

ORGANISATION FOR THE
PROMOTION OF ENERGY TECHNOLOGIES



Transport:
Results of activities 2003-2005

Context

Energy issues in European transport policies 4-5

Fuel-saving in-car devices 6-9

- 1 Testing the fuel saving effects 6
- 2 Learning the art of eco-driving 7
- 3 Promoting the use of fuel saving in-car devices 8

Biofuels for Transport 10-17

- 1 Policy on alternative fuels 10
- 2 Current market situation 12
- 3 Demonstrating new technologies 14
- 4 The next generation of biofuels 16

Clean buses for public transport 18-22

- Prioritising clean urban transport 18
- Clean buses: current options 19
- Benefits of retrofitting buses with soot filters 19
- STEP-UP 20
- Good Practice: CIVITAS 21
- Good Practice: CUTE 22

Conclusions and spin off possibilities 23

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Ever-increasing energy consumption is one of the greatest challenges facing Europe and the world today. Most consumption is derived from fossil fuels - much of it imported from outside Europe, depleting natural resources and contributing to global climate change, through increased greenhouse gas emissions. When the EU signed the Kyoto Protocol, it promised to reduce these emissions by 2012, by 8% in comparison to 1990 levels. To meet this commitment, significant changes of behaviour are required now, both in terms of energy supply and demand management.

The Organisation for the Promotion of Energy Technologies (OPET) Network, established by the European Commission, seeks to enhance sustainable energy production, distribution and consumption (excluding nuclear energy) by promoting the use and exchange of information on new technology in the marketplace. The resulting efficient knowledge transfer benefits all European citizens, supporting and implementing European policy priorities at EU, Member State and regional levels, accelerating innovation of renewable energy sources (RES) and the rational use of energy (RUE).

The OPET Network was restructured in 2002 around a series of Thematic Consortia to provide an integrated and comprehensive view of on-going research and to further innovative technologies deployment. The CO-OPET partners in cooperation with each Thematic Consortium have issued a Consortium brochure, which provides a summary of the promotion and dissemination actions undertaken between 2003 and 2005 in emerging sustainable energy technologies, aimed at the valorisation and integration of R&D results, pointing the way towards more intelligent energy use in Europe.

The OPET Thematic Consortia:

- Buildings
- Electricity generation from renewable energy sources (RES-e)
- Combined heat and power / District Heating (CHP/DH)
- Clean fossil fuels (CFF)
- Energy issues in transport
- New energy technologies in the Mediterranean region (MEDNET)
- Modern and clean energy and transport technologies in Latin America and the Caribbean (OLA)
- Early market introduction of new energy technologies (EMINENT)
- and
- CO-OPET, support to the OPET Network

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Partners working together

Adopting new energy technologies and reducing energy consumption in the transport sector is critical to meeting Europe's overall goals. According to the Commission's November 2000 Green Paper *Towards a European strategy for the security of energy supply*, energy consumption in the transport sector in 1998 accounted for 28% of emissions of carbon dioxide (CO₂-the leading greenhouse gas). Road transport is the main culprit, since it alone accounts for 84% of the CO₂ emissions attributable to transport.

Seven partners worked together within the OPET network, integrating their knowledge and expertise on energy issues in transport and giving feedback to the European Commission on the application at local level of European energy technologies in transport.

The main activities included:

- developing a strategy for OPET on transport-related energy issues
- hosting an OPET conference on 'Energy issues in transport' (Brussels, 25-26 May 2004).

The partners focused their efforts on promoting technologies in three critical areas:

- Fuel saving in-car devices
- Biofuels for transport
- Clean buses for public transport

The OPET Transport Consortium brought together seven organisations:

- SenterNovem (The Netherlands)
- STEM (Sweden)
- VTC/VITO (Belgium)
- Motiva (Finland)
- DULAS (Wales, UK)
- IDAE (Spain)
- GIEC (China)

The precarious energy situation in the European Union, characterised by strong dependence on energy imports such as mineral oil, is addressed in the Commission's 2000 Green Paper *Towards a European strategy for the security of energy supply*. Reducing dependency on imports and reducing greenhouse gas emissions in order to meet the Kyoto requirements are the two most pressing objectives.

The Green Paper outlines a long-term energy strategy on regulating energy demand, for example by fiscal instruments. Fostering demand for new energy technologies should prevail over supporting supply.

