**Keywords:** EU policy, National policy
3. Why Procurement of AFV?

**Political motivations**

The more AFV are on the roads, the less Europe is dependant on oil imports. In order to reduce the oil dependency in a significant way, Europe has to concentrate on an oil reduction in the transport sector, as transport is responsible for approximately 2/3 of the overall oil consumption in Europe. A greater independence of oil imports will stabilize the economy. Apart from this political factor, Europe would also benefit in an environmental and economic sense as the emphasis and a further public funding scheme would create new employment possibilities and allows Europe to experience an economic upswing. The environmental benefit is quite obvious as the CO₂ and other greenhouse gas emissions decrease with every car running on alternative fuels. The decrease of emissions itself will improve the state of the environment and as air and water quality improves, it will also improve the health conditions.

The decisive factor in fleet procurement remains the financial benefit although environmental concerns increase to become significant decision factors. Hence, in order to gain the interest of a fleet owner to procure an alternatively fuelled fleet / vehicle in most cases, the user has to realize a financial benefit by this procurement. Apart from the economic considerations, fleet owners should also consider the environmental impact of the AFV acquisition. The importance of ecological profits for the fleet owners increases steadily. A decision towards the employment of alternative fuel vehicles may improve local air quality and moreover contributes to the overall environmental improvement and the reduction of the greenhouse effect. When thinking of ecological profits the fleet owner has to take into account the true environmental benefit (i.e. improved air) as well as the “soft” benefit factors¹ for his business, such as an improved company image.

**Individual benefits and disadvantages**

Yet, what are your individual benefits for procuring an AFV? Some examples of benefits are given in below table along with potential draw-backs which you should also consider when thinking about AFV procurement:

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¹ Soft Benefit factors are benefits that are not calculable (or only with difficulties) in monetary terms.
### 4. Benefits and Challenges of AFV procurement

<table>
<thead>
<tr>
<th>Variables</th>
<th>Benefits &amp; strategic steps</th>
<th>Challenges &amp; strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>Energy efficiency or resource conservation (Saved fuels in volume = environmental impact but also saved costs for fuel)</td>
<td>In some industries a premium price for green products is accepted =&gt; Questionable for transport. Challenge to maintain green motivation despite cheaper available vehicles</td>
</tr>
<tr>
<td>Political &amp; Legal</td>
<td>Creating a partnership with suppliers may help in legal compliance &amp; global performance.</td>
<td>Purchasers / Consumers have to be conscious of main regulations</td>
</tr>
<tr>
<td>Socio-cultural</td>
<td>Green attitude may help improve image and gather new customers</td>
<td>Economic restrictions (costs of visibility) have to be kept in mind.</td>
</tr>
<tr>
<td>Natural</td>
<td>Spreading of an environmental culture</td>
<td>To create reward mechanisms for suppliers. To communicate green attitude &amp; involved investment in a way that the company will distinguish itself from other companies</td>
</tr>
<tr>
<td>Technological</td>
<td>Technological benefit can be identified by a life cycle cost analysis (LCCA). Company needs to keep in mind further life cycle cost as resale &amp; disposal costs</td>
<td>Reliability &amp; Efficiency Availability of replacements</td>
</tr>
<tr>
<td>Competitive</td>
<td>Financing activities such as green procurement may be good investment for advanced companies.</td>
<td>Company invests into green procurement for a long-fixed time while competitors may use these investments in quality increase etc. Risk that customer will value other (i.e. competitor investments) more than “green” investments.</td>
</tr>
</tbody>
</table>
## Policy & Fiscal Instruments available in partner countries

### 5. Instruments applicable for AFV projects in The Netherlands

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Application, objectives &amp; effects in The Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Investment Deduction (EIA)</td>
<td>Deducting investment from taxable profit up to a percentage of investment costs (max 13% or 107M€ per year and fiscal entity). Min. investment: 2.000€ (in the year of application) Stimulating investment in energy efficient assets &amp; renewable energy technologies</td>
</tr>
<tr>
<td>Green funds Scheme (GFS)</td>
<td>Investment in GFS = individual investors lend money to banks at a lower interest rate, that is compensated by a tax incentive (environmental tax credit). These banks can then offer cheaper (1-2% lower) loans to environmental projects Government tax incentive instrument encouraging environmentally initiatives</td>
</tr>
<tr>
<td>Energy research strategy (EOS)</td>
<td>Priority areas: energy-efficiency in industry and agriculture; biomass; new gas/cleaner fossil fuels; built environment; offshore wind generation and electricity grids. Subsidized programs: New Energy Research (Including generation, conversion, storage, efficiency, renewables, etc. Projects are awarded subsidy in rounds of tenders (40% of the additional costs compared to a reference situation)</td>
</tr>
</tbody>
</table>

### 6. Instruments applicable for AFV projects in Poland

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Application, objectives &amp; effects in Poland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Strategy of Renewable Energy Sector</td>
<td>Adopted in 2001 with the aim to increase the share of energy from renewable sources in Poland's primary energy balance to 7.5% in 2010 and to 14% in 2020 Proposes concrete actions in the development of the utilisation of renewable energy sources</td>
</tr>
</tbody>
</table>
| ‘Act on Biofuels Market’ | Approved by Polish Parliament in 2003 and came into force in 2004  
Determine that at least 3.5% of ethyl alcohol must be mixed in every liter of petrol  
Addition of rape seed esters to diesel fuels (modification 2005) |
|---|---|
| **EcoFund** | Provision of financial support to environmental protection projects  
Focused to the rationalisation of energy use and promotion of use of renewable energy sources  
Support of projects related to: “waste” energy generated at industrial processes; replacement of coal fuels by biofuels; reduction of methane emission from coal mines and biogas emission from municipal landfills and sewage treatment plants  
Grants of up to 70%, but only for projects where equipment (e.g. biomass boilers) has been produced in Ecofund countries (USA, France, Switzerland, Italy, Sweden, and Norway) or Poland |

The **Spanish biofuels market** has recently been supported by a new national regulation. On October 9th, 2008 the Order of Oct. 9, ITC/2877/2008 was published in the BOE (Official State Gazette), laying down a mechanism which promotes the use of biofuels and other renewable fuels for transport purposes. This Order is issued to meet the terms of Law 34/1998, for the hydrocarbon sector, which sets a target for 2010 of compulsory use of biofuels of at least 5.83% in transport. Additionally, it comprises important new aspects on biofuels policy, related to targets, blends, labelling, and who takes responsibility on what. Some examples are:

- National Energy Commission (CNE) is in charge of biofuels certification as well as supervision and control of obligations.
- Biofuels blends with fossil fuels must be carried out in EU Member States
- Sets minimum targets for each product
- Creates mechanisms for temporary flexibility for the amount of biofuels sold or consumed, i.e. share of sold biofuels should be at least 1.9 % of total sold fuel by 2008, which increases to 3.4 % in 2009 and should reach a market share of 5.83 % in 2010.
## 7. Instruments applicable for AFV projects in Spain

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Application, objectives &amp; effects in Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R&amp;D Energy Programme</strong></td>
<td>National RD&amp;D Plan integrates programmes such as the National Energy Programme (PROFIT-Energía). Focuses on four key actions: cleaner energy systems, including renewable energy sources and fuel cells; technologies for the transmission, storage, distribution, and rational and efficient use of energy; new propelling systems and fuels for the road transport sector; and complementary actions (fossil fuels, renewable energy integration, nuclear safety, environmental impact, etc.).</td>
</tr>
</tbody>
</table>
| **Matriculation Tax (January 2008)**           | - New tax scheme paid at purchase of vehicle  
- Depends on CO₂ emissions of vehicle  
- Lowered significantly the price for some vehicles  
- Old matriculation tax was a 7% of base price for cars under 1.6 liters (gasoline) or 2.0 liters (diesel).  
- New ”Green tax” is distributed like this:  
  - No tax for cars with emissions < 120 CO₂ g/km  
  - Between 121 and 161 CO₂ g/km: 4.75 %  
  - Between 161 and 200 CO₂ g/km: 9.75 % |
- Government empowers Regions to give financial support for the acquisition of environmentally friendly vehicles, with a maximum of 6,000€. Budget for these grants comes from the national entity IDAE  
- The aid, limited by the communitarian rules, will be max 6,000€ for electric propulsion vehicles, 2,000€ for cars running on natural gas or liquefied petroleum gas and 450€ if the car is modified increasing its energy efficiency  
- Objective of renewing vehicles in public fleets |
| **Renewable Energy Promotion Plan**            | Approved in 1999 and aims to supply at least 12% of Spain’s total energy demand with energy generated from renewable sources by 2010. |
### 8. Instruments applicable for AFV projects in Portugal

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Application in Portugal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Portaria no. 383/2002 (PRIME Programe)</strong></td>
<td>Supports the use of renewable energy projects Programme grants subsidies to public and private organisations for projects in Renewables for electricity generation; Energy management measures and co-generation; Green fuels for transport fleets; Fuel switching to natural gas. Subsidies vary according to renewable-type and project economic feasibility, but in general correspond to approximately 40% of the investment.</td>
</tr>
<tr>
<td><strong>Resolution of the Council of Ministries - 63/2003</strong></td>
<td>Approval of main orientations of energy policy, redefining E4 energy programme plan</td>
</tr>
<tr>
<td><strong>PNAC</strong></td>
<td>Incorporates existing and additional policies, measures and associated instruments which the government will use to meet its Kyoto target. Biofuels use is promoted principally via a guaranteed market supported by feed-in tariffs and direct subsidies</td>
</tr>
</tbody>
</table>
### 9. Instruments applicable for AFV projects in Italy

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Application in Italy</th>
</tr>
</thead>
</table>
| Carbon tax | Inaugurated in 1999 and fully phased-in since 2005  
Applies to all energy products via tax rates on fossil fuels |
| Tax Reduction for Fuels with Lower Environmental Impact | Established In 2000  
Reduced excise tax (€ 289.2 per 1 000 litres) for cleaner fuels (e.g. bio-ethanol)  
Exempts clean fuels from excise taxes up to 0.1 Mt/year  
Law of 30.12.2004, no. 311, grants biodiesel full exemption from excise tax, within a limit of 0.2 Mt/year, over a five-year period starting on 01.01.2005 |
<p>| Voluntary Climate Pact | In 1998, industry organisations concluded an agreement with the government, agreeing to limit CO₂ emissions; to improve energy efficiency in the industrial, energy &amp; transport sectors; and promote the use of renewable energy. This pact serves as a framework for specific voluntary agreements with individual signatories. The projects include measures to promote energy efficiency and the use of renewable energy as well as plans for the development of biofuels made by vegetable oils. |
| Fund for GHG Emissions Red., Energy Efficiency and Sust. Energy | Promotes energy efficiency and use of sustainable energy sources. The fund was to be financed from 3% of the receipts accruing to the carbon tax law. |
| CIPE 2000 | CIPE resolution of 2000 promotes deployment of biomass to replace fossil fuels through incentive systems. Affects mainly the agricultural, transport &amp; energy sector. |
| Financial Law of 8 Dec. 1995 No. 549 (Fuel Taxes) | The Financial law, effective from 1996, finances renewable energy projects and energy conservation projects through excise levies on petrol. This law additionally allowed the regions to impose a regional tax on petrol and natural gas. |
| Law Dec. No. | Adoption of Directive 2003/30/EC. Set up of national |</p>
<table>
<thead>
<tr>
<th>Date</th>
<th>Law/Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>128 of 2005</td>
<td>Targets for biofuel consumption as a percentage of the total transport fossil fuels, to be measured in terms of energy content: 1% by 2005 and 2.5% by 2010.</td>
<td></td>
</tr>
<tr>
<td>March 2006, Law No. 81</td>
<td>Starting from July 2006 diesel and petrol fuels suppliers were required to achieve 1% share, in terms of low heating value, of biofuels within the total amount of fuel they placed on the market in the previous year. This percentage is increased of 1% each year up to 2010.</td>
<td></td>
</tr>
</tbody>
</table>
| December 2006, Budget Law 2007 | Modification of targets set up in the Law Decree n. 128:  
- 1% by December 2005  
- 2.5% by December 2008  
- 5.75% by December 2010  

Modification of targets set up in Law n.81 of March 2006:  
- 1% by 2007  
- 2% by 2008  

The Budget Law 2007 set: 250000 tons/year of biodiesel with an excise duty that is 20% of the one imposed to diesel; starting from January 2007 the excise duty for ETBE is 0.29892 Euro/litre in the amounts fixed by the Budget Law 2005; starting from January 2008 the excise duty for ETBE and bioethanol is 0.29892 Euro/litre, for additives derived from biomass to be added to petrol is 0.28922 Euro/litre and for additives derived from biomass to be added to diesel is 0.24532 Euro/litre. Starting from 2007 pure vegetal oil to be used in the agricultural sector is excise duty exempted up to a maximum amount of 1 million Euros. The biodiesel with excise duty reduction is to be blended at a maximum 5% in diesel.  

In 2007 diesel and petrol fuels suppliers are required to achieve 1% share, in terms of low heating value, of biofuels within the total amount of fuel they placed on the market in the previous year. This percentage is fixed as 2% for 2008. |

**PROCURA RESULTS & REPORTS ON THIS TOPIC:**

D6.1 Fleet Scan Reports with fleet owners, application of tools  
D7.1 Fleet Scan Reports of 15 bus fleets in Poland  
WP3 Additional Document on Procurement Models  
D3.4 Greenlease Concepts
4. How can my fleet contribute to emission reduction

EU Transport Emissions

In 2004, almost 26% of all fossil fuels consumed were used for transportation purposes. This accounted for nearly 58% of the world’s oil consumption and little over 5% of the world’s gas consumption (IEA, 2006). Nearly all the energy used in the European transport sector comes from oil (Commission of the European Communities, 2006). As a result, this sector is responsible for approximately 21% of EU greenhouse gas emissions. Moreover, the emissions of the transport sector have increased constantly during the last years. This makes the transport sector an important candidate for emission reductions.

The use of alternative fuels for transport, such as biofuels, liquid natural gas (LNG), compressed natural gas (CNG) and hydrogen is considered an opportunity to reduce the emission of greenhouse gasses in the transport sector as well as its dependence on imported fuels. For 2010 and 2020, objectives of 5.75% and 20% substitution of conventional fuels by alternative fuels in the road transport sector have been proposed. (European Union, 2003)

The use of biofuels and natural gas may also be seen as an intermediate step to prepare the EU economy for other alternatives in the transport sector, which are not yet mature (Commission of the European Communities, 2006).

The transport sector is responsible for approximately 21% of EU greenhouse gas, which makes it an important candidate for emission reductions. The use of alternative fuels for transport is considered an opportunity to reduce the emission of greenhouse gasses in the transport sector, as well as its dependence on imported fuels. In order to catalyse the diffusion of alternative fuels and the related technology, the European Union has started several international projects concerning the implementation of Alternative Fuel Vehicles (AFVs).
10. CO2 Emissions per Sector (EU25, million tonnes CO2)$^2$

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Power &amp; Heat Generation</th>
<th>Industry</th>
<th>Households</th>
<th>Services, etc.</th>
<th>Transport:</th>
<th>of which</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Road</td>
</tr>
<tr>
<td>1990</td>
<td>3790</td>
<td>1493</td>
<td>728</td>
<td>489</td>
<td>289</td>
<td>790</td>
<td>672</td>
</tr>
<tr>
<td>1991</td>
<td>3810</td>
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<td>534</td>
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<td>1460</td>
<td>648</td>
<td>493</td>
<td>281</td>
<td>824</td>
<td>703</td>
</tr>
<tr>
<td>1993</td>
<td>3646</td>
<td>1400</td>
<td>627</td>
<td>503</td>
<td>276</td>
<td>840</td>
<td>715</td>
</tr>
<tr>
<td>1994</td>
<td>3608</td>
<td>1406</td>
<td>621</td>
<td>471</td>
<td>265</td>
<td>845</td>
<td>717</td>
</tr>
<tr>
<td>1995</td>
<td>3647</td>
<td>1408</td>
<td>638</td>
<td>474</td>
<td>270</td>
<td>857</td>
<td>726</td>
</tr>
<tr>
<td>1996</td>
<td>3752</td>
<td>1431</td>
<td>634</td>
<td>514</td>
<td>287</td>
<td>885</td>
<td>749</td>
</tr>
<tr>
<td>1997</td>
<td>3684</td>
<td>1391</td>
<td>635</td>
<td>489</td>
<td>266</td>
<td>904</td>
<td>763</td>
</tr>
<tr>
<td>1998</td>
<td>3710</td>
<td>1418</td>
<td>610</td>
<td>478</td>
<td>265</td>
<td>939</td>
<td>789</td>
</tr>
<tr>
<td>1999</td>
<td>3671</td>
<td>1400</td>
<td>578</td>
<td>467</td>
<td>257</td>
<td>968</td>
<td>812</td>
</tr>
<tr>
<td>2000</td>
<td>3692</td>
<td>1425</td>
<td>596</td>
<td>452</td>
<td>247</td>
<td>972</td>
<td>812</td>
</tr>
<tr>
<td>2001</td>
<td>3754</td>
<td>1444</td>
<td>593</td>
<td>481</td>
<td>257</td>
<td>979</td>
<td>825</td>
</tr>
<tr>
<td>2002</td>
<td>3770</td>
<td>1481</td>
<td>598</td>
<td>457</td>
<td>246</td>
<td>988</td>
<td>836</td>
</tr>
<tr>
<td>2003</td>
<td>3845</td>
<td>1517</td>
<td>591</td>
<td>472</td>
<td>263</td>
<td>1002</td>
<td>844</td>
</tr>
<tr>
<td>2004</td>
<td>3863</td>
<td>1512</td>
<td>599</td>
<td>470</td>
<td>262</td>
<td>1021</td>
<td>859</td>
</tr>
</tbody>
</table>

The Procura partners NTDA Energía and Ecofys have developed a fleet scan tool that offers the possibility to depict the economic consequences implied with a vehicle exchange towards green vehicles.

The PROCURA tool aims at supporting the integration of environmental issues in overall large-scale vehicle procurement.

The PROCURA fleet scan tool serves as guideline, providing a calculation of economic and ecological benefits or drawbacks for a fleet owner who anticipates a vehicle exchange within his fleet.

The motivation to use this tool may differ from user to user as it supports in procurement decision in various aspects. They may:

- Look for a way to improve the performance of his fleet with respect to a specific emission rate (CO2, PM10, NOx)
- Try to present the fleet in a more modern and sustainable way
- Try to align their fleet with a new policy
- Investigate the options to decrease maintenance costs (such as fuel costs)
- The environmental figures which are calculated in this tool include the CO2 emission, PM10 emission and NOx emission.

Any fleet change to a different fuel has cost and environmental consequences. The tool creates four alternative fuel scenarios and one reference scenario to benchmark these consequences in economic and environmental figures. To make clear that the alternative fuel scenarios are based on short term possibilities and figures, the purchase of new cars is foreseen only in the next three years from 2006 (if a certain car type is depreciated within the next three years).

The database allows the user to make general calculations by creating a fleet with overall characteristics, i.e. using the “General big size passenger car” or “General small passenger car” vehicles in the calculations. However, the user can concretise the calculations by selecting specific vehicle brands and types, e.g. Mercedes Sprinter 314 WB355 and thus receive results which are customised to his fleet. Overall the tool distinguishes between Transport buses, Trucks, Vans and Passenger Cars (small / medium / large).

All in all, this tool allows fleet owners to examine potential economic as well as environmental benefits and challenges possible through a vehicle exchange within an existing fleet.
Why is this tool useful?

The economic and environmental tool shows the short term possibilities (available on local scale) to reduce emissions of a fleet by changing to alternative fuels as well as the monetary impact of a vehicle exchange.

11. Analysis process implemented in the software

Each scenario consists of a set of vehicles that is separated by the current car fleet and new cars bought in the future. In most scenarios the current fleet does not change until it is entirely depreciated. However, in the Biodiesel and PPO scenario, vehicles can be adapted to run on these fuel types and need specific modifications. These modifications can be done on the existing fleet and immediately. The fleet itself would not change, but the emissions will be different up from the modification time and the fuel change to Biodiesel.

The following annual figures are calculated per car type:

- Depreciation costs based on catalogue price, company depreciation term and interest rate (std. 5%)
- Insurance cost (std. 3.5% of purchase price)
- Maintenance cost (based on fuel type and car type: truck/delivery van/passenger) plus additional maintenance costs per Km
- Road taxes (dependent of country region)
- Fuel consumption (for fuels in L/100km and for CNG and Biogas in Kg/100km) and costs (based on current fuel prices, company discounts taken into account) exclusive of BTW
- CO₂, NOx, and PM₁₀ Emissions

The scope of this tool takes into account the usual amount of kilometres per year and the amount and type of cars continued as usual according to the depreciation term of all cars for a period of five years. However, it also considers vehicles which the fleet owner already anticipates / plans to procure in the near future.

12. Welcome Screen Fleet Scan Tool: country selection & customising

The tool is designed as a collectively applicable fleet-scan-tool to be used within all EU countries. Yet, in order to make the calculations more customised to different national situations some national data has to be inserted before using the tool.
Any fleet change to a different fuel has cost and environmental consequences. The tool creates four alternative fuel scenarios and one reference scenario to benchmark these consequences in economic and environmental figures.

As an **outcome of the tool**, the user is presented with tables regarding his fleet results on:

- Annual costs (including depreciation) per fuel type
- Annual additional costs compared to reference scenario
- Fuel cost advantage for each scenario regarding annual kilometres
- Cost distribution: top = fuel, maintenance, insurance, bottom = road tax
- Annual emissions of CO$_2$
- Annual emissions of PM$_{10}$
- Annual emissions of NO$_x$

In the outcome tables and diagrams of this tool, the reference (base case) scenario is always presented with a red line, whereas coloured lines stand for the alternative fuel scenarios.
14. Benefit of Alternative Fuel vs Benzine/Diesel (x 1000€)

15. Diagram of results Fleet Scan Tool: Annual PM10 emissions (kg)
Fleet Scan Experiences within the PROCURA report

16. Italian example for the outcome of a fleet scan

Fleet Scan conducted by ETA for ATAF

<table>
<thead>
<tr>
<th>Type of fleet owner:</th>
<th>ATAF, public transport company, in this case only vehicles used for internal logistics were analysed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary of existing fleet</td>
<td>18 vehicles of which 88% are running on Petrol and 12% on Diesel; Average annual mileage per vehicle is 18.936 kilometres; One single vehicle type (passenger car); Average fuel consumption is 6.2 l/100Km; Vehicles have been purchased from 1993 to 2002; Depreciation Term for all vehicles is 10 years; Emission performance of this fleet:</td>
</tr>
<tr>
<td></td>
<td>- CO2: 50 Ton/year</td>
</tr>
<tr>
<td></td>
<td>- PM10: 3 Kg/year</td>
</tr>
<tr>
<td></td>
<td>- NOx: 54 Kg/year</td>
</tr>
<tr>
<td>Results for CNG scenario (replacing fleet vehicles with CNG factory made vehicles)</td>
<td>The principal benefit in a CNG-fleet operation is the fuel cost savings of 1500€ per year resulting from the price difference between gasoline/diesel and natural gas:</td>
</tr>
<tr>
<td></td>
<td>- lower price of CNG vehicles and fuel;</td>
</tr>
<tr>
<td></td>
<td>- lower fuel consumption for CNG;</td>
</tr>
<tr>
<td></td>
<td>- lower operating cost of CNG vehicles;</td>
</tr>
<tr>
<td></td>
<td>- depreciation term for the new vehicles purchase</td>
</tr>
<tr>
<td></td>
<td>The environmental consequences of a fleet exchange are reduced pollutant emissions compared to petrol / diesel emissions:</td>
</tr>
<tr>
<td></td>
<td>- CO2 - 43%</td>
</tr>
<tr>
<td></td>
<td>- PM10: - 53%</td>
</tr>
<tr>
<td></td>
<td>- NOx: - 51%</td>
</tr>
<tr>
<td>Results for</td>
<td>A change to FFV for this particular fleet would result in</td>
</tr>
</tbody>
</table>
| bioethanol (E85) scenario (replacing all fleet vehicle with FFV factory made vehicles) | an economic loss of 20.000€ per year due to: higher price of flexi-fuel vehicles and fuel price for E85;; higher fuel consumption for E85; higher operating cost of E85 vehicles; depreciation term for the new vehicles purchase The environmental consequences of a fleet exchange are reduced pollutant emissions compared to petrol / diesel emissions:  
- CO₂: - 38%  
- PM10: - 25%  
- NOx: - 12% |
|---|---|
| Results for biodiesel (B50) scenario | A change of the fleet vehicles to B50 results in an economic benefit of 1900€ per year compared to the existing fleet. It should be noted that B50 has positive performance attributes such as increased cetane, high fuel lubricity, and high oxygen content, which may make it a preferred blending stock with future ultra-clean diesel. The environmental consequences of a fleet exchange are increased pollutant emissions compared to petrol / diesel emissions: higher pollution of Biodiesel (especially compared to petrol); bigger size of the replacing engines The output shows negative results (compared to petrol / diesel emissions) except for CO₂ emissions:  
- CO₂: - 19%  
- PM10: +200%  
- NOx: +300% |
| Conclusion for this fleet | In the case of ATAF the fleet scan shows that only a change to a CNG fleet would result in economic as well as environmental benefits for them. |
### 17. Fleet Scan Example from the Netherlands

**Fleet Scan conducted by Ecofys for the Taxi Company Van Dijk (Nijmegen)**

<table>
<thead>
<tr>
<th>Type of fleet owner:</th>
<th>Taxi Company</th>
</tr>
</thead>
</table>
| Summary of existing fleet | 78 vehicles: diesel driven passenger cars  
Annual traveling distance for the total fleet is 3,040,000 km  
Emission: Annually approximately 780 tons of CO2, 130 kilogram’s PM10 and 2500 kilogram’s NOx |
| Motivation of the fleet scan | The municipality of Nijmegen has an ambition to introduce natural gas in its region as transport fuel, including a network of commercialized fuelling stations and a growing number of cars driving on Compressed Natural gas (CNG).  
Taxi van Dijk is interested in the probabilities that CNG has to offer as an alternative transport fuel when it is used in their car fleet. As a result of this interest a fleet scan has been done |
| Environmental Results of the scan | From the fleet scan it becomes clear that the use of CNG can lead to:  
- CO2 emission reduction of 25%  
- PM10 emission reduction of 68%  
- NOx emission reduction of 68%  
When these emission reductions can be reached is among others dependent on the vehicle replacement rate, used by Taxi van Dijk. |
| Economic Results of the scan | The total investments necessary are ± € 6,700,000 till 2015 or ± € 1,000,000 per year. By replacing the vehicles an annual cost reduction of approximately € 37,000 is achieved. |
| Reaction from this fleet owner | Change of an existing order from two conventional Mercedes Sprinters to two CNG Sprinters |
# AFV Procurement experience

The following example is a practical case from the project CIVITAS – Cleaner and better transport in cities, that illustrate the AFV implementation in Graz (http://www.civitas-initiative.org).

## 18. Procurement Example: Biodiesel Bus Fleet in Graz

### Biodiesel example: B100 bus fleet in Graz

<table>
<thead>
<tr>
<th><strong>Summary</strong></th>
<th>The Graz public transport company operates all of its ca. 120 busses on 100% biodiesel. A large part of this fuel is provided by processed used cooking oil.</th>
</tr>
</thead>
</table>
| **Objectives** | - To convert the entire public transport bus fleet of Graz to biodiesel;  
- To reduce environmental impacts from public transport system;  
- To enhance the image of public transport  
- To support the collection of used cooking oil |
| **Unique factor** | Graz was (2006) the only city in Europe operating on 100% biodiesel for the entire fleet |
| **Procedure** | Collection of used cooking oil (UCO), which then is converted into Biodiesel. This Biodiesel long with biodiesel produced from rape seeds provide the fuel for the bus fleet. The local public transport company (GVB) carried out technical, ecological and economical trials of 100% biodiesel operation. When these trials were successful the bus fleet was converted to biodiesel operation. In winter additives are added and the biodiesel is blended with ~ 30% fossil diesel. Biodiesel filling stations were installed. |
| **Success Factor** | The Biodiesel of this project is fuel tax exempt. |
| **Outcome** | Lower pollution level as all busses (120) operate now on 100% biodiesel.  
Regular monitoring of fuel quality (supported by the local university) and of the engines and engine components. |

**PROCURA RESULTS & REPORTS ON THIS TOPIC:**

D3.3 Economic & Environmental Fleet Scan Tool  
D6.1 Fleet Scan Reports with fleet owners, application of tools  
D7.1 Fleet Scan Reports of 15 bus fleets in Poland
5. Hitting the roads: AFV specification and fuel characteristics

General aspects to consider when switching to AFVs

Once a fleet owner considers the procurement of any alternative fuelled vehicle he has to consult a number of technical details in order to see which fuel would be the best choice for his particular fleet given the infrastructure and maintenance available within the fleet owners region.

This guide gives an overview of the technical, as well as maintenance and safety issues for biodiesel, bioethanol and CNG used as alternative fuels.

Apart from the technical and safety issues, the fleet owner has to be aware of all existing market barriers which he might encounter when changing his vehicle fleet partially or entirely to an alternative fuel vehicle fleet.

In general terms, the main market barriers encountered for the end users by the PROCURA project, can be linked to the following key aspects:

- fuel to be adopted
- infrastructure required
- vehicle technology required (performance, lack of knowledge, maintenance increase in the operational and maintenance costs, reliability and autonomy)
- availability and cost
- regulations, guarantee, tax incentives
- public acceptance
- low second hand value for the vehicle

19. Market Barriers of AFVs categorized by buyer type

<table>
<thead>
<tr>
<th>Private buyers</th>
<th>Final investment, Status, Reliability on a new technology, Fuelling options, Driving range, Risk of a low second hand value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company vehicles</td>
<td>Same as Private buyers Necessary supporting schemes Residual value of the vehicle</td>
</tr>
<tr>
<td>Car manufacturers</td>
<td>Incentives and policies implemented have to stable over time and Critical mass</td>
</tr>
<tr>
<td>Public fleet vehicles</td>
<td>A long-term, politically supported strategy is needed Lack of governments policy permanence</td>
</tr>
</tbody>
</table>
**Biodiesel (B100)**

Biodiesel (mono-alkyl-esters) is a vegetable oil-based fuel, made from vegetable oil (straight or waste, rapeseed and soybean oil are the most commonly used) or animal fat. It runs in almost unmodified diesel engines - cars, buses, trucks, construction equipment, boats, generators, and oil home heating units.

**Advantages**

- Renewable bio-based fuel with lower life cycle CO_2_ emissions compared with diesel (from mineral oils). B5 reduces CO_2 by 2 to 2.5%. B100, 100% biodiesel, reduces net CO_2 emissions by 50-60%.
- It contains almost zero sulphur and no aromatics
- It is biodegradable and non toxic
- As an oxygenated compound, it reduces the non-soluble fraction of the particulates
- It has a relatively high flash point which improves safety in fuel handling
- Vehicles need minor technical changes to be prepared to use Biodiesel
- Required similar infrastructure as Diesel and blending can be performed either locally or upstream by the fuel supplier
- Vehicles prepared for Biodiesel also can run with standard Diesel eliminating infrastructure lack problem, duplicating the spoilage system and definition of the percentage of Biodiesel used in the blend

**Barriers**

- Lack of certified vehicles in the market that accept B5 up to B100 without restrictions
- Biodiesel certification problems because it may be obtained by different raw materials
- Vehicle equipment must be adapted to B100 use (engine modifications) to improve efficiency and achieve some fuel consumption savings
- Biodiesel price
- Particular climate conditions (i.e. cold climates), requires a suitable blend as well as proper storage and to clean fuel storage tanks prior to filling
- The heating values difference between B100 and diesel is ~8.65% leading to higher fuel consumption on a volume basis (liter/100 Km)
- B30 can be used in existing diesel engines without modifications. There are concerns about the interaction of higher percentage blends with fuel injection system which can limit their durability. In France B5 mixtures (up to 5%, by volume, of Biodiesel) are currently in use for private vehicles. France also uses B30 to B50 mixtures in public transport captive fleets. In Germany and Austria, Biodiesel is sold in several hundred filling stations, being used in public transport and industrial fleets.
Vehicle Characteristics

Biodiesel vehicles are similar to conventional ones, but need to be slightly adapted to use B100 (minor engines modifications to improve efficiency and save fuel due to biodiesel properties (viscosity and biodegradability may affect the operation of the fuel injection system). In terms of official compatibility, despite the majority of diesel vehicles on the road being fine on B100, only a small number of companies will officially approve their vehicles for B100 use.

Guidelines for Maintenance of Biodiesel Vehicles

- Replace the fuel filter when changing to biodiesel after a long period in which mineral oil diesel only has been used.
- Surfaces which come into contact the biodiesel should be wiped clean immediately as also for conventional diesel;
- If used in non-approved vehicles, some rubber and synthetic materials can be damaged under certain circumstances after longer usage.
- Biodiesel (B100) freezes at higher temperatures than most conventional diesel fuel. Most B100 starts to cloud at between 2ºC and 16ºC, so heated fuel lines and tanks may be needed even in moderate climates.
- As biodiesel begins to gel, the viscosity also begins to rise, and it rises to levels much higher than most diesel fuel, which can cause increased stress on fuel pumps and fuel injection systems.

The oil change intervals should be upheld as specified by the manufacturer. Regarding the employed engine oil, it is possible that the engine oil of utility vehicles will become diluted with fuel, but only when the engine runs at low loads for longer periods.

Re-equipping program for biodiesel vehicles

A) Reequipping of fuel system
   a. Emptying of fuel tank
   b. Insert 0-ring fuel filter 34 x 3
   c. Renew fuel filter cartridge with seating ring
   d. Exchange fuel pipe within the area of the injection pump
   e. Euro 2 loader engines: Exchange EHAB, EURO 1 Loader engines/EURO 0/1 Suction engines: Renew oil leakage pipes

B) Reequipping of exhaust system
   a. Remove exhaust pipe and silencer
   b. Dismantle exhaust aperture, drill rivets
   c. Remove end silencer
   d. Insert oxidation catalyser
   e. Insert exhaust pipe without back silencer
   f. Bolt exhaust aperture on

C) Checking
   a. Check fuel system for tightness
   b. Check exhaust system for tightness
Filling Procedure for a vehicle running on biodiesel

Fuelling practices for biodiesel blends of B20 or less are identical to normal diesel fuelling. Also identical are the essential components, including storage tanks and dispensers, found at conventional diesel fuelling stations. Like any petroleum fuelling station, a biodiesel station should be equipped with an emergency shutdown system. Drivers and attendants should receive formal training on how to use the system.

Several items must be observed in the practical use of biodiesel to guarantee permanently smooth operation:

- It may be necessary to change the fuel filter when changing to biodiesel after a only mineral oil diesel has been used for a long period of time. Because biodiesel acts as a solvent, residues of the diesel fuel can be released and block the filter;
- For the same reason, surfaces which come into contact the biodiesel should be wiped clean immediately as also for conventional diesel;
- If biodiesel is used in non-approved vehicles, some rubber and synthetic materials can be damaged under certain circumstances after longer usage. For example, it is possible that fuel hoses will swell. This can be remedied by using the approved materials. An authorised garage can provide information on the type of the employed materials. A regular inspection of the fuel system and replacement of the affected materials can be conducted quickly and economically;
- The oil change intervals should be upheld as specified by the manufacturer. Regarding the employed engine oil, it is possible that the engine oil of utility vehicles will become diluted with fuel. However, this only usually occurs when the engine runs at low loads for longer periods.

If a biodiesel fire occurs, do not attempt to disconnect the nozzle from the vehicle. Evacuate the immediate area; trigger the emergency safety device and contact the fire department. A biodiesel fire can be extinguished by dry chemical, foam; halon, CO₂ and water spray (fog). Pay attention to the fact that a water stream may splash the burning liquid and spread fire. For cooling purposes a fire water spray may be used.

Biodiesel soaked rags or spill absorbents (i.e. oil dry, polypropylene socks, sand, etc.) can cause spontaneous combustion if stored near combustibles and not handled properly. These should be stored in approved safety containers and dispose of properly. Oil soaked rags may be washed with soap and water and allowed to dry in well ventilated area. Fire-fighters should use self-contained breathing apparatus to avoid exposure to smoke and vapour.
Bioethanol (E85)

Bioethanol is a renewable liquid fuel produced from the fermentation and distillation of agricultural raw materials (mainly sugar and starch, such as sugar beet, cereals, potatoes and fruits) which are high in carbohydrates. It can be used alone or be mixed with gasoline. E85 refers to the fuel mix of 85% bioethanol and 25% gasoline.

Advantages

- Biodegradable and less toxic than fossil fuels
- It can be produced locally, reducing the need of imported energy for transport and increasing security of supply
- Offers net greenhouse gas emission reductions (50-60% reduction for E100 made from both sugar beet and wheat and approximately 2.5-3% for E5 on a “life-cycle” basis compared with conventional fossil fuels)
- Reduces tailpipe emissions (exact performance of ethanol varies depending on the type of petrol vehicle and fuel specification)
- Ethanol FlexiFuel vehicles require little or no additional cost (solving problems such as the need for producing and marketing different vehicles running with gasoline or ethanol)
- Fuel infrastructure of E85 is 10 times cheaper than f.e. CNG stations
- Second generation bioethanol eliminates the Food for Fuel arguments, and offers a cheap feedstock (waste based ethanol for example being produced in Valencia, Finland, etc)
- FFV technology is a very low cost alternative fuel vehicle technology allowing a volume solution to the environment issue
- Main advantage of ethanol is reduction in net greenhouse gas. For E100 the reductions are typically 50-60% on a “life-cycle” basis compared with conventional fossil fuels. Benefits deriving from the use of blends are less, i.e. E5 blends bring approximately 2.5-3% net reductions.

Barriers

- Lack of AFV versions for both light and heavy duty vehicles
- Certain materials commonly used with gasoline are incompatible with Ethanol
- Poor refuelling infrastructure in Europe (with the exception of Sweden), as well as the need of some financial support to purchase fully Ethanol-compatible tanks, accessories and ancillary equipment.
- Production costs are influenced by the high cost of agricultural raw material
- To produce the same amount of power as gasoline about 1,4 times the volume of Ethanol is needed.
**Vehicle Characteristics**

Ethanol *FlexiFuel* vehicles are very similar to conventional ones, except for materials used in the fuel management and engine calibration systems, as FFV components have to be made of stainless steel, for example. Engine and vehicle manufacturers have approved blends of up to 10% ethanol for use in their vehicles.

**20. Concept scheme of an ethanol FFV vehicle**

![Concept scheme of an ethanol FFV vehicle](image)

Because of the modified components in the fuel system and on the engine, vehicles which can be operated on ethanol may require more frequent servicing.

**21. Guidelines for Maintenance of Ethanol Vehicles**

<table>
<thead>
<tr>
<th>After 10000 Km or at the latest 1 year:</th>
<th>Renew engine oil and filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 000 Km</td>
<td>Check of Valve clearance (intake &amp; exhaust)</td>
</tr>
<tr>
<td></td>
<td>Valve clearance above 0.2 mm proceed to the next 60 000 Km service check</td>
</tr>
<tr>
<td></td>
<td>Valve clearance below 0.2 mm, then proceed to relash the valve clearance:</td>
</tr>
<tr>
<td></td>
<td>- Exhaust valve clearance between 0.3 mm and 0.36 mm (high limit preferred);</td>
</tr>
<tr>
<td></td>
<td>- Intake valve clearance to between 0.25 mm and 0.31 mm (high limit preferred).</td>
</tr>
</tbody>
</table>
### 22. Service Schedule Ford Focus 2004 (1.8 DURATEC – HE/FFV)

#### Taking the vehicle to the garage
- **Instrument display, warning & control lights, horn**: Check functioning
- **Clutch**: Check functioning/adjust, if applicable
- **Window wiper, window cleaner**: Check functioning/adjust, if applicable

#### Under the vehicle
- **Engine**: Drain the oil and substitute the oil filter
- **Break system**: With the tires on, check if the breaks are worn out

#### Outside the vehicle
- **Engine**: Change engine’s oil
- **Maintenance warnings**: Put the sticker on the driver’s side

#### Extension of the maintenance
- **Break system**: Every two years: change break’s oil
- **Air conditioner**: Every three years: check evaporator’s exit tube temperature. Check for damages or leaks on air conditioner’s tubes
- **Cooling system**: Every ten years: drain, wash and fill with purple Super Plus
- **Accessories strings**: Change every 200000 Km or ten years, which happens first

#### Supplementary services and additional offers (optional)
- **Maintenance service package**: Check/rectify the window washer’s liquid, check if the tire repairing kit and emergency equipment are complete and valid
<table>
<thead>
<tr>
<th>Light service package</th>
<th>Check all the inner and outer lights. Check the headlights level and rectify if necessary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner filter substitution</td>
<td>Check the pollen/odour filters</td>
</tr>
<tr>
<td>Air conditioner maintenance package</td>
<td>Check the air conditioner system. Apply cleaning product on the air distribution system</td>
</tr>
</tbody>
</table>

**Filling Procedure for a vehicle running on a bioethanol / gasoline mix**

During storage and handling it is essential to ensure proper ventilation. If the general ventilation is not sufficient, mechanical ventilation or local exhaust ventilation should be used. Ethanol should be kept away from sources of ignition (smoking, welding, flames or sparks), and sparks’ formation due to static electricity have to be prevented. During the loading and unloading appropriate grounding and electrical connection should exist, and explosion proof electrical equipment have to be used.

In the event of an E85 fire, do not attempt to disconnect the nozzle from the vehicle. Evacuate the immediate area, trigger the emergency safety device, and contact the fire department. Powder or carbon dioxide extinguisher or water spray should be used. The container can be cooled using a diffuse spray of water. Ethanol vapours can form explosive mixtures with air at temperatures below room temperature. The clothes contaminated with ethanol are considered a fire hazard.
Compressed Natural Gas (CNG)

Natural gas is a gaseous fossil fuel composed of about 90% methane (CH$_4$), with the remainder comprising of propane, butane and other components (composition may vary according to the source of the natural gas). Biogas and biomethane will be considered in the context of natural gas technologies.

**Advantages**

- Natural gas vehicles are generally very clean in terms of their air quality emissions.
- Near-zero particulate emissions compared with diesel.
- Natural gas produces less CO2 per unit of energy released due to the lower ratio of carbon to hydrogen within its molecular structure even though diesel engines are more efficient.