Within the transport sector, therefore, we need an active policy aimed at energy conservation and efficiency combined with diversification to less-polluting energy sources.

This policy was laid down in the 2001 White Paper *European transport policy for 2010: time to decide*. The new objective of the Common Transport Policy is: "restoring the balance between modes of transport and developing intermodality, combating congestion and putting safety and the quality of services at the heart of the efforts, while maintaining the right to mobility".

Besides reducing fuel use, the Commission has set the objective for road transport to replace 20% of conventional fuels with substitute fuels by 2020.

The White Paper set out an Action Programme of 60 measures to be undertaken before 2010, such as fair pricing, and measures for improving railways, short-sea and inland shipping, intermodality and urban public transport. The Union has adopted a Directive on the gradual introduction in each Member State of a minimum proportion of biofuels consumption, as well as new Community rules on tax reductions for biofuels.

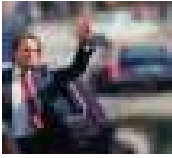
In addition, new clean car technologies (natural gas, hydrogen) are given greater EU support. Among others, the Commission has brought together several sources of financing in the CIVITAS initiative, which supports cities which pioneer innovative projects on clean urban transport. Similarly, the CONCERTO initiative supports communities taking the lead with innovative projects on sustainable energy systems including energy for mobility.

The OPET Network also aims to contribute to development and support for European enterprise. Whilst energy-efficiency efforts are required across all modes of transport, both at local and regional levels - at which members of the OPET Network operate, it is in road transport that results can best be obtained. Within the Consortium, efforts have focused on three areas:

- technologies in cars to save fuel
- up-take of alternative fuels
- developing clean bus fleets for urban transport.

Individual partners have worked on a wide range of projects and initiatives in their local region - many of which are described in this brochure. Whilst the results of these projects are valuable in themselves, the aims of the Consortium - and of this brochure - are to exchange experiences and ideas with a wider audience. The examples quoted in this brochure demonstrate that energy saving by road transport users is possible and provide a range of ideas and references for stakeholders to follow up.





Technologies which can help drivers save fuel include cruise control, on-board computers, limiters (road speed and/or engine revolution), gear-shift indicators, automated stop-start mechanisms and tyre pressure monitors.

The OPET Consortium aimed to draw up an efficient European strategy to promote fuel saving in-car devices, and additionally to assist China to give reality to the 2008 Olympic slogan 'Green Olympics'. The Chinese Government aims to drastically reduce exhaust gas emissions by 2008 when the Olympic Games will be held in Beijing. A first successful workshop was held in Brussels in September 2003. A March 2004 seminar was also held in Beijing and a workshop was held during the concluding OPET 'Energy issues in transport' conference in May 2004.

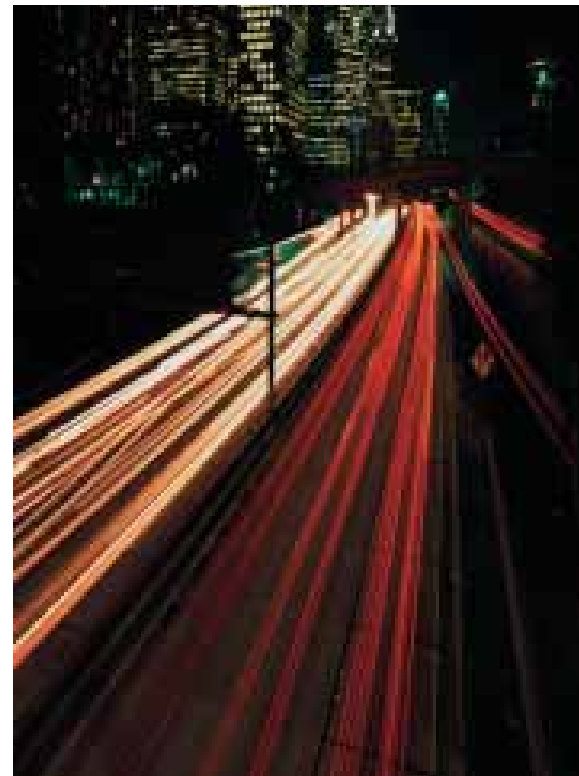
1 Testing the fuel saving effects

A large number of demonstration projects and field tests with fuel saving in-car devices have been carried out since 1990, in The Netherlands and elsewhere. These projects have included testing of econometers, eco-revolution meters, on-board computers, cruise controls, fuel consumption meters, speed and revolution limiters and shift indicators.