**Barriers**

- Lack of natural gas vehicles. Long-term government incentives are necessary to expand their market share.
- Need to have trained and competent technicians at the refuelling station.
- Lack of refuelling stations.
- Cost of fuelling station.
- Filling time (depending on fuelling station technology).
- Availability of fuel.
- Vehicle additional cost.
- Depending on type of operation, reduced autonomy can be an obstacle (not a problem for bi-fuel vehicles).
- Availability of space in the vehicle for the gas in passenger cars and light duty vehicles.
- For heavy duty vehicles it exists only dedicated vehicles with limited availability.

**Vehicle Characteristics**

Natural gas can be used to fuel almost any kind of vehicle: motorcycles and three wheelers, cars, vans, pickups, lift trucks, buses, trucks, trains, boats, even aircraft. The availability of vehicles or conversion equipment varies greatly from country to country depending on local conditions. This fuel is most commonly stored on board vehicles in high pressure cylinders, available in a number of different types, weights and sizes to suit different applications.
<table>
<thead>
<tr>
<th>Maintenance Type</th>
<th>CNG Vehicles</th>
<th>Gasoline Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scheduled maintenance</strong> (average for vehicle type)</td>
<td>$2354</td>
<td>$3454</td>
</tr>
<tr>
<td><strong>Unscheduled maintenance</strong> (average – with accidents)</td>
<td>$1628</td>
<td>$1499</td>
</tr>
<tr>
<td><strong>Unscheduled maintenance</strong> (average – without accidents)</td>
<td>$519</td>
<td>$769</td>
</tr>
<tr>
<td><strong>Non-mechanical repairs</strong> (average for vehicle type)</td>
<td>$711</td>
<td>$634</td>
</tr>
<tr>
<td><strong>Other costs</strong> (average for vehicle type)</td>
<td>$46</td>
<td>$123</td>
</tr>
<tr>
<td>Total maintenance and repair (average – without accidents)</td>
<td>$3630</td>
<td>$4979</td>
</tr>
<tr>
<td>Total maintenance and repair: cents per mile (average – without accidents)</td>
<td>3.39</td>
<td>3.95</td>
</tr>
</tbody>
</table>

The basic difference between a CNG vehicle and a conventional one lays on the feeding and supply system. The feeding system comprises an independent supply source, a CNG tank, a pressure decrease device, a control unit and, in the case of a bi-fuel vehicle, a selection button CNG/gasoline.
## 24. Onboard CNG storage system

<table>
<thead>
<tr>
<th>Location of cylinders</th>
<th>Capacity/Autonomy</th>
<th>More information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Light duty vehicles</strong></td>
<td>In the rear of the vehicle</td>
<td>20 Nm³ / ~400 km</td>
</tr>
<tr>
<td><strong>Heavy duty vehicles</strong></td>
<td>On top of the vehicle</td>
<td>150 to 200 m³ at 200 bar/ 200 to 350 km (depending on the number of cylinders installed)</td>
</tr>
</tbody>
</table>

### Materials

<table>
<thead>
<tr>
<th>Material</th>
<th>More information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Storage cylinders</strong></td>
<td>Usually made of carbon steel</td>
</tr>
</tbody>
</table>

## 25. Maintenance measures for diesel and natural gas buses

<table>
<thead>
<tr>
<th>Maintenance Measure</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Changing of motor oil</strong></td>
<td>Manufacturer's recommendation: 30,000 km; expected for the future: 45,000 km. No special motor oil required</td>
</tr>
<tr>
<td><strong>Valve adjustment</strong></td>
<td>Manufacturer's recommendation: 15,000 km (Only necessary for the first motor generation.)</td>
</tr>
<tr>
<td><strong>Changing of spark plugs</strong></td>
<td>Manufacturer's recommendation: 15,000 km</td>
</tr>
</tbody>
</table>
Filling procedure for the filling of a CNG vehicle

1. Open the fuel door and remove the protective cap on the vehicle fuel receptacle;
2. Remove the fuelling nozzle from the dispenser;
3. Inspect the fuelling hose and nozzle for damage;
4. Place the nozzle on the receptacle and pull back to ensure it is secure;
5. Turn the fuelling valve handle on the nozzle to the “open” position;
6. Swipe the fuelling card through the card reader;
7. Turn the dispenser fuelling handle to the “on” position;
8. After the fuel stops flowing, turn the dispenser fuelling handle to the “off” position;
9. Turn the fuelling valve handle on the nozzle to the “vent” position;
10. Remove the nozzle from the receptacle and place it back on the dispenser and replace the protective cap on the vehicle fuel receptacle.

Purchase prices for natural gas vehicles are somewhat higher than for similar conventional vehicles (between 5 to 15%). The auto manufacturers' typical price premium for a light-duty CNG vehicle can be $1 500 (1 199 Euro) to $6 000 (4 797 Euro), and for heavy-duty trucks and buses it is in the range of $30 000 (23 977 Euro) to $50 000 (39 967 Euro) (U.S values). In addition, fleets may need to purchase service and diagnostic equipment if access to commercial CNG vehicle maintenance facilities is not available.

CNG historically costs about 30% to 50% less than gasoline, which varies by country and continent. As a reference, it is possible to say that on July 2005, the price was about $1.78 per gasoline gallon (0.37 Euro/litre), for CNG used as a motor fuel (U.S values).

Vehicle Availability

In the PROCURA project, safety data sheets for Biodiesel, Bioethanol and Natural Gas have been gathered in together in Deliverable 2.4, including physical and chemical properties, first aid measures, fire fighting measures, handling and storage.
### 26. World-wide NGV availability

<table>
<thead>
<tr>
<th>Country</th>
<th>Total vehicle Nº</th>
<th>Total road vehicles</th>
<th>LD cars, vans, trucks</th>
<th>MD/HD Bus’s</th>
<th>MD/HD Trucks</th>
<th>Other vehicles</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>40255</td>
<td>40220</td>
<td>40000</td>
<td>200</td>
<td>20</td>
<td>35</td>
<td>1,91%</td>
</tr>
<tr>
<td>Italy</td>
<td>580000</td>
<td>580000</td>
<td>576500</td>
<td>2334</td>
<td>1166</td>
<td></td>
<td>1,48%</td>
</tr>
<tr>
<td>Sweden</td>
<td>15474</td>
<td>15474</td>
<td>14278</td>
<td>808</td>
<td>388</td>
<td></td>
<td>0,33%</td>
</tr>
<tr>
<td>Germany</td>
<td>64454</td>
<td>63964</td>
<td>62520</td>
<td>1444</td>
<td>490</td>
<td></td>
<td>0,13%</td>
</tr>
<tr>
<td>Austria</td>
<td>2980</td>
<td>2980</td>
<td>2950</td>
<td>25</td>
<td>5</td>
<td></td>
<td>0,07%</td>
</tr>
<tr>
<td>France</td>
<td>10150</td>
<td>10150</td>
<td>7500</td>
<td>2000</td>
<td>650</td>
<td></td>
<td>0,03%</td>
</tr>
<tr>
<td>Latvia</td>
<td>500</td>
<td>227</td>
<td>30</td>
<td>10</td>
<td>187</td>
<td>273</td>
<td>0,03%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>1153</td>
<td>1130</td>
<td>880</td>
<td>215</td>
<td>35</td>
<td>23</td>
<td>0,03%</td>
</tr>
<tr>
<td>Slovakia</td>
<td>337</td>
<td>337</td>
<td>102</td>
<td>220</td>
<td>15</td>
<td></td>
<td>0,02%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>858</td>
<td>850</td>
<td>740</td>
<td>95</td>
<td>15</td>
<td>8</td>
<td>0,01%</td>
</tr>
<tr>
<td>Poland</td>
<td>1470</td>
<td>1470</td>
<td>800</td>
<td>240</td>
<td>430</td>
<td></td>
<td>0,01%</td>
</tr>
<tr>
<td>Finland</td>
<td>250</td>
<td>250</td>
<td>145</td>
<td>95</td>
<td>10</td>
<td></td>
<td>0,01%</td>
</tr>
<tr>
<td>Greece</td>
<td>416</td>
<td>416</td>
<td>416</td>
<td></td>
<td></td>
<td></td>
<td>0,01%</td>
</tr>
<tr>
<td>Spain</td>
<td>1846</td>
<td>1803</td>
<td>200</td>
<td>845</td>
<td>758</td>
<td>43</td>
<td>0,01%</td>
</tr>
<tr>
<td>Portugal</td>
<td>379</td>
<td>379</td>
<td>36</td>
<td>314</td>
<td>29</td>
<td></td>
<td>0,01%</td>
</tr>
<tr>
<td>Belgium</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td></td>
<td></td>
<td></td>
<td>0,01%</td>
</tr>
<tr>
<td>Ireland</td>
<td>81</td>
<td>81</td>
<td>81</td>
<td></td>
<td></td>
<td></td>
<td>0,004%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>368</td>
<td>368</td>
<td>63</td>
<td>5</td>
<td>300</td>
<td></td>
<td>0,001%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>721515</strong></td>
<td><strong>720643</strong></td>
<td><strong>707236</strong></td>
<td><strong>9399</strong></td>
<td><strong>4008</strong></td>
<td><strong>872</strong></td>
<td><strong>0,91%</strong></td>
</tr>
</tbody>
</table>

**PROCURA RESULTS & REPORTS ON THIS TOPIC:**

- D 2.1 Market Barriers of large-scale Alternative Fuel Vehicles Procurement;
- D 2.3 Training Guidelines for Maintenance and Support of AFVs
- D 2.4 User manuals for fleet owners concerning AFVs
6. Hitting the roads: Infrastructure build up

Fuel Production

Biodiesel Production

The following table shows the feedstock, conversion and distribution cost for the production of biodiesel. The data is taken from EUBIA – European Biomass Industry Association, year 2004 and can be used as an indication. However, the price development should be checked regularly as this information is very volatile.

27. Average biodiesel production costs in the EU-25

<table>
<thead>
<tr>
<th></th>
<th>Rapeseed based</th>
<th>Sunflower based</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>€/L</td>
<td>€/GJ</td>
</tr>
<tr>
<td><strong>Net feedstock cost</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Feedstock</td>
<td>0.570</td>
<td>16.8</td>
</tr>
<tr>
<td>- Co-product credit</td>
<td>0.011</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Subtotal feedstock cost</strong></td>
<td>0.559</td>
<td>16.4</td>
</tr>
<tr>
<td>Conversion costs</td>
<td>0.070</td>
<td>2.1</td>
</tr>
<tr>
<td>Blending costs (incl. adaptation)</td>
<td>0.010</td>
<td>0.3</td>
</tr>
<tr>
<td>Distribution costs</td>
<td>0.100</td>
<td>2.9</td>
</tr>
<tr>
<td><strong>Total costs at petrol station</strong></td>
<td>0.739</td>
<td>21.7</td>
</tr>
</tbody>
</table>
Below diagram shows the different elements of the fuel production and transport chain along the main steps of the Biodiesel fuel production chain.

28. Main steps of biodiesel production and distribution chain

- Source of Bio Oil
  - Animal Fat
  - Vegetal Cropped
  - Used Oil

- Temporary Storage Tank & Transport to Distribution

- Reception and First Cleaning
  - Filter and temporary storage

- Production of the Biodiesel
  - Ethanol
  - Glycerine

- By yourself

- External partner

- Storage Temporary With
  - Station Fuelling

- B50, ..... B10, B20 Percentage desirable Mixing at the

- supplier External
  - Fossil Fuel

- Final use on the vehicles

Developed within the Fuelling Station Structure or transported already mixed
Bioethanol Production

The following table shows the feedstock, conversion and distribution costs for the case of bioethanol production. The data is taken from EUBIA – European Biomass Industry Association, year 2004 and can be used as an indication. However, the price development should be checked regularly as this information is very volatile.

29. Bioethanol production costs in the EU-25 + Bulgaria, Romania

<table>
<thead>
<tr>
<th></th>
<th>Wheat based</th>
<th></th>
<th>Beet based</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>€/L</td>
<td>€/GJ</td>
<td>€/toe</td>
<td>€/L</td>
</tr>
<tr>
<td><strong>Net feedstock cost</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Feedstock</td>
<td>0.40</td>
<td>18.9</td>
<td>790</td>
<td>0.26</td>
</tr>
<tr>
<td>- Co-product credit</td>
<td>0.15</td>
<td>7.1</td>
<td>296</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Subtotal feedstock cost</strong></td>
<td>0.25</td>
<td>11.8</td>
<td>493</td>
<td>0.23</td>
</tr>
<tr>
<td><strong>Conversion costs</strong></td>
<td>0.28</td>
<td>13.3</td>
<td>553</td>
<td>0.22</td>
</tr>
<tr>
<td><strong>Blending costs (incl.)</strong></td>
<td>0.05</td>
<td>2.4</td>
<td>99</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Distribution costs</strong></td>
<td>0.01</td>
<td>0.5</td>
<td>20</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Total costs at petrol</strong></td>
<td>0.59</td>
<td>27.9</td>
<td></td>
<td>0.6</td>
</tr>
</tbody>
</table>

Many different elements come together in the ethanol fuel production and transport chain. Its main steps are presented in the following diagram.
In common with biodiesel, the climate change benefits will depend on the feedstock used for ethanol production. The 50-60% greenhouse gas emissions savings on a life cycle basis are from ethanol made from both sugar beet and wheat. If cellulose materials are used, then the net greenhouse gas savings can be greater – perhaps as much as 75-80%. It is the low energy inputs to cellulose crop production and more efficient / renewable based processes that are the key to reducing emissions.

Ethanol can also reduce emissions of some tailpipe emissions from road vehicles, although the exact performance of ethanol can vary depending on the type of petrol vehicle and specification of fuel.
Natural Gas Production

In order to better understand the different elements of the fuel production and transport chain the main steps of the Natural Gas production chain were drawn in below diagram:

31. Main elements of CNG production and distribution chain

- Production
  - Refining
    - Compression
      - Liquefaction
        - Transport by: Pipeline, Boat
          - Might include: Local storage system, Re compression stations, An international phase

- Direct to Captive fleet
  - Local Distribution System
    - Gas Gateway could include: Local storage, Liquification
  - Fast Fill System
    - Combination of both
      - Slow fill System
        - Fuelling Stations
  - Final Use On the Vehicles
Fuel Quality Obligations

Biodiesel Quality

No matter where and by which path biodiesel is produced, eventually it has to meet the common international standard for Biodiesel (EN 14214), which requirements can be seen in below table.

32. European Norm EN14214 (Biodiesel)

<table>
<thead>
<tr>
<th>Properties</th>
<th>Units</th>
<th>Min.</th>
<th>Max.</th>
<th>Test methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density at 15°C</td>
<td>kg/m³</td>
<td>860</td>
<td>900</td>
<td>EN ISO 3675, EN ISO 12185</td>
</tr>
<tr>
<td>Cetane number</td>
<td></td>
<td>51,00</td>
<td>-</td>
<td>EN ISO 5165</td>
</tr>
<tr>
<td>Kinematic viscosity at 40°C</td>
<td>mm²/s</td>
<td>3,50</td>
<td>5,00</td>
<td>EN ISO 3104</td>
</tr>
<tr>
<td>Flash point</td>
<td>°C</td>
<td>101</td>
<td>-</td>
<td>ISO / CD 3679</td>
</tr>
<tr>
<td>Carbon residue (on 10% distillation residue)</td>
<td>% wt.</td>
<td>-</td>
<td>0,30</td>
<td>EN ISO 10370</td>
</tr>
<tr>
<td>Oxidation stability at 110°C</td>
<td>hrs</td>
<td>6</td>
<td>-</td>
<td>pr EN 1412</td>
</tr>
<tr>
<td>Copper strip corrosion (3h at 50°C)</td>
<td>rating</td>
<td>Class 1</td>
<td></td>
<td>EN ISO 2160</td>
</tr>
<tr>
<td>Esters</td>
<td>% wt.</td>
<td>96,50</td>
<td>-</td>
<td>EN 14103</td>
</tr>
<tr>
<td>Water</td>
<td>mg/kg</td>
<td>-</td>
<td>500</td>
<td>EN ISO 12937</td>
</tr>
<tr>
<td>Sulphated ash</td>
<td>% wt.</td>
<td>-</td>
<td>0,02</td>
<td>ISO 3987</td>
</tr>
<tr>
<td>Sulphur</td>
<td>mg/kg</td>
<td>-</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>Acid value</td>
<td>mg KOH/g</td>
<td>-</td>
<td>0,50</td>
<td>pr EN 14104</td>
</tr>
<tr>
<td>Iodine value</td>
<td>-</td>
<td>-</td>
<td>120</td>
<td>pr EN 14111</td>
</tr>
</tbody>
</table>
Bioethanol Quality

With the aim of using ethanol, one can consider two main options, pure and mixed with other fuels. Both forms have its barriers and European Standards have to be observed, as follows:

1. Ethanol with a water content of approximately 5% - E95 for use in diesel engines (compression ignition engines):
   a. Technically can be added up to 15% in volume (so called E-Diesel), but it is limited up to 5% in volume (or must not be called diesel).

2. Water-free (anhydrous) ethanol, with 15% added gasoline - E85 for use in gasoline (Otto/spark-ignition engines):
   a. Technically can be added up to 20% in volume, but due to European Committee for Standardisation based on the “Fuel directive” EN228, it is limited up to 5% in volume (or must not be called gasoline).

For ethanol the pr EN15376 will be published soon. This will set ethanol standard as a blending component up to 5% (v/v) in EN228 gasoline. The
specific requirements that ethanol has to fulfil in order to be considered a quality product are defined in below table:

### 33. European Norm EN15376 (Ethanol)

<table>
<thead>
<tr>
<th>Properties</th>
<th>Units</th>
<th>Min.</th>
<th>Max.</th>
<th>Test methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol (incl. higher saturated alcohols)</td>
<td>% wt.</td>
<td>98,70</td>
<td>-</td>
<td>EC/2870/2000 method I</td>
</tr>
<tr>
<td>Higher saturated monoalcohols (C3-C5)</td>
<td>% wt.</td>
<td>-</td>
<td>2,0</td>
<td>EC/2870/2000 method III</td>
</tr>
<tr>
<td>Methanol</td>
<td>% wt.</td>
<td>-</td>
<td>1,0</td>
<td>EC/2870/2000 method III</td>
</tr>
<tr>
<td>Water</td>
<td>% wt.</td>
<td>-</td>
<td>3,0</td>
<td>EN 15489</td>
</tr>
<tr>
<td>Inorganic chloride</td>
<td>mg/l</td>
<td>-</td>
<td>20,0</td>
<td>EN 15484</td>
</tr>
<tr>
<td>Copper</td>
<td>mg/kg</td>
<td>-</td>
<td>0,1</td>
<td>EN 15488</td>
</tr>
<tr>
<td>Total acidity (as acetic acid)</td>
<td>% wt.</td>
<td>-</td>
<td>0,007</td>
<td>EN 15491</td>
</tr>
<tr>
<td>Appearance</td>
<td>-</td>
<td>Clear and bright</td>
<td>Visual inspection</td>
<td></td>
</tr>
<tr>
<td>Phosphorous</td>
<td>mg/l</td>
<td>-</td>
<td>0,5</td>
<td>EN 15487</td>
</tr>
<tr>
<td>Involatile material</td>
<td>mg/100 ml</td>
<td>-</td>
<td>10,0</td>
<td>EC/2870/2000 method II</td>
</tr>
<tr>
<td>Sulphur</td>
<td>mg/kg</td>
<td>-</td>
<td>10,0</td>
<td>EN 15485, EN 15486</td>
</tr>
</tbody>
</table>

**Natural Gas Quality**

The fuel quality of Natural Gas is defined and assured by the **ISO 15403** Natural gas - Designation of the quality of natural gas for use as compressed fuel for vehicles.
Technology and Associated Infrastructure Requirements

Biodiesel Infrastructure and safety issues

A private station may have a facility layout plan on file informing about:
- Biodiesel storage tank locations;
- Emergency equipment switches;
- Fire extinguishers;
- Street address of the facility and pre-planned evacuation routes;
- Designated assembly areas

Biodiesel fuelling station safety practices are essentially the same as those for a conventional petroleum fuelling station. They include:
- Posting safety signs, including emergency telephone numbers for police, fire department, emergency medical help, maintenance and adjoining facilities;
- Regularly inspecting all equipment, including dispenser hoses, fuelling nozzles, and receptacles (report and stop using defective equipment immediately);
- Keeping ignition sources away from the fuel (this means no match lighting or cigarette smoking on the premises);
- Refraining from re-entering a vehicle during fuelling.

Supervisors should draft an emergency action plan, and regularly discuss it with staff. The plan should include notification procedures, evacuation procedures, the operation of safety systems and emergency action items.

34. Biodiesel storage aboveground
### 35. Information on biodiesel storage & infrastructure

<table>
<thead>
<tr>
<th></th>
<th>Materials</th>
<th>Avoid</th>
<th>Extra info</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STORAGE TANK</strong></td>
<td>Aluminium, steel, fluorinated polyethylene, fluorinated polypropylene and Teflon</td>
<td>Copper, brass, lead, tin and zinc</td>
<td>Keep tank at temperature between 10°C-49°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Same regulations for above-ground and underground diesel fuel tanks apply</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Clean tanks every 2 years</td>
</tr>
<tr>
<td><strong>PIPELINES</strong></td>
<td>Steel (black or galvanized), fibreglass or plastic suitable for fuel use</td>
<td>Nonferrous heavy metal (copper, brass, bronze) or zinc coated materials</td>
<td>All the joints have to be tested for leaks, Teflon tape can be used as a thread sealant</td>
</tr>
<tr>
<td><strong>FUEL DISPENSER</strong></td>
<td>Same dispensers used for diesel fuel can be used for biodiesel</td>
<td>Elastomers</td>
<td>The hose and the pistol of the petrol pump have to be made of resistant biodiesel materials</td>
</tr>
</tbody>
</table>

### 36. Subterranean Biodiesel storage

**Storing containers, subterranean**

1. Container
2. Dome cover
2a. Sealing ring
3. Dome shaft
4. Stop valve for control liquid
5. Container for control liquid
6a. Max. filling level 97% of the volume (if earth cover is less than 0.8 m, then max. filling level is 95%)
6b. Min. filling level: corresponding to the building of the suction pipe

![Diagram of subterranean biodiesel storage](image-url)
Bioethanol Infrastructure and safety issues

Although ethanol can be used in unmodified diesel cycle engines up to 10% Ethanol – E-diesel, it is more commonly used in Otto cycle (spark ignited) engines to replace several percentages of gasoline.

For a higher content of ethanol, dedicated or flex fuel vehicles (FFVs) must be used. FFVs have the advantages of flexibility of choice when filling the tank since FFVs can use any fuel from pure gasoline to E85 (85% ethanol content), less engine degradation, increased engine performance in cold weather and less corrosion.

Ethanol can be used pure and mixed with other fuels, as follows:

- Ethanol with a water content of approximately 5% - E95 for use in diesel engines (compression ignition engines): technically can be added up to 15% in volume (so called E-Diesel), but it is limited up to 5% in volume (or must not be called diesel).
- Water-free (anhydrous) ethanol, with 15% added gasoline - E85 for use in gasoline (Otto/spark-ignition engines): technically can be added up to 20% in volume, but due to European Committee for Standardisation based on the “Fuel directive” EN 228, it is limited up to 5% in volume (or must not be called gasoline).

Like any fuelling station, an E85 station should be equipped with an emergency shutdown system and should have a facility layout plan on file that includes:

- Locations of fuel storage tanks, pumps, and dispensers;
- Locations of the emergency shutdown device and fire extinguishers;
- Pre-planned evacuation routes;
- Descriptions of adjoining facilities;
- Designated assembly areas and
- Street address of the facility.
- Every fuelling station should have an emergency action plan. The plan should first identify what constitutes an emergency including the following aspects:
  - Specific evacuation procedures;
  - The phone numbers of local police, fire, and maintenance departments and medical providers and
  - Descriptions of safety systems and practices.
### 37. Information on bioethanol storage & infrastructure

<table>
<thead>
<tr>
<th>Materials</th>
<th>To avoid</th>
<th>More info</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Storage tanks</strong></td>
<td>Metallic materials compatible with ethanol are unplated steel, stainless steel, black iron and bronze. Compatible non-metallic materials are reinforced fibreglass, thermoplastic piping, neoprene rubber, polypropylene, Viton and Teflon materials</td>
<td>Zinc, brass, lead, aluminium ternary (lead-tin-alloy)-plated and steel lead-based solder. Non-metallic materials such as natural rubber, polyurethane, cork gasket material, leather, polyvinyl chloride (PVC), polyamides, methyl-methacrylate plastics and certain thermo plastics.</td>
</tr>
<tr>
<td><strong>Underground piping</strong></td>
<td>Non-metallic corrosion free materials. Pipes thread sealant must be made of Teflon tape or Teflon based pipe-thread compound.</td>
<td>Conventional zinc-plated steel</td>
</tr>
<tr>
<td><strong>Fuel dispensers</strong></td>
<td>All fittings, connectors, and adapters in contact with the fuel blend should be made of materials like stainless steel, black iron, or bronze</td>
<td>Aluminium or brass fittings must be nickel plated</td>
</tr>
</tbody>
</table>
38. **E85 (bioethanol) dispensing equipment**

39. **E85 (bioethanol) Underground Storage System**

**Figure 3. Typical E85 Underground Storage System**

- Dispenser
- Dispenser details are found in Figure 4
- Ground level
- Vapor Recovery Stage 2 only
- Supply Line
- Storage Tank
- Dip Stick Access
- Submersible Turbine Pump
- Fill Tube
- Spill Container
- Manhole Covers
- Top Seal Cap
- Top Seal Adapter
- Vapor Vent
- Overfill Prevention Lab
- Vent Line
- 12'
### Natural Gas Infrastructure and safety issues

Natural gas can be used in Otto cycle engines as gasoline replacement.

#### 40. Information on CNG infrastructure requirements

<table>
<thead>
<tr>
<th>FILLING STATION</th>
<th>Components</th>
<th>Gas inlet, dryer, compressor, storage &amp; dispenser. Modern stations include credit card readers and should have an emergency shutdown device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types</td>
<td>Fast fill station</td>
<td>Pressurized fuel is stored in tanks continually refilled by compressors. Require 'cascade storage'. Large fleets or public customers</td>
</tr>
<tr>
<td></td>
<td>Slow fill station</td>
<td>The fuel is fed directly from the compressor to the vehicle's on-board storage cylinder. Less space is required for equipment and lower up-front and maintenance costs. Extended fuelling period Typically serves small fleets</td>
</tr>
<tr>
<td>Design criteria</td>
<td></td>
<td>Station capacity, sizing, refueling profile (per 24h max), type of NGV, suction pressure (NG grid), gas quality, available power capacity on location, sound emission level on location, land availability (at least 300m²), and expected fleet increase over some years, f.e. 10 years. Distance to other buildings outside the station should be not less than 5m, though some local regulations asked for more distance. Generally, the noise level should not exceed 65dB(A) in 1m distance to the outside of the compressor building. In urban areas the level has to be lower. Compressors of the filling station must be dimensioned accordingly to the type of fleet. A public filling station should have at least two compressors, in case one of them fails.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DISPENSER NOZZLES</th>
<th>Public fuelling</th>
<th>In a adapted Filling Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleet fuelling</td>
<td></td>
<td>For larger vehicles (buses) which require more and faster volume</td>
</tr>
</tbody>
</table>

| Piping CNG | Stainless steel seamless tubing | Must be capable of four times the rated service pressure without failure |
41. Complete CNG systems – Slow Fill (Home & Fleet Filling)
## International Standards for CNG infrastructure

<table>
<thead>
<tr>
<th>ISO Reference</th>
<th>Deals with …</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO ISO/DIS 11439:2000</td>
<td>Gas cylinders -- High pressure cylinders for on-board storage of natural gas as a fuel for automotive vehicles</td>
</tr>
<tr>
<td>ISO 15500-1</td>
<td>CNG Fuel System Components: Part 1 - General requirement and definitions</td>
</tr>
<tr>
<td>ISO 15500-2</td>
<td>CNG Fuel System Components: Part 2 - Performances and general test methods</td>
</tr>
<tr>
<td>ISO 15500-3</td>
<td>CNG Fuel System Components: Part 3 - Check valve</td>
</tr>
<tr>
<td>ISO 15500-4</td>
<td>CNG Fuel System Components: Part 4 - Manual valve</td>
</tr>
<tr>
<td>ISO 15500-6</td>
<td>CNG Fuel System Components: Part 6 - Automatic valve</td>
</tr>
<tr>
<td>ISO 15500-8</td>
<td>CNG Fuel System Components: Part 8 - Pressure indicator</td>
</tr>
<tr>
<td>ISO 15500-9</td>
<td>CNG Fuel System Components: Part 9 - Pressure regulator</td>
</tr>
<tr>
<td>ISO 15500-10</td>
<td>CNG Fuel System Components: Part 10 - Gas flow adjustor</td>
</tr>
<tr>
<td>ISO 15500-11</td>
<td>CNG Fuel System Components: Part 11 - Gas/air mixer</td>
</tr>
<tr>
<td>ISO 15500-12</td>
<td>CNG Fuel System Components: Part 12 - Pressure relief valve</td>
</tr>
<tr>
<td>ISO 15500-13</td>
<td>CNG Fuel System Components: Part 13 - Pressure relief valve</td>
</tr>
<tr>
<td>ISO 15500-14</td>
<td>CNG Fuel System Components: Part 14 - Excess flow valve</td>
</tr>
<tr>
<td>ISO 15500-15</td>
<td>CNG Fuel System Components: Part 15 - Gas tight housing and ventilation hose</td>
</tr>
<tr>
<td>ISO 15500-16</td>
<td>CNG Fuel System Components: Part 16 - Rigid fuel line</td>
</tr>
<tr>
<td>ISO 15500-17</td>
<td>CNG Fuel System Components: Part 17 - Flexible fuel line</td>
</tr>
<tr>
<td>ISO 15500-18</td>
<td>CNG Fuel System Components: Part 18 – Filter</td>
</tr>
<tr>
<td>ISO 15500-19</td>
<td>CNG Fuel System Components: Part 19 – Fittings</td>
</tr>
<tr>
<td>ISO/DIS 15501-1</td>
<td>Road vehicles - CNG fuelling systems, Part 1: Safety requirements</td>
</tr>
<tr>
<td>ISO/DIS 15501-2</td>
<td>Road vehicles - CNG fuelling systems, Part 2: Test methods</td>
</tr>
</tbody>
</table>
The underlying financial concept of procurement schemes and the creation of infrastructure can be the decisive success factor or showstopper of an entire procurement plan as well as the viability of installed biofuels infrastructure. Therefore, a financial concept which can be applied to a certain procurement case or the biofuels infrastructure creation and which generates a win/win situation for all participants can be highly beneficial.

A developed infrastructure for alternative fuel vehicles (AFVs) is vital for the successful market penetration of AFVs within Europe. This infrastructure incorporates everything an owner of an AFV may have to rely on:

- Fuelling stations, which give access to alternative fuels
- Maintenance facilities, which are experienced with AFVs
- Repair facilities, which are experienced with AFVs
- Availability of AFVs

Part of the support of the development of infrastructure should be dedicated to financing mechanisms which facilitate the financing of companies which are engaged in the AFV field. These companies may be alternative energy producer, energy provider, alternative energy transport companies or companies which offer maintenance and repair facilities for AFVs.

The European Investment Bank (EIB) and the EU budget of 2007 – 2013 generate approximately twenty billion Euros in bank lending with the intention of supporting the transport infrastructure. Moreover, programmes like JASPERS (Joint Assistance to Support Projects in European Regions) facilitate the creation of projects, which support infrastructure development.³

The use of biofuels demands a thoroughly developed infrastructure allowing access for individual drivers to filling stations as well as to maintenance services. Therefore it is important to stimulate the development of all facilities along the value chain (i.e. biofuels production, logistics, fuel provider, maintenance and disposal) at the same time. Moreover, the installation of new infrastructure should go along with high effort to inform the general public of these new possibilities and fuels.

During the design phase preceding the set-up of a biofuels infrastructure in a city or a region, the placement of the first filling stations is of great significance. Filling stations should be placed on main roads used to enter or leave the city so that commuters have easy access to them. Moreover, it should be taken into account that large fleet operators are close-by in order to persuade them of a vehicle change.

³ Mid-term review of the European Commission’s 2001 Transport White Paper, p. 17
An alliance with local dealers of alternative fuel vehicles is beneficial for both sides as the dealer is dependent on presenting an existing infrastructure to his customers and the alternative fuelling station proprietor gains visibility and popularity among alternative fuel consumers. In the ideal case, the dealer hands out directions and characteristics of the alternative fuel filling station to his customers along with the purchase documents.

Cost of Filling Stations

Biodiesel Filling Stations

The existent filling stations and tanks can be used for biodiesel with only small modifications. The cleaning of a conventional diesel tank may be sufficient.

Regarding the prices, a set of 1 000 litres costs about 1 500 Euro, a set of 5 000 litres about 5 000 Euro and a set of 10 000 litres about 7 500 Euro (Ecofys).

Bioethanol Filling Stations

The economic minimum capacity of an ethanol plant is at 300,000 litres per day (=100,000 tons per year) in Europe; provided that energy cost are favourable it may be 100,000 litres per day in other regions.

Decisive factors for the plant location are short transport routes for raw material and product and availability of energy (preferable biomass = CO₂ reduction).

The investment for a 300,000 litre per day facility is around 40 to 50 million euros, this is however depending on infrastructure. With permits on hand planning and construction takes 18 - 24 months..

Ethanol facilities cost will, of course, vary depending on the circumstances that apply to each particular establishment and on national, regional and local legislation. To establish a new complete station for ethanol refuelling, including a 50 m³ tank, cost around 42 000 Euro (Swedish values). In the case of a 20 m³ tank the cost would be about 32 000 Euro. Treating the inside of an existing tank so that it can be used for ethanol costs about 7 400 Euro for a 50 m³ tank and about 4 800 Euro for a 20 m³ tank. Exchanging the connection between tank and pump costs about 26 Euro per meter, excluding the necessary digging. A new dispenser costs about 5 000 Euro.

The cost of upgrading an existing dispenser for E85 is approximately $2 500 (1 996 Euro). The installation of a new ethanol facility can range from $10 000 (7 985 Euro) to $60 000 (47 914 Euro), U.S values.
Natural Gas Filling Stations

The size of a CNG refuelling station has strong influence on the economics of the station. A small station has a higher investment cost per Nm³ of CNG than a large station. However, the station can only be economic if there is a maximum use of the station (over 80%). Therefore, in the calculations the user profile is an important input.

As reference values, below are presented some costs for the needed equipment (all regarding to the German price scale).

**Equipment Costs (all these are budget prices ± 10%)**:

**Compressor Delivery**:
- 150 Nm³/h: € 100-150 000,-
- 350 Nm³/h: € 150-250 000,-
- 500 Nm³/h: € 250-350 000,-
- 750 Nm³/h: € 350-450 000,-

**Storage**
- Bottle Storage per m³ Volume: € 7 000,-
- Tube Storage per m³ Volume: € 12 000,-

**Dispenser**
- One Hose, one meter: € 22 000,-
- Two Hose, one meter: € 30 000,-
- Two Hose, two meter: € 38 000,-

**Infrastructure**
- Foundations: Local
- Price per m² Paving: Local
- Steel Structure: Local

**Power and Gas**
- Power connection: Local
- Transformer Unit: Local
- Gas grid connection: Local

**PROCURA RESULTS & REPORTS ON THIS TOPIC:**

D.2.2 Manual for infrastructure development for AFVs
D.5.2 Assessment of the main drivers for biofuel
D8.1 New financial instruments in the Valencia Region supporting the development of infrastructure and acquisition of AFVs
7. Hitting the roads: Smart incentives, procurement models

The concept of regional Public Private Partnerships

The concept of a working partnership between the private sector and public bodies for the development and operation of environmental and transport infrastructure is well established and today regional public-private partnerships are common practice in delivering services. Many regions have already established such partnerships and achieved a great deal in delivering infrastructure – such as roads or buildings, or services. One interesting example for a PPP in the field of AFVs is the partnership called “S.I.En.A. project”. This PPP started in 2007 with the aim of the construction of a pilot production chain of biodiesel from sunflower and puts together many partners both from the public authorities (Tuscany Region, Province of Siena) as well from the private sector (farmers, transformation industries and final users).

All the steps of the production row (agricultural phase, extraction, esterification and final use) are entirely closed in a small area (the Province of Siena, Tuscany).

This partnership is extremely important for the developing of an AFVs market at regional scale in Italy because the local scale production row makes the national biofuel more sustainable.

Procurement Stimulation of Alternative Fuel Vehicles

In order to increase the market demand of an early market, the grouping of buyer pools is advantageous. Buyer pools allow reaching economies of scale even if the single product price is still high above the average market price. Another aspect which favours the early market development of a new technology is an increased access to leasing facilities. When thinking about the AFV market stimulation it is important that new intentions and actions don´t separate this market from the traditional vehicle market as this would obstruct the real market development. Instead AFVs should be presented as additions to the existing market.

The public procurement takes a significant share of the overall procurement in vehicles. Thus, it could be interesting to engage public entities in new procurement schemes as often and intense as possible.

New technologies need a reliable political framework in order to attract consumers on a long-term basis. As a result, it is important to engage in standardization and harmonization of European policies in the support of the AFV market.
From a governmental perspective there are different possibilities to stimulate the procurement of alternative fuels as well as of alternative fuel vehicles on a local level.

**Fiscal Measures:**
- Use of duty exemption and reductions on mineral oils which may be used for any pure or blended biofuels to decrease end-user price, e.g. the fuel price which end-user pays at a filling station. The exemption may be based on a quota or can be a simple refund.
- Use of an exemption CO\textsubscript{2} tax on energy products which will decrease the cost disadvantage of biofuels
- Local Tax benefits for the use of certain fuels

**Communication Measures**
- Public Awareness Programmes initiated by the public (government) or market partners (manufacturer, fuel provider)

**Public Measures**
- Involvement in subsidised research and development as well as demonstration projects
- Public initiative to open tenders for the supply of alternative fuel vehicles
- Local Governments could substitute their public fleets (i.e. police fleet, ambulances) with alternative fuel vehicles

**Policy Measures**
- Establishment of EU, National, Regional or local obligation to substitute a certain percentage of traditional fuelled vehicles (or vehicles which exceed a certain emission per unit) for alternative fuelled vehicles

**Market Measures**
- Establishment of voluntary agreements, e.g. vehicle manufactures agree to increase their production efforts in vehicles with lower emissions

Commonly the measure of Excise duty is used most frequently related to the stimulation of the biofuels market. Furthermore, the national R&D programmes are of significance. The following table gives an overview of measures applied in Europe and identifies the countries which are implementing them.
### 43. Policy Measures for Market Stimulation in EU Member States

| Policy Measure                        | AT | CY | CZ | DK | EE | FI | FR | DE | GR | HU | IE | LV | LT | MT | NL | PT | SK | ES | SE | UK | TOTAL |
|---------------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|
| Excise Duty                           | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | 14   |
| CO₂ Tax Exemption                     | x  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 1    |
| Reduction of Benefit                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | x  | 1    |
| R&D programmes                        | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | x  | 10   |
| Substitution obligation               | x  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 1    |
| Quality Needs                         |    | x  | x  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 2    |
| Public Awareness                      |    |    |    |    |    | x  |    |    |    |    |    |    |    |    |    |    |    | x  | x  | 3    |
| Voluntary Agreements                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | x  |    |    | 1    |
| Technology Procurements               |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | x  | 1    |
| Greening of Gov. Fleets               |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | x  | 1    |
| ECAs                                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | x  | 1    |
| State Aid                             | x  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 1    |
44. Buyer’s Pools and different incentive levels suitable for all EU Member States

Local Level
Incentive schemes:
- Free parking
- Zoning
- Etc.

National/EU Level
Incentives: taxes, exemptions, levies,
- Regulation and traffic tools
- Economical and financing tools

Suppliers
Fuel, Maintenance, Vehicles, etc.

Buyer’s Pool

Successful AFV Purchase Process

45. Instruments (National & EU) stimulating the increase of alternative fuels

<table>
<thead>
<tr>
<th>Incentive</th>
<th>Corresponding criteria and objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon/Energy fuels taxes</td>
<td>To control diesel and petrol consumption by encouraging consumers to use less energy and choose more environmentally friendly energy sources. This measure affects a large proportion of society (industrial, domestic and commercial users) and may reduce significantly pollutants (CO2, CO, NOx, SOx). Energy taxes can be quickly implemented, and they would reduce biofuels prices down in comparison to fossil fuels.</td>
</tr>
<tr>
<td>Exempt taxes for biofuels</td>
<td>To erase tax policies for using biofuels blended. This will eliminate economic barriers and compensate the higher cost of using renewables while increasing competitiveness and market penetration of biofuels. But it may create price distortions with other fuel markets. Member States updates of Directive 2003/30/EC can be found in <a href="http://www.ebb-eu.org/legislation.php">http://www.ebb-eu.org/legislation.php</a>.</td>
</tr>
</tbody>
</table>
| **Vehicle Taxation** | Reduction on registration fees and road taxes for cleaner vehicles while non-clean vehicle are penalized (compulsory payment, insurance taxes, VAT, road tolls, etc.)

**Actual Taxation vs. Proposed Taxation**

Taxes associated with the acquisition, purchase or registration of a vehicle (VAT and registration taxes, RT) *vs.* Establishment of a RT refund system totally or partially CO2 based

Taxes payable in connection with possession of a vehicle (annual circulation taxes, ACT) *vs.* Restructuring the tax base of ACT to be totally or partially CO2 based

Taxes directly or indirectly related to the use of vehicles (fuel taxes (FT), road tolls, insurance taxes, road user charges, …) *vs.* Exempt taxes for biofuels |
| **Capital/Consumer grants** | Government would cover part of the investment costs in renewable energy with grants, facilitating investment in biofuels and improving its competitiveness relatively to conventional ones. |
| ** Tradable Certificates** | Certificates on biofuels to trade renewable energy attribute separately from the physical electricity product. The creation of a market for carbon places a monetary value on external benefits of reducing GHG emissions, and renewable energy certificates provide a mechanism to track and register renewable fuel production.