Even without undergoing any eco-driving training, drivers using such devices saved an average of 5% on their fuel consumption (although some drivers obtained no reduction in fuel-consumption, others achieved a reduction of well over 10%). Three conclusions can already be drawn from these results:

- Equipping a fleet of cars with fuel saving in-car devices reduces fuel consumption by an average of 5%.
- The benefits of fuel saving in-car devices are substantially higher (on average around 10% reduction in fuel consumption) when combined with eco-driving courses.
- The functionality of in-car devices has to meet certain criteria (in particular, display and operability) to maximise their effectiveness.

Several reports on these experiments and field tests are currently available.



2 Learning the art of eco-driving

Significant experience has been gained with individual, fuel efficient driving training - so-called 'eco-driving' courses for licensed drivers and for learner drivers through driving school curricula. Following eco-driving courses, drivers have achieved fuel consumption savings ranging between 10% and 30%, in comparison to typical driving habits where engine speed levels (revs per minute-RPM) are generally too high in lower gears, coupled with frequent acceleration and deceleration. Lasting fuel savings can be counted on and a reduction in CO₂ emissions is at around 10% per driver.

Positive experiences with eco-driving have led to changes in driving examination criteria in countries such as The Netherlands and Lithuania, where the objective is to ensure that all new and young drivers adopt fuel saving driving habits at the outset. However, the majority of licensed car drivers continue a less efficient driving style unsuited to modern engine technology (high power, high torque at low RPM, electronic engine management, turbos and variable valve technology). As a result, the vast majority of drivers consume 10-20% more fuel on average than is necessary. Hence, a range of national and international programmes is needed to promote driver training and dissemination of driving style tips and know-how.

Results from European and Chinese market studies



A quantitative market survey has been conducted to establish the experiences with and requirements for fuel saving in-car devices among users and potential users. The study focused on five European countries - The Netherlands, Germany, France, Finland and Spain - as well as the City of Beijing and the fast developing region of Guangzhou in Southern China.

Conclusions from Europe:

- 84% had a rev counter; 21% had cruise control.
- 38% had a fuel-consumption meter; 66% would like to have a fuel-consumption meter as standard equipment.
- 32% had an on-board computer, of which 91% provided the driver with information on current fuel consumption.
- 5% had a tyre-pressure monitoring system; 60% would like to have a tyre-pressure monitoring system as standard equipment.

Conclusions from China:

- 75% had a rev counter; 22% had cruise control.
- 45% had a fuel-consumption meter; 72% would like a fuel-consumption meter as standard equipment.
- 18% had an on-board computer, of which 91% provided the driver with information on current fuel consumption.
- Drivers aged between 18-24 would like to receive traffic information via an on-board computer, particularly in Beijing.
- <1% had a tyre-pressure monitoring system; 64% would like to have a tyre-pressure monitoring system as standard equipment.

3 Promoting the use of fuel saving in-car devices

Currently, The Netherlands eco-driving programme, *Het Nieuwe Rijden* encourages the retrofitting of fuel saving in-car devices in current fleets, informing target groups of the benefits and providing financial support. However, few car drivers and fleet owners are sufficiently motivated to equip their existing vehicles. Interest is therefore mainly restricted to standard or optional in-car devices in new cars.

The main reasons for this reluctance include the high cost of retrofitting, the fact that most devices are fuel specific (either petrol or diesel), as well as a number of warranty and liability issues. Retrofitting of in-car devices does not appear, therefore, to be a realistic option.

In this context, a Dutch working group on fuel saving in-car devices was set up. This group, working in close contact with the European Commission, ACEA (the European Carmakers' Association) and VDA (the Association of German Car Manufacturers), aims to equip all new cars in Europe with fuel saving in-car devices as standard. Particular attention is currently being given to sophisticated gear-shift indicators which signal the driver when to change gear.