EFOA- The European Fuel Oxygenates Association
http://www.efoa.org/index.html

FEDIOL- Oil & Proteinmeal Industry http://www.fediol.be/ |
Plan of action on CNG introduction in a municipal car fleet

Several steps have to be taken before AFVs are procured by an organisation, company or municipality. But which steps have to be taken? To answer this question, the main core aspects of the municipal action plan are outlined as an example:

- Define a clear and long term ambition about sustainability, which includes the goal of setting a good example for others and to procure in a sustainable way.
- Get knowledge of alternative fuel vehicles and its the environmental effects and its costs and define the best alternative for the current fleet.
- Make sure you have internal support of other fleet owners and the end users in the organisation, so involve them.
- Based on the obtained information, let the Board make a decision for the introduction of AFVs.
- Make sure all the fleet owners in the internal organisation are familiar with the Boards decision and the need for implementation.
- Get a clear view of the current fleet: who will replace a vehicle and when? Can the car be replaced by an AFV? Will the budget meets the demands?
- In case of any questions, there has to be someone in the organisation who can give the fleet owners some advice about the procurement of AFVs.
- Agree on where to refill the vehicles and where to repair & maintain them.
- Make sure that the department which will invest in AFVs will get the financial profits in case the alternative fuel is cheaper than the diesel. (In some organisations, the profits will disappear in the overall costs. It will be a good incentives if the fleet owner himself can profit of the procurement of AFVs).
- In case the organisation is involved in public tenders: set some requirements and terms about the use of AFVs in these tenders.
- Communicate the fact that the organisation has procured AFVs and why. That way, other organisations and companies will get inspired to procure AFVs as well.
- Last but not least: Once procured and having some experiences with AFVs evaluate the vehicles, the procurement process and the implementation process. Which lessons can be learned for procurements in the future?
Procurement Schemes

Fleet owner may choose to either purchase, lease or rent vehicles in order to create a fleet. When discussing different payment options it is important to distinguish between incremental costs and overall product costs. Incremental costs of a product include the following sub-costs for any additional unit of a product related to:

- material
- manufacturing
- labour
- packaging
- royalty
- distribution

Additionally to these costs, calculations based on overall product costs include the costs related to

- research
- development
- advertising
- interest on working capital
- capital invested in facilities used for manufacturing, research, marketing, administration or any other activity
- depreciation and maintenance costs of above mentioned facilities and any element of profit.

AFV Procurement schemes are Purchase models which may be applied to the acquisition of alternative fuel vehicles. Whenever new and untraditional financial schemes are employed, it is important that the national as well as European regulations are consulted as national codes and standards as well as specific national taxes may prevent the successful implementation of a financing scheme.

Progress Payment – Bus procurement (or many AFV units)

Traditionally the lead-time, i.e. the duration between the order of a bus and the actual delivery may be a significant amount of time (one-to-two years). Likewise the payment for such an order traditionally takes the form of a lump sum payment after the delivery has taken place. As a result to this payment the bus manufacturer may be forced to issue a short-term loan in order to finance the manufacture expenses. The interest rates of this loan are generally passed on to the buyer in form of an increased selling price.

This traditional payment concept has the advantage of security for the purchaser. Despite this advantage, both entities would benefit from a decreased price. If they come to an understanding that the purchaser pays progressively along the manufacturing process, e.g. along the expenses which the manufacturer has to bear, then a short-loan may be not required and the manufacturer has no reason to increase the selling price. This Progress
Payment concept would mean that the purchaser pays for the completion of individual components whenever these components have been fully manufactured.

As a payback for the period payment, the purchaser receives a decreased price. Hence, the manufacturer only has to finance the manufacturing process for limited (and significantly shorter) time spans and thus saves the money currently spend on the interest rates of short-term loans.

The overall savings on both procurement sides of the Progress Payment concept may vary depending on the degree / monetary commitment of the Progress Payment rates. The more the purchaser is willing to pay in advance to delivery the less likely is the necessity of a short-loan on the manufacturer's side. Degrees can be set between the progress payments solely for the materials or the progress payment for materials plus labour costs up to the defined time.

Important steps and aspects of the Progress Payment procedure are stated below:

1. In advance to using progress payment a contractual agreement has to be drawn up between the procurement partners which defines
   a. the payment details
   b. the kind of evidence the manufacturer has to provide in order to proof single manufacturing stages have been competed.
   c. interest rates are not advance payments
   d. payments have to be documented
   e. Penalties for late delivery (or non-delivery) of the vehicle

2. In advance the net present value of the procurement order has to be calculated for the progress payment method and then should be compared to the net value which arises under lump sum payment.

3. Additional bureaucracy costs (administrative costs) under the progress payment scheme have to be included in the initial net present value calculations

To avoid the risk of never receiving the product plus the risk of not receiving the progress payments rates, the procuring entity may demand the purchase of performance bonds\(^4\) with the same value of the payments.

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\(^4\) Bond offered by insurance companies which guarantee the termination of a project / procurement, e.g. in case of bankruptcy the entity will receive compensation to the degree of already issued progress payment rates
46. Advantages & Disadvantages of the concept of Progress Payment

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages / Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall procurement price decreases</td>
<td>Risk, that product will not be manufactured entirely</td>
</tr>
<tr>
<td>Financing of production / procurement is facilitated for both sides</td>
<td>Increases bureaucracy according to the necessity of providing evidence</td>
</tr>
<tr>
<td>Manufacturer has a reduced risk to run into too much debt as his financing periods are shorter.</td>
<td></td>
</tr>
</tbody>
</table>

Shared Savings Plan – a case example

To achieve a win/win situation based on fuel savings two entities are necessary. One entity (company X) contributes to the initial procurement costs and thus reduces these costs for the real procuring entity (company Y). This investment by (X) is refinanced by cost savings which arise due to fuel cost savings and the improved efficiency. Once the payback of the initial investment plus an interest rate is complete, (Y) benefits from the continuing fuel savings.

Entity (X) benefits in form of secure interest on his investment plus the possibility of marketing a good image connected to the procurement of alternative fuel vehicles. If the procured fleet runs in public rather than solely on industrial premises they may serve as additional marketing space for (X) for bus posters, stickers, etc. stating that (X) has facilitated the procurement.

(Y) on the other hand is enabled to procure an alternative fuel fleet as his higher initial procurement costs are taken away from him. Instead he benefits in the long-term by achieving further fuel cost savings plus (Y) benefits from the positive image related to the AFV procurement.

In order to be successful this financing scheme has to calculate the possible fuel savings for the individual fleet in advance to any procurement contract. It has to be validated in advance that fuel cost savings will be generated by the new fleet. Part of this financing scheme should be an intensive marketing strategy the increased public awareness and positive company image play a significant role in this strategy.
### 47. Case Example of Shared Savings Plan Model

<table>
<thead>
<tr>
<th>Example:</th>
<th>Shared Savings Plan Egypt (1992 – nowadays)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target groups:</strong></td>
<td>Individual vehicle owners (e.g. taxi drivers), but scheme can likewise be attractive for private sector fleet owners</td>
</tr>
<tr>
<td><strong>Crucial aspects:</strong></td>
<td>Continuity of incentives, involvement of national / local governmental as well as Financial Institutions</td>
</tr>
</tbody>
</table>
| **Procedure:** | **1991/93**: Creation of a Public-Private Partnership which served as the initiator of various pilot projects and organised funding and standards criteria for the successful development of the scheme  
→ **1996**: Development staggered at 180 NGV vehicles & 5 filling stations  
**1996**: Nassar Bank (Egyptian bank with governmental shares) facilitated funding for taxi conversions to CNG, i.e. Nassar (and not the vehicle owner) pays the conversion costs → CNG price advantage as compared to other vehicles  
**Dec 99**: Commercial vehicles are obliged to use natural gas → served as driver for the steady market development  
**2002**: Introduction of Gas Card system, including a loan pay-back system that takes advantage of CNG / Diesel price differences  
CNG price at pump = normal price (incl. taxes) + fixed sum for the Bank  
CNG price < Diesel price |
| **Benefits:** | - Government benefits from lower national air pollution  
- Driver benefits by filling cheaper fuel  
- Bank has an incentive to participate as it receives paybacks in the long-term, is involved in a good image campaign and might even acquire new customers. |

### Results:

Joint Procurement / Buyer Pool procurement

Similar to the savings pack of a product found in the grocery store, an increased procurement of the same AFV at the same time will decrease the price per unit. This augmented demand decreases the price per unit as a natural economic result. The key to a successful market penetration of AFVs is therefore an increase in demand. From the manufacturers’ perspective, this money can be reinvested in the technology and producing circle in order to allow improvements, a more efficient production and the realisation of economies of scale. As a result the production price per unit decreases and the producer can decrease the sales price without lessening its profit margin.

A joint procurement of various private or / and public buyers triggers the overall demand and can decrease the sales price. In general terms, joint procurement is the collection of different procurement demands from different entities.

An existing and successful example for a joint procurement of alternative fuel vehicles is the AFV acquisition within the ZEUS project. Within this project more than 1000 zero and low emission vehicles were jointly purchased by eight European cities and enabled the realisation of substantial economies of scale.

Additionally, joint procurement should be considered by entities from different EU countries in order to allow everyone to get access to the lowest price possible. As an alternative fuelled vehicle of a certain type may cost a substantial amount more in one EU country than in another, a cross – border
joint procurement may enable two benefits at once: the access to the lowest price within the EU and the realisation of economies of scale.

The traditional procurement procedure can vary from company to company as no fixed standard has ever been set or is legally dictated. In a joint procurement process these different procurement methods have to be aligned in order to follow a mutual procurement procedure which is functions effectively and allows the highest economies of scale. In the process of this alignment the following aspects have to be considered in order to reach a significant degree of uniformity:

- Procurement cycles (how long until the next procurement)
- Procurement size (Procurement as soon as demand for one unit is there in general procurement of more units...)
- Framework Contracts over several years for further procurement
- Existing binding agreements
- Vehicle selection
- Harmonisation of procurement documents (e.g. documents for ordering, billing and payments
- Average prices which entities are capable of paying
- Timeframe which passes between ordering and delivery of vehicles
- Individual payment methods according to past method
- Technical and environmental specifications

A recent example for the creation of a European public buyer pool is the anticipated joint procurement of hydrogen busses. This buyer pool is consolidated in the signing of a Memorandum of Understanding which is supported by six European cities. The Memorandum of Understanding to jointly procure Hydrogen Busses has been signed in the presence of European Commission Vice-President and Energy Commissioner Jacques Barrot at the HFP General Assembly on October 5th, 2006. With this memorandum the signing authorities committed themselves to co-operate and work together with regards to the procurement of hydrogen buses for public transport. They also agreed to share information on the technology, infrastructure, planned procurements and tender procedures. The entities which have already signed the Memorandum of Understanding are representatives of:

- GVB Amsterdam, City of Amsterdam
- Transporte de Barcelona S.A., City of Barcelona
- Berliner Verkehrsbetriebe BVG, City of Berlin
- British Columbia Transit, Province of British Columbia
- Hamburger Hochbahn AG, City of Hamburg
- London Bus Services Ltd., City of London

Within the PROCURA work on financial schemes, some additional concepts have been elaborated and are described in the PROCURA reports. For example, these reports include concepts on Cross Border Lease, Leasing with obliged insurance (LoI)
Further Cost Reduction options of AFV Procurement

The reliance of local productions of alternative fuels is the basis of a scheme which involves a voluntary agreement among agriculture and industry within one community. Farmers offer crops for a cheaper price and receive the fuel in return to run their own vehicles. Although this scheme does not facilitate the procurement itself it offers a long-term decrease in the total cost of ownership. Overall, it creates a no costs, no profit situation on both sides.

Another option of realising overall cost reductions is via cost compensations via additional revenue source. Within this scheme an additional revenue source has be developed so that earnings from this source can be used as marginal compensation for the higher purchase price. For example, a company may use their AFV as additional source of income in the non-labour time (meaning the time the vehicle is normally not in use). These additional sources of income may be the rental for demonstration, i.e. at technology fairs and exhibitions or for the use of marketing reasons. However, this only allows a small change in the total costs of ownership.

Certification of alternative fuels and alternative fuel vehicles

PROCURA partner NTDA held a public consultation on Certification issues related to regulation demand, standardisation and labelling of alternative fuels and alternative fuel vehicles. The Certification document (downloadable in the PROCURA homepage) is based on the responses received and targeted to provide a starting point for recommendations to the European Commission in their function as policy developer. NTDA aimed at gathering information and market perspectives from different market participants along the value chain of alternative fuel vehicles to analyse the real market demand related to alternative fuel vehicle classification and certification.

The compiled information is very valuable and extensive, since the nature of the experts identified is very wide. Within this report, a limited number of certification issues are commented, while the Certification document contains 20 analysed topics.

When asked which direction the EU policy regulation should preferably take, i.e. regulation in direction of fuel economy, (engine efficiency, transmission technologies, aerodynamics) or regulation in direction of greenhouse gas emission standards (emissions generated by the vehicle, emissions generated by fuel production), the majority is in favour of regulation in the direction of enforcing GHG emission standards.

Regarding financial incentives, it was stated that it is preferable to have at least in the beginning financial incentives offered to AFVs in order to promote their market introduction. On the other hand the concern was voiced that different countries and cities have to give different incentives (financial or non-financial according to their local demands). The opinion expressed on the basis of this
consideration was that thus, vehicle labels should be neutral without financial incentives and incentives should be offered separately.

It is important to highlight that 83% of the questioned people are in favour of a revision of the 1998 EU Fuels Quality Directive.

The creation of a second-hand vehicle market stands for a significant step in the market development of Alternative Fuel Vehicle. When asked whether a labelling system should also be applied to second hand vehicles, 65% of the interviewed experts are in favour of applying the system to the 2nd hand market.

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**Eco-labelling of fuels**

Apart from protecting the interests of fleet owners changing to alternative fuels, Eco-labels stimulate the clean fuels market and offer producers the opportunity to differentiate the quality of fuels and vehicles. It provides information on environmental consequences of the product properties, production, consumption and disposal. The present eco-labels are not compulsory and there are not enough economic incentives for the producers to make them willing to obtain it.

It is important that the information on an eco-label is presented in a way that consumers understand the environmental performance of the presented fuel or vehicle. An example is the colour-coded label displaying CO₂ emissions on all new cars sold in the UK since September 2005. The goal of this “green label” is to give consumers clear information about the environmental performance of different vehicles. Other EU member countries are also in the process of introducing consumer-friendly labels.
48. EU Energy Label for household appliances

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>More efficient</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>C</td>
<td>D</td>
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<tr>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>F</td>
<td>G</td>
</tr>
<tr>
<td>Less efficient</td>
<td></td>
</tr>
<tr>
<td>1.75 kWh/cycle</td>
<td></td>
</tr>
<tr>
<td>Energy consumption (based on standard test results for 60°C cotton cycle)</td>
<td></td>
</tr>
<tr>
<td>Actual energy consumption will depend on how the appliance is used</td>
<td></td>
</tr>
<tr>
<td>Washing performance</td>
<td>A:B:C:D:E:F:G</td>
</tr>
<tr>
<td>Spin drying performance</td>
<td>A:B:C:D:E:F:G</td>
</tr>
<tr>
<td>Spin speed (rpm)</td>
<td>1400</td>
</tr>
<tr>
<td>Capacity (cotton) kg</td>
<td>5.0</td>
</tr>
<tr>
<td>Water consumption</td>
<td>5.5</td>
</tr>
<tr>
<td>Noise (dB(A) re 1 pW)</td>
<td>Washing: 5.2, Spinning: 7.6</td>
</tr>
</tbody>
</table>

Further information contained in product brochure
Vehicle Classification Systems

Examples for existing vehicle classification system are

- EURO – European emission standard
  - EURO I – for passenger cars (1993)
  - EURO II – for passenger cars (1996)
  - EURO III – for any vehicle (2000)
  - EURO IV – for any vehicle (2005)
  - EURO V - for new HD vehicles controls emission to no more than 2.0 g/kWh of NOx and 0.02 g/kWh pf Particulate Matter (2008)
- Cleaner Drive Standard
- EEV
- BIM EcoScore

49. EURO Standards

<table>
<thead>
<tr>
<th>Emissions Standard</th>
<th>Diesel (PM) (mg/km)</th>
<th>Petrol (PM) (mg/km)</th>
<th>Diesel (NOx) (mg/km)</th>
<th>Petrol (NOx) (mg/km)</th>
<th>Diesel (HC) (mg/km)</th>
<th>Petrol (HC) (mg/km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euro 2 (1996)</td>
<td>80-100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Euro 3 (2000)</td>
<td>50</td>
<td>-</td>
<td>500</td>
<td>150</td>
<td>-</td>
<td>200</td>
</tr>
<tr>
<td>Euro 4 (2005)</td>
<td>25</td>
<td>-</td>
<td>250</td>
<td>80</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>Euro 5 (2009)</td>
<td>5</td>
<td>5</td>
<td>180</td>
<td>70</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>Euro 6 (2014)</td>
<td>5</td>
<td>5</td>
<td>80</td>
<td>70</td>
<td>-</td>
<td>100</td>
</tr>
</tbody>
</table>

PROCURA RESULTS & REPORTS ON THIS TOPIC:

D 2.5 Report on available incentive systems
D 3.4 An Outline for successful Greenlease concepts
D 4.6 Plan of action on CNG introduction in the municipal car fleet of Nijmegen
D 5.4 Workshops with local and regional fleet owners
D 5.5 Workshops with automotive supporting industry
D 6.5 Regional public-private partnership on AFVs
D 9.2 Update report of models, tools and manuals
D 9.3 Report on generalising of models, tools, and manuals for specific countries, market segments and technologies
8. Street wise: experiences in the Procura Pilots projects:

One of the main aim of PROCURA was to find out which strategies for market penetration work Europe-wide and which strategies will result in positive results only in some countries. To this end, five pilot cases were conducted in which different fleet owners (private and public fleets) from different European Union countries are stimulated to implement the use of AFVs in their fleet. In each of the countries, a PROCURA partner organisation was designated as change agent for that specific country. During the pilot cases, national procurement models were developed with a focus on centralised buyer pools, permitting centralised infrastructure, maintenance and repair, and stronger purchase power that will lower the total costs of ownership. PROCURA also assessed and developed local incentive systems to compensate for higher purchase prices.

The overall experience of the PROCURA Pilot Cases showed that Fleet owners are generally willing to adopt AFVs if this induces a significant overall cost reduction, whereas fleet owners are generally unwilling to adopt AFVs if the cost of ownership increases as a result. The fuel availability is the second critical success or failure factor that was recognised. An alternative fuel that is (locally) unavailable is unlikely to diffuse through a social system, whereas a substantial increase in fuel availability is an enabler for the widespread adoption of corresponding AFVs.

The environmental impact was also a significant success or failure factor. The absence of a demonstrably decreased environmental impact in comparison to other technologies is an insurmountable failure factor. Moreover, a demonstrable and tangible decreased environmental impact is a strong success factor. Some of the pilot cases involving the adoption of bioethanol vehicles established that the image of AFVs is also a critical success or failure factor. Especially for commercial fleet owners, the image (whether it be positive or negative) of AFVs had an important influence on their willingness to adopt.

Overview of PROCURA pilot cases

The overall aim of PROCURA is the integration of alternative fuel vehicles in existing vehicle fleets. With this purpose and with the developed PROCURA tools at hand (Fleet Scan Tool, Manuals, Procurement Models), all project partners tried to stimulate their local AFV market at one or more phases of below diagram:
Pilot Case Nijmegen

On the 20th of September 2006, the City of of Nijmegen has decided to introduce CNG vehicles in its own fleet. From this day on, the City will only procure CNG vehicles. All the current vehicles which drive on diesel and petrol (broadly thirty) will be replaced by CNG vehicles within several years. Only if a vehicle can not be replaced by a CNG vehicle (because there is no suitable CNG vehicle available) the municipality will choose another kind of clean technique or fuel. The first vehicle that will be replaced by a CNG vehicle will be the mayor’s car. Citizens and companies will recognize the CNG vehicles by a logo. Until a public filling station in Nijmegen is realized, the municipality will use a home-filling station.

On the 14th November 2007, the first public CNG filling station in Nijmegen has been opened by the minister of Environmental Issues. Nijmegen is the first of all cities in the province of Gelderland with a CNG tank facility, which is realizes by the local company Nijol. The support funding by the province of Gelderland (€100.000 for each new filling station) has stimulated Nijol to develop its plans and to overcome the chicken-and-egg dilemma. Some local companies have already procured CNG vehicles, for instance the local waste disposal company. The first two CNG vehicles of the municipality of Nijmegen will be presented in March 2008, which include the car of the Mayor Thom de Graaf.
With the aim of accomplishing the emission reduction goals set by the Kyoto Protocol this pilot was considered imperative by the Municipality of Lisbon to find new ways to decrease the emissions from road transports. One of the paths to follow was the promotion of the use of biofuels and other alternative fuels, since the transport sector is one of the main responsible for pollutants emissions. The Lisbon Municipality wanted to promote this initiative by setting an example itself and introducing alternative vehicles in its fleet, in order to substitute the conventional ones when possible. The variety of vehicles and fuels existent in its fleet, and the different types of functions performed by each, presented as an opportunity for a wide variety of alternative vehicles solutions. The Municipality of Lisbon fleet is diversified and comprises around 1149 vehicles (2006 data). The major fuel consumption is achieved by diesel vehicles (768 diesel vehicles), although gasoline represents an important share (381 gasoline vehicles). The largest share of fuel consumption is carried out by heavy duty vehicles (66%), which are mostly used for waste collection and street cleaning.

### 51. Procurement Model Municipalities

<table>
<thead>
<tr>
<th>1</th>
<th>Critical Motivation Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Local Air Quality</td>
</tr>
<tr>
<td></td>
<td>Quiet City Centres</td>
</tr>
<tr>
<td></td>
<td>Image of innovative &amp; green city</td>
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</tbody>
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<table>
<thead>
<tr>
<th>2</th>
<th>Fuel Type</th>
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<tbody>
<tr>
<td></td>
<td>CNG</td>
</tr>
<tr>
<td></td>
<td>Hybrids</td>
</tr>
<tr>
<td></td>
<td>Electric</td>
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<table>
<thead>
<tr>
<th>3</th>
<th>Procurement Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Other public communities</td>
</tr>
<tr>
<td></td>
<td>Large private fleet owners</td>
</tr>
<tr>
<td></td>
<td>Private Maintenance companies with interest in entailed business opportunity</td>
</tr>
<tr>
<td></td>
<td>Local Taxi Fleet</td>
</tr>
<tr>
<td></td>
<td>Infrastructure Partners</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>4</th>
<th>Incentives &amp; Obligations</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Free Parking</td>
</tr>
<tr>
<td></td>
<td>Access to special street lanes</td>
</tr>
<tr>
<td></td>
<td>EU Obligation to green public procurement</td>
</tr>
<tr>
<td></td>
<td>Strategic long-term EU positioning</td>
</tr>
<tr>
<td></td>
<td>Regional / National incentives</td>
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<table>
<thead>
<tr>
<th>5</th>
<th>Procurement Method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Due to Bureaucracy restrictions:</td>
</tr>
<tr>
<td></td>
<td>Leasing uncommon</td>
</tr>
<tr>
<td></td>
<td>Financing support via Third party involvement unlikely</td>
</tr>
<tr>
<td></td>
<td>Ownership rights remain at public authority</td>
</tr>
</tbody>
</table>
Pilot Case Valencia

Pilot Objectives:

- Stimulating the diffusion of bioethanol and FFV vehicles in the region in order to increase the sustainability of regional fleets
- Investigation of financial instruments / incentive schemes in Valencia region, supporting the infrastructure development and acquisition of AFVs;
- Gaining experience in the implementation of procurement models, thus identifying key issues, evaluating their effectiveness and assessing the possibility to export these models to other regions;
- Increasing awareness among Valencia inhabitants, public administrations, local fleet owners and companies of AFVs, including general knowledge on innovative technologies, fuel use, barriers and solutions;
- Increasing AFV related business and activities (availability of AFVs, maintenance locations, filling facilities, etc.);
- Changing vehicle purchase behaviour towards AFVs;
- Creating a critical mass of specialised human resources covering the whole value chain of the AFV sector in the Valencia region.

Main Stakeholders involved:

**Ford:** Support in providing information on bioethanol and vehicle availability

**FIVEC:** Public entity, which provided support in dissemination / contacts

**Fundación Comunidad Valenciana Región Europea (FCVRE):** Dissemination on local and EU level

**Policía Local de Valencia:** Public Fleet Owner

**VIVO Petroliferas:** Fuel supplier

**Banco Santander:** Provision of “green” leasing contracts

**Mediterranean Biofuels S.L:** Fuel Infrastructure set-up

**Asociación Valenciana de la Industria de Automoción (AVIA):** Association for vehicle part manufacturers; facilitated contact details of manufacturers

Significant action for success:

Signing of Memorandum of Understanding stating common intention of infrastructure set-up and AFV procurement

Pilot Case Results:

Within the pilot case local barriers on AFV development were identified. Relevant stakeholders and end users (public / private fleet owners, bus companies, fuel providers) were interviewed. The coordinator of this pilot case (NTDA) elaborated financial instruments supporting the infrastructure development and acquisition of AFVs. Moreover, the Valencia Pilot included fleet scans and training programme for fleet owners, car dealers, potential AFV drivers as well as supporting industry.
**AFV Procurement Achieved:**
15 FFV were procured by the Local Police

---

**Supply chain**
- Fuel supplier(s)
  - Vivo
  - Mid-Hertfordshire Biogas
- Car manufacturer(s)
  - Ford Motor Company
- Fuel distributors
  - Vivo
- Potential bioethanol vehicle adopters
  - Valencia local police department
  - Supermarket chain
- Car dealers
  - Ford dealer

---

**Facilitating government**
- AVEN (Valencia energy agency)
- European Union

**Change agents**
- NTDA
- IDEA
- FVEG
- PCVRE

**Peers**
- AFV adopters
  - EMT (bus company using 72 CNG and 104 biodiesel buses)

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### 52. Key Procurement Aspects for Parties with Business Interest

<table>
<thead>
<tr>
<th></th>
<th>Critical Motivation Factors</th>
<th>Fuel Type</th>
<th>Procurement Partners</th>
<th>Incentives &amp; Obligation</th>
<th>Procurement Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Opportunity of new</td>
<td>Depending on business background</td>
<td>Fleet owners (public / private) within company’s field of business</td>
<td>Receipt of third party benefits apart from business augmentation</td>
<td>Customised</td>
</tr>
<tr>
<td></td>
<td>Market sector</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Business relations</td>
<td></td>
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</tbody>
</table>

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86
Lessons learned from the perspective of PROCURA partners

The EU-wide project PROCURA has the objective of increasing the sustainability of public and private car fleets throughout Europe. The below presented experiences of the PROCURA team show the barriers and potential for this market from different perspectives. It was intended to present perspectives from almost all stakeholders needed for the creation of a strong alternative fuel vehicle market, i.e. from the perspective of

- public authorities as market stimulator
- Fuel logistic companies as fuel provider
- Vehicle manufactures as provider of the vehicles
- Consultancies as support entity and facilitator for AFV procurement activities
- Leasing companies as intermediate entity
### 53. Lessons learned from the perspective of a public authority

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Municipality Nijmegen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your presented perspective</td>
<td>Public Authority</td>
</tr>
</tbody>
</table>

#### Your view on potential of AFV procurement:

- **Public transport**: local government has influence on public tenders (terms & requirements)
- **Public fleet** (municipalities, province and national government): the government has to set a good example for others. “If even the government won’t procure AFVs, who will?”
- **Local companies** which have logistic activities as a core business and have a limited range (taxi companies, driving schools, courier companies).

#### Your recommendations on AFV procurement for

**PUBLIC fleet owners:**

- A structural / long-term policy is required: the Board has to make the ambition and the decision for the introduction of AFVs. For example in perspective of (local) air problems, the global warming or the oil-peak and the transition towards the use of sustainable fuels.
- Make sure all fleet owners in the internal organisation are familiar with the Boards ambition and will implement this decision.
- Knowledge of costs and the environmental effects of the switch to AFVs is required to make a decision. For example by performing fleets scan.
- Set requirements and terms about the use of AFVs in the public tenders.
- Set a good example: communicate the fact that the organisation will procure / has procured AFVs and why the organisation has decided to do so! That way, other organisations and companies will get inspired to procure AFVs as well.

**PRIVATE fleet owners:**

- Knowledge of the costs and the environmental effects of the switch to AFVs required making a good decision. For example by performing fleet scans.
- Communicate the fact that the company will procure and has procured AFVs. And why the organisation has decided to do so!
- Check if subsidies or other financial incentives are available (local & national).
- If local government has no incentives, try to influence them.
**What strategies and actions gave you positive results in the realisation of your pilot case?**

- Set a good municipal example by deciding (on long-term) to introduce AFVs in your fleet.
- Similar long-term policy of local, regional and national government will make the introduction of AFVs easier. Differences in ambition will slow down the introduction.
- Sharing knowledge and cooperate with other governmental organisations, the (local) car dealers, owners of filling station and other experts.
- Search and find subsidy for the realisation of a filling station for AFVs. That way companies are willing to invest in a filling station more easily because the financial risk is limited.
- Network of regional / national filling stations for AFVs is required to overcome chicken & egg problem. Make regional / national government aware of importance of this network & AFVs.
- The national government has to stimulate the procurement of AFVs by long term incentives, like low taxation, less complicated regulation for building of filling stations, privileges for AFVs.
- Organising events for local companies about AFVs and let fleet owners experience what it is like to drive in an AFV (for example an AFV rally).
- Offer parties who are interested in AFVs a fleet scan to investigate the financial costs and benefits of introducing AFV in their fleet.
- Communication of successes which the municipality and other private owners have booked.

**Have you encountered any surprising news or circumstances about the AFV market?**

In the Netherlands there is a strong diesel lobby from the car industry, which involves national policy makers, scientists and consultants. This lobby organises -successfully- big events and publicity to discourage AFV introduction.

Improvement of new battery technologies (nanotechnology) which makes electric vehicles an attractive future alternative. This technology competes with AFVs in our program.

Market parties are interested in developing LNG (Liquefied Natural Gas) network for fuelling AFV trucks.

EU has redefined its policy according the 20-20 challenge, because of geopolitical reasons and the global food for fuel discussion.

**Based on your perspective what is the main bottleneck of the AFV market penetration?**
Chicken & egg dilemma: there has to be filling station + AFVs: otherwise no company invests in AFVs.

Based on your perspective, how do you evaluate the current policy situation regarding AFV procurement?

**EU level:** The EU has redefined its policy according the 20-20 challenge, because of geopolitical reasons and the global food for fuel discussion. The EU, at this moment, seems not to have a clear long-term strategy on sustainable fuels and mobility. If this strategy lacks, the car industry and other companies and organisations are insecure about the technology they have to invest in.

**National level:** There is no clear policy about sustainable fuels and mobility. The national government does not make a clear choice. If this strategy lacks, the car industry and other companies and organisations are insecure about the technology they have to invest in.

Based on your perspective, what alternative / additional policy measures do you wish for?

**EU level:** long term vision on sustainable fuels and mobility for which clear ambitions, goals and standards are formulated for the nearby future and on which policy is based.

**National level:** a clear policy focused on the introduction of clean vehicles and fuels, which is in line with the EU policy and integrates different goals like meeting the air quality standards, lowering green house emissions and having a more reliable energy supply.
54. Lessons learned from the perspective of a vehicle manufacturer

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Ford Motor Company</th>
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</thead>
<tbody>
<tr>
<td>Your presented perspective</td>
<td>Lessons learned of a vehicle manufacturer</td>
</tr>
</tbody>
</table>

**Your view on potential of AFV procurement:**

In view of the current economic (oil) crisis, all AFV's form an opportunity but the key element for AFV's to be credible is to be AFFORDABLE and ought to be offered in high volume quantities (therefore the low cost technology of Flexifuel Vehicles making use of sustainable produced bio-ethanol as shown in Brazil and Sweden is a good benchmark; the key hurdle to be taken is to have enough government support allowing all partners (fleet owners, fuel distributors, government procurement, car manufacturers, etc) to work together making full use of a well-conceived incentive package; the Swedish government's vision/strategy and its implementation is a good benchmark to start from.

**Your recommendations on AFV procurement for**

**Public fleet owners** (in view of the different situation in each country the public (government local and national) should base their procurement on a sustainable incentive package whereby they are leading by example; as in Sweden the definition of an EEV (environmentally enhanced vehicle) does allow a whole portfolio of AFV's and conventional low CO2 vehicles to be considered.

**private fleet owners** (a lot depends on the specific taxation/incentive situation in the country itself but in view of the relatively stable pricing of the E85 in many countries, the flexibility of the Flexifuel vehicles offers a good green opportunity next to other alternatives like CNG (biogas), hybrids, etc; again the AFFORDABILITY plays an immense role in the current crisis situation.

**What strategies and actions gave you positive results in the realisation of your pilot case?**

Working together in certain areas (e.g. Bolzano and Valencia) shows the opportunities but at the same time proves that the only way real results can occur is by joining all the partners involved and this supported by local and national governments.

**Have you encountered any surprising news or circumstances about the AFV market?**
The real surprise is the way in which the lack of communication or dissemination of completely wrong information (around biofuels for example) can ruin completely the introduction of AFV’s.

Based on your perspective what is the main bottleneck of the AFV market penetration?

A lack of consistency in Europe around legislation/support with objective communication around difficult themes such as biofuels, sustainability, etc.

Based on your perspective, how do you evaluate the current policy situation regarding AFV procurement?

**EU level:** No consistency (need for regulation on the E85 fuel for example, sustainability criteria etc)

**National level:** good example is Sweden with their clear definition of EEV and a well implemented support plan that covers all the aspects.

Based on your perspective, what alternative / additional policy measures do you wish for?

**EU level:** clear definition of E85, regulation for example; also a definition of EEV like in Sweden allowing to avoid all kind of CO2 measurement discussions.

**National level:** copy the Swedish example.

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55. Key Procurement Aspects for Large Fleet Owners

<table>
<thead>
<tr>
<th>1 Critical Motivation Factors</th>
<th>2 Fuel Type</th>
<th>3 Procurement Partners</th>
<th>4 Incentives &amp; Obligations</th>
<th>5 Procurement Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Fuel Savings</td>
<td>• Subsidised fuels</td>
<td>• Public entities</td>
<td>• Free Parking</td>
<td>• Flexible financing schemes</td>
</tr>
<tr>
<td>• Positive Company Image</td>
<td>• Fuels that receive incentives &amp; have best tax rates</td>
<td>• Private Maintenance companies with interest in entailed business opportunity</td>
<td>• Access to special street lanes</td>
<td>• Centralised infrastructure</td>
</tr>
<tr>
<td>• Homogenous Fleet – vehicle availability</td>
<td>• Infrastructure Partners</td>
<td></td>
<td>• Regional / National Incentives</td>
<td></td>
</tr>
</tbody>
</table>

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56. Lessons learned from the perspective of a consultancy

Company Name: ETA Florence – Renewable Energies

Your market perspective is representing: Consultancy Entities

Your view on potential of AFV procurement:

Italian Government is required to develop plans for market introduction of biofuels.

Alternative fuels and advanced technology vehicles are seen by Italian National and local Governments as integral to improving urban air quality, decreasing dependence on foreign oil, and reducing emissions of greenhouse gases.

However, major barriers — especially economics — currently prevent the widespread use of these fuels and technologies.

Despite these barriers, there is continued interest in providing impulse and support for their development and commercialization from many Association and Organization working for biofuels and AFVs market expansion.

Your recommendations on AFV procurement for

**Public fleet owners:** Public fleet owners have only the possibility to choose CNG vehicles because there is no developed infrastructures for E85 and for Biodiesel. Industry stakeholders need to be aware of the popularity of CNG in Italy and should propose new alternatives for it.

**Private fleet owners:** The penetration of biofuels for private fleet owners is low. Also in this case, only CNG vehicles are an option due to the lack of subsidies and an ineffective storage and transportation infrastructure for E85 and Biodiesel.

For the development of the alternative fuels vehicles market in Italy a set of measures must be achieved such as laws, taxation, incentives, sustainable fuel production and creation of networks of fuelling stations.

What strategies and actions gave you positive results in the realisation of your pilot case?

Workshops and seminars organized within the project have been extremely effective in order to communicate and publicize benefits of
alternative fuels and for connect stakeholders involved in the AFVs chain.

**Have you encountered any surprising news or circumstances about the AFV market?**

No, the identified barriers were real barriers also for our pilot case. Probably the biggest surprise has been the lack of knowledge of fleet owners and fleet managers.

**Based on your perspective what is the main bottleneck of the AFV market penetration?**

Higher purchase costs for E85 and biodiesel and lack of infrastructure.

**Based on your perspective, how do you evaluate the current policy situation regarding AFV procurement?**

**EU level:** Good. Numerous legislative initiatives in the European Union have led to the growing of new drivers and challenges for hydrogen, biofuels and natural gas. They also encourage major methods of production, applications analysis and emerging technologies for each of these fuels.

**National level:** Bad. More ambitious targets as well as fiscal incentives and other measures are expected.

**Based on your perspective, what alternative / additional policy measures do you wish for?**

**EU level:** accelerate the movement towards second generation biofuels and developing strict sustainability criteria for biofuels with regard to minimum CO2 savings and land use.

Support the developing of biogas utilization for transport.

**National level:** Exemption or reduction from the excise tax for national biofuels.
**57. Lessons learned from the perspective of a leasing company**

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Terberg Leasing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your market perspective is representing</td>
<td>Leasing Companies</td>
</tr>
</tbody>
</table>

**Your view on potential of AFV procurement:**

AFV are to be the only way of transport in the near future. The speed of penetration is depending on governments and industries. (manufacturers, oil-companies, fuel-stations)

Legislation that enables companies to save on the exploitation of fleets

**Your recommendations on AFV procurement for public and / or private fleet owners:**

For both groups you have to take in account that cars represent emotion. Drivers should be “helped” to choose for an alternative that offers at least the same comfort in use.

**What strategies and actions gave you positive results in the realisation of your pilot case?**

Offering an alternative with lower running costs.

**Based on your perspective what is the main bottleneck of the AFV market penetration?**

Availability of cars, fuel, fuelling points, reduced driving range per tank-filling

**Based on your perspective, how do you evaluate the current policy situation regarding AFV procurement? (EU / national level)**

National Government is successfully enticing drivers to choose the most fuel efficient cars.

**Based on your perspective, what alternative / additional policy measures would you like to see realised? (EU / national level)**

EU set European standards for fuel efficiency (just like Euro NCAP)

Stimulate the introduction of fuel efficient cars through well thought of measures that enables manufacturers to meet the set standards. And offers them time to develop new technologies for new means of transportation.
### 58. Lessons learned from the perspective of a Fuel Supplier

<table>
<thead>
<tr>
<th>Company Name</th>
<th>NTDA Energía / Mediterranean Biofuels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your market perspective is representing</td>
<td>Fuel Logistics</td>
</tr>
</tbody>
</table>

#### Your view on potential of AFV procurement:

Alternative fuels (and thus AFVS) have potential
to realise drastic reductions in transport CO₂ emissions
to reduce dependence on fossil fuels and producers countries (avoiding issues related with fuel price, political instability, oil reserves, etc.)
increase agriculture activities in areas where it is disappearing

#### Your recommendations on AFV procurement for public and / or private fleet owners:

Scan your existing fleet for the economic & environmental consequences of changing some vehicles in your fleet. You might be surprised to see how much lower your annual spending on fuel costs could be.

Identify a procurement model that best suits your needs. If possible get together make a bulk procurement

#### What strategies and actions gave you positive results in the realisation of your pilot case?

Development of awareness campaigns at regional level in order to spread benefits of using biofuel in vehicles (Food for fuel discussion).

Commitment of large vehicle manufacturers, i.e. provision of technical information, allowance of biofuel in their vehicles

To assign specific funds to reduce biofuel price and encourage its use

#### Based on your perspective what is the main bottleneck of the AFV market penetration?

Technical bottlenecks

Prohibition of biodiesel use car manufacturers => loss of insurance

Ensuring standardized quality of biodiesel

Obtaining raw material (energy crops) for fuel production

Economic bottlenecks
In order to be successful, alternative fuels and AFVs have to present a clear economic benefit for the fleet owner (public or private)

**Based on your perspective, how do you evaluate the current policy situation regarding AFV procurement? (EU / national level)**

**EU policy:** More consistency required, creation of clear market incentives via policy stimulation

**National policy:** Already a lot of economic support in forms of subsidies etc. however, local public authorities should be forced to give an example of green procurement and get active themselves

**Based on your perspective, what alternative / additional policy measures would you like to see realised? (EU / national level)**

Modification of the European Agriculture Policy required in order to promote the biofuel production

Regulation of max profit margins for the fuel production along the value chain

Creation of overall awareness training campaigns in order to increase public awareness on fuel issues in terms of safety, food vs fuel, availability, maintenance
59. Lessons learned from a bus company procuring AFVs

<table>
<thead>
<tr>
<th>Company Name</th>
<th>IST-Lisbon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your presented perspective</td>
<td>Bus company that implemented AFVs</td>
</tr>
</tbody>
</table>

**Your view on potential of AFV procurement:**

AFVs can be seen as profitable and environmental friendly alternatives to diesel, as well as good opportunities to develop social responsibility, at the same time as innovate. As a service supplier, and considering our activity as a responsibility in the level of emissions, we have the duty to act better giving our clients the best service, with the highest possible quality standards.

**Your recommendations on AFV procurement for public and / or private fleet owners:**

**Public fleet owners:** Try to do the procurement activity together with other public fleets, in order to increase the “critic mass” and obtain some financial benefits. In this way it can be a lot easier to overlap the main market barriers encountered in process and facilitate its implementation.

**Private fleet owners:** Also try to procure with other private fleets.

**What strategies and actions gave you positive results in the realisation of your pilot case?**

The substitution of old and inefficient vehicles for new AFVs, and the negotiation of these vehicles maintenance costs in order that they can be supported by the operational leasing providers can have very positive results. On the other hand the operational results were quite satisfactory, considering that no major questions on the power of the engines and mechanical issues of the vehicles were reported.

**Have you encountered any surprising news or circumstances about the AFV market?**

The Portuguese AFV market is not vast. In this sense, some AFVs have to be ordered directly to the manufacturer.

**Based on your perspective what is the main bottleneck of the AFV market penetration?**

In this case, the main barrier is the lack of government support. The lack of AFVs models and fact that the national alternative fuel supply infrastructure
is not well developed are also hampering AFV market penetration.

<table>
<thead>
<tr>
<th>Based on your perspective, how do you evaluate the current policy situation regarding AFV procurement?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EU level:</strong> Some efforts have been made, however European entities should reinforce their position on this matter in order to promote AFV procurement policies in all member states.</td>
</tr>
<tr>
<td><strong>National level:</strong> Very poor, AFV is not a priority at all for the Portuguese Government, for heavy fleets.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Based on your perspective, what alternative / additional policy measures do you wish for?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EU level:</strong> European actions in order to promote AFV in each member state.</td>
</tr>
<tr>
<td><strong>National level:</strong> National legislation in order to support the companies interested in procure AFV for their fleets. A long-term politically supported strategy is essential, and we lack of that.</td>
</tr>
</tbody>
</table>
### Lessons learned from the perspective of an Eastern Member State

<table>
<thead>
<tr>
<th>Company Name</th>
<th>KAPE S.A.</th>
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</thead>
<tbody>
<tr>
<td>Your presented perspective</td>
<td>New EU Member State</td>
</tr>
</tbody>
</table>

#### Your view on potential of AFV procurement:

Development of local production of fuels using local resources – farmers, local transport, city and regional public transport. Acceptance of local budget for implementation of Local authorities plans of CO₂ and GHG reduction in transport.

#### Your recommendations on AFV procurement for:

**Public fleet owners** – public order for transport services is covered by local authority budget. This position of budget is prepared on the base of plan of regional transport development. Recommendation is to have promotion of AFV in the plan.

**Private fleet owners** – main decision factors for the development of AFV fleets are information about future fuel prices and policy of taxes and fees. Level of uncertainty of the above factors is important to take decision. Recommendation is to have national strategy of fuels supply for minimum 10 years. The strategy has to promote AFV.

#### What strategies and actions gave you positive results in the realisation of your pilot case?

First step was to make direct contacts to local authority and exchange information, discussion to local authority representatives on regional transport development strategy. Second step was signature of contract to elaborate for local authority “Plan of activities which authority has to initiated to reduce CO₂ and GHG emission by 2020”. The last point is to implement the action of the plan: “Prepare public tender to order public transport services using CNG buses”.

#### Have you encountered any surprising news or circumstances about the AFV market

Missing of alternative fuels on the market. In fact, CNG and LPG were only alternative fuel accessible on the market. Access to use fuels like BIOETHANOL or BIOESTER were limited and user of these fuels needs to arrange set of documents to receive permit ion.

#### Based on your perspective what is the main bottleneck of the AFV


**market penetration?**

Legal solution according biofuels production, distribution and trade. Missing of national strategy on fuel supply which causes uncertainty of relation between fuels prices and level of taxes and fees in relation to the AFV are not possible to forecast.

**Based on your perspective, how do you evaluate the current policy situation regarding AFV procurement?**

**EU level** – current policy has right direction but is general far too. It should define that external costs of transport impact on environment and dependences of energy supply should be calculated and reflected in the system of taxes and fees.

**Based on your perspective, what alternative / additional policy measures do you wish for?**

**EU level** - technical documentation for cars should inform and confirm, beyond standard EURO, engine parameters to be possible to calculate future fuel consumption and emission in time in real conditions. EU directive should define methodology of taxes and fees calculation for vehicles to reflect real emission and real external costs of emission on the base of “well to whiles” chain for fuel, maturity of technology (promotion of new technology), and source of origin of raw material for production of fuel used (region, country, Europe, outside EU).

**National level** – implementation of policy defined at EU level. National strategy for fuel supply and local/regional strategy for fleet of AFV development.
### Information from other European AFV procurement projects

#### 61. Buyer’s pool and projects developed

<table>
<thead>
<tr>
<th>Buyer’s Pool</th>
<th>EU projects(^5)</th>
<th>Main authorities involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxi companies</td>
<td>CIVITAS</td>
<td>Taxi drivers</td>
</tr>
<tr>
<td></td>
<td>TELLUS</td>
<td>Municipalities</td>
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<td></td>
<td>NICHES</td>
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<td></td>
<td>BEST</td>
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<tr>
<td></td>
<td>TRENDSETTER</td>
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<tr>
<td>Buses companies</td>
<td>CIVITAS</td>
<td>Bus fleet providers</td>
</tr>
<tr>
<td></td>
<td>TELLUS</td>
<td>Bus operators</td>
</tr>
<tr>
<td></td>
<td>NICHES</td>
<td>Municipalities</td>
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<tr>
<td></td>
<td>BEST</td>
<td>Logistics/transportation companies</td>
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<tr>
<td></td>
<td>TRENDSETTER</td>
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<tr>
<td>Waste disposal</td>
<td>TELLUS</td>
<td>Traffic and Public Transport Authorities</td>
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<td></td>
<td>NICHES</td>
<td>Municipalities</td>
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<tr>
<td></td>
<td>BIOGASMAX</td>
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<tr>
<td></td>
<td>TRENDSETTER</td>
<td></td>
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<tr>
<td>Municipal fleet</td>
<td>CIVITAS</td>
<td>Municipalities</td>
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<td>BEST</td>
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<td>TELLUS</td>
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<td>MIRACLES</td>
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<td></td>
<td>TRENDSETTER</td>
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</tr>
<tr>
<td>Private companies interested in “greening” image</td>
<td>NICHES BEST</td>
<td>Private companies</td>
</tr>
<tr>
<td>Private citizens</td>
<td>NICHES</td>
<td>Public incentives</td>
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<tr>
<td></td>
<td>BEST</td>
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**PROCURA RESULTS & REPORTS ON THIS TOPIC:**

D.9.1 Report on cross-case evaluation of pilot projects
9. Policy recommendations

General recommendations

Based on the experience gathered within the PROCURA project, e.g. within the five pilot cases the PROCURA consortium considers the following policy recommendations to have a positive impact on the market development of AFVs:

- Synchronisation of national policies with regard to alternative vehicles and fuels;
- Creation of price competition between conventional vehicles and AFVs, if necessary by introducing financial incentives for AFVs;
- Introduction of legislation concerning local air quality problems;
- Specification of environmental conditions in public transport tenders;
- Facilitation of local alternative fuel infrastructure;
- Involvement of committed municipalities.

Based on the experiences gathered during PROCURA, the following policy recommendations have been formulated to stimulate the diffusion of AFVs.

EU level

1. Synchronise national policies

The pilot cases were each conducted in very specific national contexts. Every country has its own policy with regard to (alternative) fuels and AFVs. To stimulate the diffusion of AFVs, it is recommended that the national policies involving AFVs are synchronised with each other on a European level. The European Union has made an important statement by labelling the use of natural gas/biogas and biofuels as a necessary intermediary step for the near future. The logical next step would be to synchronise the national policies with regard to these fuels, to provide certainty to end users, suppliers and manufacturers. The synchronisation of national policies should of course not slow down the development of breakthrough national or regional initiatives, like the Swedish example. On the contrary the EU legislation could use the Swedish initiative (like for example the definition of the EEV (Environmentally Enhanced Vehicle)) as a benchmark
2. Introduce an international certificate system for biofuels

In a first phase there needs to be on the EU level recognition of E85 as a fuel for homologation purposes of the Flexifuel vehicles. The use of biofuels is also hampered by the fact that there is often uncertainty about its origin and sustainability. By introducing a certificate system, a guarantee of origin can be provided for biofuels. The guarantee of origin is needed to ensure that the biofuel has a positive greenhouse gas balance and does not have a negative impact on the global food prices. Negative effects of the use of biofuels are minimized by demanding such a certificate for all biofuels used in the European Union.

3. Introduce an alternative fuel directive

It is recommended to introduce an EU directive on the introduction of alternative fuels. This directive should specify tangible targets with regard to the market penetration of natural gas/biogas and biofuels in the transport sector. By formulating these targets in an EU directive, the targets can be posed for the EU member countries as well. Additionally, these targets should be actively mandated, to ensure that all EU member countries meet them.

At the moment the EP and Council are reviewing the EU Fuels Directive in which biofuels and hydrogen have been included, as well as sustainability criteria for biofuels.

4. Formulate and articulate a clear long-term strategy by following an integrated approach

Currently, the automotive industry as well as other companies and organisations are uncertain about the technology they have to invest in. It is recommended to formulate and articulate a long-term strategy on alternative fuels and sustainable mobility, in which clear ambitions, goals and standards are set for the nearby future and on which policy is based. These goals should be set via an integrated approach in which all the parties (national/local governments, fuel distributors, car manufacturers, etc) are being involved.

5. Include Transport in the EU’s “Lead Markets initiative”

As DG TREN seeks a network for public procurement of clean vehicles the inclusion of transport issues in the EU’s Lead Market Initiative is advisable in order to establish networks of key stakeholders at local level.
Example of Policy measures in Sweden

Nowadays, the largest European E85 Flexifuel vehicle (FFV) fleet can be found in Sweden and numbers to 116,695 units (data July 2008). The significant increase in the national procurement of AFV can be directly linked to the Global Cooperation Bill which was passed in 2005. This bill not only ratified the Kyoto Protocol but also integrated biofuels targets of the EU Biofuels Directive (2003) and led the Swedish government to the decision of eliminating oil imports by 2020.

As a result to the Global Corporation Bill, Sweden offers a number of core incentives for AFV procurement:

- Exemption of CO₂ and energy taxes until 2009 for Biofuels
- 30% price reduction at the pump of E85 fuel over gasoline
- 40% price reduction at the pump for biodiesel over gasoline
- Bonus of $1.800 for the procurement of a FFV (payable to buyer)
- Exemption of Stockholm Congestion Tax
- 20% (max) reduction on car insurance
- Free parking spaces in larger Swedish cities
- Decreased annual registration taxes
- 20% tax reduction for the procurement of FFVs as company cars

In order to make a good example the Swedish Government decided that 25% of their vehicle purchases (excluding police, fire and ambulance vehicles) have to be running on alternative fuels. Additionally, since 2005 any filling station selling more than 3 million litres of fuel / year has an obligation of offering at least one biofuel type. This resulted in a current red of over 1200 filling stations providing E85 (data 2008). Moreover, this obligation for filling stations will be increased as to include all those filling stations with an annual volume of more than 1 million litres. This will probably result in the creation of additional 2800 filling stations by the end of 2009.

The Sweden case shows that a significant market push can be realised with supporting policy measures. Nonetheless, even Sweden still has a long way to go as only 2% of the Swedish vehicles are running on alternative fuels.
National level

1. Create a level playing field for alternative and conventional fuels

On a national level, it is especially important to monitor and influence how the costs of AFVs compare to the costs of conventional vehicles. If necessary, it is recommended to provide tax exemptions or financial incentives to ensure that AFVs are at least competitive with conventional vehicles for certain niches, depending on their fleet characteristics and use. Cost competitiveness is decisive for the diffusion of AFV. Again, it is specifically important to articulate a clear long-term strategy concerning alternative fuels along with this, and formulate distinct national objectives. Most tax incentives are only effective when they are in place for at least several years. Following the Swedish incentive package the aim should be to not only to give incentives regarding excise duty exemption of the fuel but also looking at stimulating the end customer (retail or fleet) AND making sure the necessary fuel infrastructure is (or will be) in place. The national governments should lead by example by implementing the green product portfolio clearly in their tenders.

2. Introduce legislation concerning local air quality problems

The Nijmegen pilot case shows that national legislation on local air quality is an effective way to create a sense of urgency in municipalities with air quality problems. It is recommended to address air quality problems and monitor the results of measures that are taken on a local level. By doing so, the observability with regard to the environmental impact of AFVs is enhanced, which has a positive influence on the willingness to adopt and endorse the use of AFVs.

Local level

1. Specify environmental conditions in public transport tenders

It is recommended to incorporate obligatory environmental conditions in public transport tenders. This will make concession authorities as well as public transport companies more aware of the environmental impact their public transport has. As mentioned in the theory chapter, awareness of the environmental impact of bus transportation alone may very well create an urge to innovate. Additionally, stringent environmental conditions can easily be mandated this way.
2. Facilitate local alternative fuel infrastructure

On a regional level, it is recommended to address the availability of alternative fuels. Local fuel availability has the largest and most direct influence on fleet owners’ willingness to adopt AFVs. Moreover, a sensible distribution of filling stations for AFVs on a regional scale is important. The pilot cases showed that fleet owners were hesitant to use a filling station further away from their company, because of increased mileage and working hours needed to refuel their vehicles. In many cases, financial incentives may be necessary to catalyse the realisation of an adequate fuel infrastructure. For deciding how and where financial incentives should be used, a regional overview can be very useful. (Again here the Swedish example can be used whereby there is a national obligation to have a minimum of alternative fuel pumps installed with as a result that nowadays Sweden has covered almost half of its fuel stations (E85 or CNG)

3. Involve committed municipalities

Municipalities can play an important role in the diffusion of AFVs. On a low level, the adoption of AFVs can be stimulated substantially by providing leadership, by acting as an ambassador for AFVs, by involving industry and other stakeholders and by setting the example. Moreover, it is recommended to formulate detailed, long-term local policy with regard to the introduction of AFVs. It is key for municipalities to ensure internal commitment to the adoption of AFVs in the municipality board. The Nijmegen pilot case is a good example of successful involvement by the municipality.

62. Recommendations for the market stimulation on local level

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<td></td>
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<tr>
<td>Development of a Clear Zone</td>
<td>To ensure traffic calming and pedestrianisation considering noise, pollution, historic areas not protected from the effects of traffic and conflict between road users and pedestrians</td>
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Project level recommendations

The following recommendations are applicable when trying to stimulate the diffusion of AFVs and should be considered by any change agent. They are specifically useful when conducting a project similar to PROCURA, whether it be a EU / local project or the creation of an European AFV Information Network for public and private fleet owners:

- Provide examples from European Union projects and networks to inspire others;
- Provide exposure to excellent examples by peers of the targeted fleet or vehicle owners;
- Realise involvement with relevant industry and public-private partnerships;
- Provide detailed and tailor-made information on financial and environmental consequences; (PROCURA fleet scan tool)
- Calculate and communicate the environmental costs of both conventional vehicles and AFVs;
- Increase the visibility of AFVs, for example with stickers.
- Accelerate large scale procurement.
- Provide information on incentives, regulation, best practice and available models, open tenders etc

PROCURA RESULTS & REPORTS ON THIS TOPIC:
D.9.4 Report on policy recommendations regarding the acceleration of green procurement targeted on relevant stakeholders
D.3.3 Outline for a certification system for Green Vehicles
D8.1 New financial instruments in the Valencia Region supporting the development of infrastructure and acquisition of AFVs
FAQ on biodiesel:

What is Biodiesel?

Biodiesel is a renewable fuel produced from vegetable oils such as rape seed oil, sunflower seed oil, and soybean oil and also used frying oils (UFO) or animal fats.

In the transport sector, it may be effectively used both when blended with fossil diesel fuel and in pure form. Tests undertaken by motor manufacturers in the European Union on blends with diesel oil up to 5-10%, or at 25-30% and 100% pure have resulted in guarantees for each type of use.

Minor modifications (seals, piping) are required for use at 100% pure, unless specifically guaranteed by car manufacturers.

The use of biodiesel as a transport fuel does not require any changes in the distribution system, therefore avoiding expensive infrastructure changes. Biodiesel is also used as efficient heating oil.

Is Biodiesel the same thing as raw vegetable oil?

No, biodiesel is produced from any fat or oil such as soybean oil, through a refinery process called transesterification. This process is a reaction of the oil with an alcohol to remove the glycerine, which is a by-product of biodiesel production. Fuel-grade biodiesel must be produced to strict industry specifications in order to insure proper performance.

Is Biodiesel more expensive than other alternative fuels?

When reviewing the high costs associated with other alternative fuel systems, many fleet managers have determined biodiesel is their least-cost-strategy to comply with state and federal regulations. Use of biodiesel does not require major engine modifications. That means operators keep their fleets, their spare parts inventories, their refuelling stations and their skilled mechanics. The only thing that changes is air quality.
Do I need special storage facilities for biodiesel?

In general, the standard storage and handling procedures used for petroleum diesel can be used for biodiesel. The fuel should be stored in a clean, dry, dark environment. Acceptable storage tank materials include aluminium, steel, fluorinated polyethylene, fluorinated polypropylene and Teflon. Copper, brass, lead, tin, and zinc should be avoided.

Can I use biodiesel in my existing diesel engine?

Biodiesel can be operated in any diesel engine with little or no modification to the engine or the fuel system. Biodiesel has a solvent effect that may release deposits accumulated on tank walls and pipes from previous diesel fuel storage. The release of deposits may clog filters initially and precautions should be taken. Ensure that only fuel meeting the biodiesel specification is used.

Is the Biodiesel produced in the EU?

Biodiesel has been produced on an industrial scale in the European Union since 1992, largely in response to positive signals from the EU institutions. Today, there are approximately 120 plants in the EU producing up to 6,100,000 tonnes of biodiesel annually. These plants are mainly located in Germany, Italy, Austria, France and Sweden.

Specific legislation to promote and regulate the use of Biodiesel is in force in various countries including Austria, France, Germany, Italy and Sweden. The EU has also published strict guidelines in compliance with CEN Standardisation (EN14214) in order to insure quality and performance.

More Info:

This information and more detailed information can be found at http://www.biodiesel.org and http://www.ebb-eu.org.
FAQ on bioethanol:

What is BioEthanol?
BioEthanol is also known as grain alcohol or ethyl alcohol. It can be derived from any plant material that contains starch or sugar. It is created in a similar manner to beverage alcohol, but it is denatured to prevent human consumption. Like gasoline, BioEthanol contains hydrogen and carbon molecules. It also contains oxygen molecules, which makes it cleaner burning. Any material that contains starch or sugar can be used to create BioEthanol.

How is BioEthanol produced?
BioEthanol is produced from a feedstock like corn, barley or wheat, and fermented and distilled into useable grain alcohol. It is denatured and blended with gasoline into either E85 or E10 and shipped to retail pumps. In a next phase (second generation) bioethanol will be produced based on non-food biomass.

Is the production of BioEthanol interfering with the Amazone forest?
No, since the production of ethanol requires a different climate than the Amazone climate (most of the production plants are situated around the Sao Paolo area).

Can my vehicle use BioEthanol?
E10 Gasoline (Mixture of 10% bioethanol & 90% gasoline)
All vehicles with gasoline engines manufactured after 1980 can use E10 Gasoline. Vehicles with gasoline engines can switch between E10 GASOLINE and regular gasoline.

E85 BioEthanol (Mixture of 85% bioethanol & 25% gasoline)
Only FFV can use E85 BioEthanol. FFV can run regular gasoline or any blend of BioEthanol (up to 85%). BioEthanol will absorb any water that has accumulated in the fuel tank of a vehicle over time. As a result, the first tank of E10 Gasoline or E85 BioEthanol may cause an engine to run slightly rough. Once the water has been consumed in the first tank of fuel, the vehicle will return to normal operation.

BioEthanol blends are usable at any temperature. E85 BioEthanol may contain up to 30% gasoline during winter months to ensure proper cold starting.
Can I convert my gasoline vehicle to run E85 BioEthanol?

According to the National Ethanol Vehicle Coalition, the answer is yes. "Yes. However, there are no conversions or after-market parts that have been certified by the EPA as meeting the standards to maintain clean exhaust emissions. Technically speaking, converting a vehicle that was designed to operate on unleaded gasoline only to operate on another form of fuel is a violation of the federal law and the offender may be subject to significant penalties. No after-market conversion company has successfully certified an E85 kit that would allow a gasoline vehicle to operate on 85 percent ethanol. The differences in fuel injector size, air-fuel ratio, PCM calibrations, material composition of the fuel lines, pumps and tanks are just a few of the components that contribute to making an E85 conversion extremely complex. It is our understanding that at least one company is working to obtain EPA certification. We will monitor the situation closely, understanding the certification process can be time consuming, difficult and expensive."

Does BioEthanol provide similar fuel efficiency as gasoline?

E85 contains 27% less energy than a gallon of gasoline, but because of the increased octane rating gas mileage only goes down by 5% to 12%. FFV have larger fuel tanks to compensate for this. For E10, there is an almost unnoticeable decrease in fuel efficiency.

Will using ethanol void my engine warranty?

Every major car company in the world approves the use of E-10 Unleaded under warranty. Ethanol is a common oxygenating additive in gasoline – you have probably already used it without knowing it. In Europe commonly until now a maximum low blend of 5% has been used.

Can I switch back and forth between BioEthanol blends and gasoline?

You can switch between BioEthanol and regular gasoline; FFV are made to run on gasoline or BioEthanol in blends up to 85%. For regular gasoline vehicles, you can switch back and forth with blends up to 10% BioEthanol.

More Info:

FAQ on natural gas

What is natural gas?
Natural gas forms when plant and animal matter are trapped beneath solid rock under tons of pressure for millions of years. Made up mostly of methane, natural gas is both odourless and tasteless in its original form.

How safe is natural gas?
Statistics clearly show natural gas to be the safest energy form. Compared to other energy sources, it has an enviable safety record because of several factors. Natural gas is non-toxic. The odorant that we add makes it easy to detect small leaks. Since natural gas is lighter than air, it dissipates quickly in a well-ventilated area. These factors, combined with the rigorous controls and safety standards that regulate the industry, make natural gas a safe energy choice.

Is a natural gas vehicle more dangerous than a gasoline or diesel car?
No. Natural gas vehicles (NGV) are in fact safer than most other vehicles. The natural gas used in cars is the same natural gas that is used in many millions of homes for cooking and eating.

Natural gas is lighter than air and thus, in the event of an accident, rises into the atmosphere away from its source. Vapours from liquid fuels on the other hand tend to 'pool' at ground level, creating the potential for explosions.

Natural gas is also relatively difficult to ignite, requiring specific concentrations and temperatures before ignition occurs.

Compressed natural gas (CNG) cylinders are tested in the most extreme conditions, even having bullets fired at them, before they receive standards approval.

Despite the safety characteristics of NGV, proper safety precautions must still be observed. Caution should be taken when refuelling and repairs or installations should only be carried out by qualified personnel.

What are the advantages of natural gas over diesel?
Natural gas is an inherently cleaner alternative fuel that produces very low particulate and nitrogen dioxide emissions. Utilizing natural gas fuel not only provides greater overall emission reductions, but also supports the goals of fuel diversity and reducing petroleum dependence.
Is it easy to refuel a CNG vehicle?

Yes. In many ways it's easier than using diesel or gasoline.

The process is similar but, because the refuelling coupling is pressure sealed, and because there are no liquids, there are no spills to contend with.

Users of home or work refuelling systems have it even easier, as they have the convenience of refuelling without interfering with their daily routine.

Of course, as with any fuel, proper safety procedures should be followed. Always ensure the engine is switched off before refuelling.

More Info:

11. PROCURA Partner contact list

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Company Information
Established in 1984, Ecofys specialised in energy saving and renewable energy solutions. Ecofys has conducted extensive research and completed projects for many energy companies, housing corporations, building companies, international and local authorities, and world – wide energy consumers.

Pilot Case
To improve its air quality, the municipality of Nijmegen works towards the introduction of a substantial fleet of CNG-vehicles within its boundaries. CNG vehicles cause much less air pollution. Besides that, the odour nuisance will be less and the engines will be more silent.
Company Information

Founded in Milan in 1897, FAST, the Italian Federation of the Scientific and Technical Associations, is an independent non profit organisation, legally recognized by Law of October 30th 1995 by the Minister of Scientific and Technological Research and Universities, operating on national and international level, directly, or through its associated organisations and dedicated to:
- offer customized services to industry and public administration;
- favour the Italian participation in European Research and Technology Programmes and their dissemination;
- plan and carry out initiatives regarding advanced training and professional schooling;
- deepen knowledge in the field of research policy and of tecnological development;
- promote cultural debate, information and scientific dissemination;
The consumption of fossil fuels has negative effects on the climate, environment and energy security. The municipality of Nijmegen takes its responsibility. In cooperation with other parties, the municipality has the ambition to increase the use of sustainable energy and to reduce the emissions of greenhouse gases and particulate matter.

Nijmegen is looking after the condition of the soil and the quality of the air and water every day.

To improve its air quality the municipality of Nijmegen works towards the introduction of a substantial fleet of CNG-vehicles within its boundaries. Therefore, the municipality will introduce CNG vehicles in its own fleet. Furthermore the city of Nijmegen will increase the awareness on CNG among other fleet owners, like the local bus company and local companies. For example by organizing workshops and performing fleet scans. The city will also work at the introduction of a public CNG tank facility in Nijmegen.
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Company Information

In cooperation with ENGVA and Terberg Leasing, Ecofys will perform several tens of fleetscans. Progress of project: 
- Focus on CNG procurement: buses and cars (200 AFV) 
- Municipality as partner  
- Several workshops with relevant parties  
- Fleet scans with interested fleet owner

Pilot Case

Conclusions of project: 
- Condensed knowledge valuable (manuals) for municipalities and stakeholders  
- Relevant to include complete supply chain:  
e.g. bus companies, end users, concession authority  
- Integration on public tender process
Company Information

10 years experience in the research, development and implementation of Renewable Energy systems by offering consultancy and project implementation services.

ETA Florence will interview potential end-users in order to assess market barriers and potential solutions applying the developed PROCURA tools and models to tackle these barriers. ETA will perform fleet scans among public and private fleet owners, proposing and applying procurement models to fleet owners and groups of private car owners.

ETA will create private-public partnerships on FFV introduction and will develop political lobbying, together with the partners, to resolve the problem of the high taxation of alcohol.
Company Information

KAPE was established in 1994. The mission of KAPE is to develop and implement sustainable energy policies in Poland successfully implementing EU energy policy into national energy sector, playing a leading role in providing a wide range of sustainable energy services.

Pilot Case

To improve air quality in Polish municipalities and work towards a diversified fuel mix, the Polish National Energy Conservation Agency (KAPE) aims to introduce CNG-buses within various bus fleets. The planned action will deliver tools for national and local decision makers involved in fleet operations.
Contact

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Company Information

IST has been active in energy issues such as fuel cells, new and renewable energy sources, feasibility studies, sustainable energy technologies and energy systems for developing countries, development and transfer of technology, capacity building in developing countries (especially Africa).

The intensification of the use of biofuels is an important aspect of the current Portuguese strategy to reduce the dependence on oil products imports.

This is also an opportunity to explore the design of a geographical approach in the concept of “buyer pool”, also concerned with the management of a considerable fleet (public transportation, transport of goods and equipments, urban trash removal, etc).
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Company Information
Ford is market leader for bio-ethanol vehicles in Europe with 17,000 Ford Flexi-Fuel vehicles (FFVs) sold in Sweden since 2001 and more than 50000 sold in Europe) The Flexi-Fuel line-up is currently on sale in 16 European countries (eg UK, Ireland, Germany, Spain, Austria and the Netherlands). The company expects FFV production of up to 250,000 units in North America this year - with the total number of ethanol-powered vehicles built by Ford in the past decade totalling more than 1,5 million globally.

Pilot Case
Ford announced an expansion in its flexifuel range. Flexifuel allows a vehicle to run on either regular petrol or E85 - an 85/15 percent bio-ethanol/petrol blend - and automatically offsets any carbon emissions produced because more crops are always produced to meet the demand for fuel. In 2008 the existing FFV line-up consisting of Focus and C-Max flexifuel cars has been joined by Mondeo, Galaxy and S-Max derivatives. Ford Motor Company strongly supports the usage of sustainable fuels in order to have the best possible environmental effect. There is a strong need for partnership between the governments, fuel producers, car manufacturers, etc to join in an integrated approach to make the bioethanol solution a success.
Company Information

Founded in 2002, NTDA Energía is a leading international company. Its diverse business activities have established the company as a pioneer in the field of energy sustainability.

Pilot Case

Within this pilot, NTDA will identify local barriers on AFV development by interviewing relevant stakeholders and end users like public and private fleet owners, bus companies and fuel providers. Additionally, NTDA will develop and perform a training programme on maintenance, safety and use issues for fleet owners, car dealers, potential AFV drivers as well as supporting industry.
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Company Information

Utrecht University, Department of Innovation and Environmental Sciences. The department of Innovation and Environmental Sciences is responsible for Education and Research on relations between humans and the environment, environmental policy and its influence on sustainable development, and the management of innovation.

Pilot Case

Utrecht University is responsible to research the Procura project from a System Innovation Perspective, with an emphasis on the transition from the use of traditional vehicles toward Alternative Fuel Vehicles
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14. ANNEX – Overview of PROCURA reports and tools

D2.1 Report: Market barriers of large-scale AFV procurement

Target group: EU, partners, fleet owners, end users

Content summary: Identification and description of key barriers (related to infrastructure & market) considering type of alternative fuel, stakeholders and type of vehicle. Describes main alternative fuels for transport, required vehicle technology and additional infrastructure demands.

Keywords for content of report: Market barriers, additional infrastructure, AVF availability, operational costs, target groups, alternative fuels

D2.2 Manual for infrastructure development for AFVs

Target group: Fleet owners, municipalities, end users, and partners.

Content summary: Manual to AFV infrastructure development with alternative fuels infrastructure requirements (for biodiesel, ethanol and natural gas), safety practices, costs and feasibility and practical examples.

Keywords: Infrastructure for alternative fuels, regulations codes and standards, costs and feasibility

D2.3 Training guidelines for maintenance and support of AFVs

Target group: Maintenance personnel, Repair shops, fleet owners, end users.

Content summary: Manual with main guidelines for maintenance of AFV (oil and fuel filter change intervals, incompatible materials, etc). Characteristics of AFV’s. Maintenance costs, oil, fuel filter, exhaust valve storage

D2.4 User manuals for fleet owners concerning AVFs.

Target group: Maintenance personnel, fleet owners, end users, municipalities.

Content summary: Manual with an overview of the different technologies that can be adopted and the necessary supporting infrastructure (properties, characteristics, fuelling stations, vehicles maintenance and availability, safety, regulations and costs) in accordance with the type of alternative fuel (biodiesel, ethanol and natural gas) selected. Case examples for referred fuels

Keywords: Alternative fuels, filling stations, vehicles availability, safety, costs, regulations
D2.5 Report on available Incentive systems.

**Target group:** Municipalities, fleet owners, end users.

**Content summary:** Existent incentive systems implemented at local, national and EU level. Economical and financial instruments. Example of applications in different EU countries. Incentives (taxes, exemptions, levies, project subsidies)

**Keywords:** Eco-labelling, legislation, financial instruments

D3.1 Communicative economic tools that link green procurement to economic benefits

**Target group:** Fleet owners, end users, municipalities, fuel providers

**Content summary:**
- Tool consisting of various Excel books and a user screen interface.
- Tool allows fleet owners to examine potential economic as well as environmental benefits and challenges possible through a vehicle exchange within an existing fleet
- Handbook (User manual) explaining the use and analysis options of the tool.

**Keywords:** Software tool, effects vehicle replacement, emissions, fuel costs; Fleet owners, end users, municipalities, fuel providers.

D3.3 An outline for a certification system for green vehicles

**Target group:** EU, national governments, fleets owners, end users, fuel providers, car manufacturers.

**Content summary:** Background Document based on desk research and expert interviews. Presentation of different definitions of the term “certification” along with examples and potential use for AFVs.

**Keywords:** European CO2 Emission Trading System, US SO2 Trading Programme, Dutch “Groen label”, EU Energy Label, UK Fuel Economy Label

D3.4 An outline for successful Greenlease concepts

**Target group:** Fleet owner, lease companies, end users, fuel providers, car manufacturers.

**Content summary:** Basic concepts on what to consider when leasing AFVS (Contract elements and leasing forms, Benefits & Disadvantages of Green Vehicle Leasing, Fleet Analysis, Fleet Management, Maintenance, Repair, Eco-Driving, fuel saving mechanism & CO2 – Compensation schemes

**Keywords:** EURO Standards, Driver Mobility, Leasing options, Fuel Savings
D3.5 A platform of relevant stakeholders which aims to further develop an international supported certification systems for AFVs

Target group: Fleet owners, end users, carmakers, fuel providers, national governments, certification companies.

Content summary: Public Consultation of a public consultation on certification issues and corresponding analysis. Expert interviews presenting different market perspectives related to regulation demand, standardisation and labelling of alternative fuel vehicles.

Keywords: Certification, label, regulation, policy, standard, guarantee of origin, Trading Schemes, fuel economy, mileage, fuel quality, safety, EU Energy Label.

D4.1 Reports of workshops with local and regional fleet owners

Target group: Local and regional fleet owners, municipality.

Content summary: To increase the awareness on CNG among local fleet owners, the municipality will organize workshops about CNG.

Keywords: Increasing awareness, workshop, local fleet owners.

D4.2 Fleet scan reports with fleet owners, application of PROCURA tools.

Target group: Local and regional fleet owners.

Content summary: To increase the awareness on CNG among local fleet owners, the municipality will perform a CNG fleet scan for the fleet owners who are interested.

Keywords: Applying PROCURA tools, fleet scan, increasing awareness.

D4.3 Reports of meetings with bus companies and concession authority KAN

Target group: Bus companies, local municipalities.

Content summary: To stimulate the introduction of CNG busses in Nijmegen, the municipality will have intensive contacts with the various bus companies and with the regional public transport concession authority KAN.

Keywords: CNG buses, public transport, concession, applying tools, fleet scan, increasing awareness.

D4.4 Reports of workshops with automotive supporting industry

Target group: Car dealers, maintenance, municipalities.

Content summary: The automotive industry play an important role in the CNG chain. The municipality has organized several meetings with the local car dealers and to create common willingness to undertake some public actions to increase the awareness.
Keywords: car dealers, workshops, increasing awareness

D4.5 Increased activity on CNG in at least 5 SMEs of supporting industry.
Target group: Car dealers, maintenance, municipalities.

Content summary: Several local companies have increased their activities on CNG

Keywords: introducing CNG, procurement of CNG vehicles, experiences with CNG

D4.6 Plan of action o CNG introduction in the municipal car fleet.
Target group: Municipality

Content summary: The municipality will introduce CNG vehicles in its own fleet. Therefore, a plan of action has been made

Keywords: increasing awareness, procurement of CNG vehicles

D4.7 Report on feasibility of introduction to AFVs in the Terberg Rental fleet
Target group: Lease companies

Content summary: Based on the vehicle specifications and surrounding factors an identification was made for possibilities for Terberg Leasing to offer profitable alternative fuel vehicles for current and future customers.

D4.8 Report on feasibility of introduction of AFVs in the Terberg Rental fleet
Target group: Lease companies

Content summary: Based on the refuelling options for alternative fuels in the Netherlands an identification was made for possibilities for Terberg Leasing to offer profitable alternative fuel vehicles for current and future customers.

D4.9 Report with analysis of meetings with 600 fleet owners in lease context.
Target group: Lease companies, fleet owners, fleet owners in local government, NGOs and companies in a lease context

Content summary: An opinion poll has been held to represent the opinion of the client. 621 fleetmanagers and 379 drivers responded and were selected on the survey. Advantages and disadvantages were investigated for switching to alternative fuels.

D4.10 Reports of fleet scans with use of procurement tools on public and private fleet owners
Target group: Lease companies, public/private fleet owners.
Content summary: A substantial part of the PROCURA activities consist of the execution of fleet scans. In these fleet scans the various fleet owners receive a technical, economical and environmental assessment of their current fleet, based on the availability and prices of vehicles and fuel as well as their current operations and management.

**D5.1 Pilot Study for the introduction of Biofuels in the Lisbon area – Portugal**

Target group: Municipalities, fleet owners, end users, car makers.

Content summary: Characterisation of the Lisbon Municipality and its fleet. List of activities to develop in order to achieve a large scale introduction of AFV in the municipality of Lisbon’s fleet.

Keywords: Lisbon, fleet, municipality

**D5.2 Assessment of the main drivers for biofuel introduction in the Lisbon metropolitan area – Portugal**

Target group: Municipalities, fleet owners, car makers, fuel providers, end users.

Content summary: Main barriers and drivers to the introduction of biofuels in the local market. Local situation regarding alternative fuels and barriers and drivers for the biofuels introduction.

Barriers, drivers, AFV, biofuels, Lisbon

**D5.3 Fleet scan reports**

Target group: Fleet owners, municipalities.

Content summary: Report on the application of the fleet scan tool to each fleet, with the main results obtained and recommendations of the best renovation scenarios.

Keywords: Fleets, Fleet Scan, alternative fuels scenarios, AFV

**D5.4 Workshops with local and regional fleet owners**

Target group: Fleet owners, municipalities, energy agencies.

Content summary: Most relevant conclusions and remarks of each workshop developed with the intent to discuss alternative fuels and vehicles.

Keywords: Alternative fuels, AFV, fleets, biofuels experiences

**D5.5 Workshops with automotive supporting industry (car dealers, maintenance, among others)**

Target group: Automotive supporting industry (car dealers, maintenance, among others)
**Content summary:** Most relevant conclusions and remarks of each workshop.

**Keywords:** Alternative fuels, AFV, fleets, biofuels experiences

### D5.6 Roadmap for the analysis of similar action applicability by other local governments

**Target group:** Local governments, municipalities, fleet owners.

**Content summary:** Roadmap on the introduction of biofuels in local fleets, by cities and municipalities, with characterisations of the main AFV.

**Keywords:** Roadmap, biofuels, AFV, procurement, barriers, drivers

### D6.1 Fleet scan reports with fleet owners, application of PROCURA tools

**Target group:** Fleet owners

The purpose of the economic and environmental tool is to show a fleet owner the short term possibilities (available on local scale) to reduce the emissions of a fleet by changing to alternative fuels as well as the monetary impact of a vehicle exchange.

**Keywords:** Emissions, fleet, Compressed Natural Gas, biodiesel, bioethanol, costs, alternative

### D6.2 Workshops with local and regional fleet owners

**Target group:** Local and regional fleet owners

**Content summary:** The aim of the workshops was to present the project, main results and activities, to increase awareness about alternative fuels and alternative fuel vehicles, change in vehicle purchase behaviour towards AFVs, extend the concept of sustainable mobility and to discuss possible solutions for the reduction of the traffic in urban areas.

**Keywords:** Sustainability, mobility, emissions, costs, Alternative, experience

### D6.3 Workshops with automotive supporting industry (car dealers, maintenance, etc.)

**Target group:** Automotive supporting industry (car dealers, maintenance, etc.)

**Content summary:** The aim of the workshops was to present the project, to increase awareness about alternative fuels and alternative fuel vehicles, and to create regional public-private partnership on AFVs between automotive supporting industry, fleet owners, fuel providers, etc.

**Keywords:** Local, fleet, manager, biofuels, market, industry

### D6.4 Increased activity on Alternative Fuels in at least 5 organizations/associations in the AFV-chain

**Target group:** National and local government
Content summary: In order to increase activity on Alternative Fuels in many association and organization in Italy, many efforts have been made for creating contacts in the AFV chain. Alternative fuels and advanced technology vehicles are seen by Italian National and local Governments as integral to improving urban air quality, decreasing dependence on foreign oil, and reducing emissions of greenhouse gases.

Keywords: Market, barriers, biofuels

D6.5 Regional public/private partnership on AFVs

Fleet owners, governments, carmakers, fuel providers.

Content summary: Relevant partnerships have been established also for the AFVs market development and the PROCURA project has had an important role in this process by a continuous work with public and private organizations to create and maintain a wider infrastructure for these alternative fuels vehicles. Concerns about air pollution, energy security, and climate change have prompted the development of alternative fueled vehicles (AFVs) and policies to encourage their use.

Keywords: Pollution, development, bioethanol, transport, infrastructure

D7.1 Fleet scan reports of 15 bus fleets in Porland: state of art, barriers and solutions

Target group: Fleet owners

D7.3 Face to face meetings (15) with bus companies on technical and financial CNG issues

Target group: Bus companies, technical staff

D7.5 Report on second-hand market opportunities for CNG busses in Poland

Target group: CNG stakeholders, fleet owners, carmakers.

D7.6 Promotional folder

Target group: Fleet owners, bus companies, car makers, fuel providers

D8.1 New financial instruments in the Valencia Region supporting the development of infrastructures and acquisition of AFVs

Target group: Fleet owners, municipalities, financial institutions

Content summary: Document stating financing sources for the region of Valencia in to be applied to the creation of infrastructure or vehicle procurement.

Keywords: Procurement Models, infrastructure setup, Project Finance

D8.2 Fleet scan reports
Target group: Fleet owners

Content summary: Reports on the conducted Fleet Scans for the Valencia Region

CNG scenario,

Keywords: Bioethanol scenario, biodiesel scenario, fleet scan tool

D8.3 Workshops with local fleet owners

Target group: Local fleet owners, municipalities, bus companies, fuel providers

Content summary: Series of 3 workshops dealing with the local activities and problems of the production, distribution and use of alternative fuels and its vehicles.

Keywords: Food vs fuel debate, Valencia activities

D9.1 Report on cross-case evaluation of pilot projects

Target group: Fleet owners, carmakers fuel providers.

Content summary: Cross-case evaluation of pilot projects, elaborating on the pilot’s progress and the various barriers and enablers that were encountered. Conclusions are drawn on the general barriers and enablers that were most dominant throughout the pilot projects.

Keywords: Cross-case, evaluation, progress, barriers, enablers

D9.3 Generalisability of models, tools and manuals

Target group: Municipalities, EU, national governments.

Content summary: Report on generalisability of models, tools and manuals that were developed in WP2 and WP3 for specific countries, market segments and technologies

Keywords: Generalisability

D9.4 Policy recommendations

Target group: Municipalities, EU, national governments.

Content summary: Report on policy recommendations regarding the acceleration of green procurement, targeted on relevant stakeholders

Keywords: Policy recommendation
### 15. Nomenclature

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>AFV</td>
<td>Alternative Fuel Vehicle</td>
</tr>
<tr>
<td>B100</td>
<td>100% biodiesel</td>
</tr>
<tr>
<td>CNG</td>
<td>Compressed Natural Gas</td>
</tr>
<tr>
<td>CO₂</td>
<td>Carbon Dioxide</td>
</tr>
<tr>
<td>E10</td>
<td>Fuel Mix of 10% Ethanol + 90% Gasoline</td>
</tr>
<tr>
<td>E85</td>
<td>Fuel Mix of 85% Ethanol + 25% Gasoline</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>EP</td>
<td>European Parliament</td>
</tr>
<tr>
<td>EPA</td>
<td>US Environmental Protection Agency</td>
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<tr>
<td>EU-ETS</td>
<td>European Greenhouse Gas Emission Trading System</td>
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<tr>
<td>FFV</td>
<td>Flexi-Fuel Vehicle</td>
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<tr>
<td>GHG emissions</td>
<td>Greenhouse Gas emissions</td>
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<tr>
<td>HD</td>
<td>Heavy Duty</td>
</tr>
<tr>
<td>LD</td>
<td>Light Duty</td>
</tr>
<tr>
<td>NG(V)</td>
<td>Natural Gas (Vehicle)</td>
</tr>
<tr>
<td>NOₓ</td>
<td>Nitrogen Oxide</td>
</tr>
<tr>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>Particulate matter (or fine particles)</td>
</tr>
<tr>
<td>PPP</td>
<td>Public Private Partnership</td>
</tr>
<tr>
<td>REB</td>
<td>Regulating Energy Tax</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>UCO</td>
<td>Used cooking oil</td>
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</table>