Relevant publications

- Hoogma, R.J.F.**, *A transport energy strategy for the OPET Network*, March 2004, SenterNovem, The Netherlands
- Hoogma, R.J.F., et al.**, *Reasoning paper on in-car equipment*, February 2004, SenterNovem, The Netherlands
- NEA**, *Fuel saving in-car devices in passenger cars: A European market survey*, November 2004, The Netherlands
- Wilbers, P.T.**, *Final report, including results of the market survey and the workshops, on strategies for Europe-wide promotion of in-car devices and for reaching the 'Olympic goals' in emission reduction of Beijing/China in 2008*, October 2003, SenterNovem, The Netherlands
- Wilbers, P.T.**, *Factsheet on fuel saving in-car equipment (Dutch)*, September 2004, SenterNovem, The Netherlands

Good Practice

Securicor equips surveillance vehicles with rev counters and speed limiters.

The mobile patrol service of Securicor undertakes opening and closing security rounds for companies and households, as well as intervening when alarms go off.

For the *Introduction to the Ecodrive System* project, 130 Securicor surveillance cars in The Netherlands were equipped with a rev counter and speed limiter. The rev counter, provided by the company Ecodrive, can limit the number of revolutions at each gear level. This requires drivers to shift gears on time and to drive at a controlled speed.

The vehicles were equipped with these in-car devices at the end of 2003. To measure the effect of the devices, fuel consumption over the distance travelled has been recorded. A total reduction in CO₂ emissions of 92.4 tonnes is expected.

Policy recommendations

- Initiate a European-level initiative standardising equipment in all new cars in the Member States, with one or more in-car instruments factory-installed at lowest or no extra costs.
- Support such actions through a Europe-wide publicity campaign on eco-driving, encouraging drivers to use the on-board devices in their cars and to change their driving behaviour.





The EU adopted two Directives for the promotion of biofuels for transport in 2003.

2003/30/EC Promotion of the use of biofuels and other renewable fuels for transport establishes a voluntary scheme for the introduction of biofuels in road transport, aiming for 5.75% of consumption by 2010, (from a proportion of 2% of fuel consumption for road transport which was projected for 2005). Each Member State sets its own targets, and if these are lower than the reference targets, must justify them using objective criteria.

2003/96/EC Restructuring the Community framework for the taxation of energy products and electricity allows Member States to apply a reduced rate of excise duty on biofuels.

The market penetration potential of these alternative fuels and transport technologies depends on many factors, such as geographical coverage, production cost, availability of infrastructure and adapted vehicles, etc. Enhancing the market for biofuels (production, vehicles, pilot actions) and national strategies to implement the Biofuels Directives were reviewed and the results were presented and discussed at the May 2004 OPET 'Energy issues in transport' Conference in Brussels.

The main conclusions were:

- both the short- and long-term targets are very ambitious.
- continuous support during the market development phase is essential to build up the emerging biofuels market.
- the adoption of the Directives launched a strategy for the substitution of fossil fuels, but this has to be supported by national strategies.

working on ethanol solutions (for example, 5,000 ethanol powered cars in Sweden; investments by Shell in ethanol production plants; research in ethanol derived from lignocellulose).

The Commission's Green Paper *Towards a European strategy for the security of energy supply* introduced the objective of substituting 20% of fossil fuels in the road transport sector with alternative fuels by the year 2020. The Commission sees three main alternative fuels contributing to the desired substitution: biofuels, natural gas and hydrogen.

The biofuels which currently have the largest market potential appear to be rape-seed methyl ester (RME) and UFO-ME (used frying oil methyl ester). However, new developments (for example, in France and Sweden) show an emerging market for the use of biogas as fuel. Other developers are also

Availability of biofuel vehicles (Spring 2004)

Brand	Biofuel allowed	Model & Market	Brand	Biofuel allowed	Model & Market
Passenger cars			All petrol engines		
Ssang Yong	0% of ethanol	All models	Volkswagen	5.5 % of ethanol	All petrol engines
Suzuki	0% of ethanol	All models	All diesel engines		
Alfa Romeo	2% ethanol	-	Fiat	5% RME, (EN 590)	All diesel engines, sales per year 480,000 (EU 25)
Audi	5.5% ethanol	All	Fiat	Fisher Tropoli Diesel, (EN 590)	All diesel engines (All countries), sales per year 480,000 (EU 25)
BMW	5.5% ethanol	All, except Engines M98, M62, M62	Pass. cars, Pick up		
Chrysler	10 % ethanol	All models, 1997 on	Toyota	10% of ethanol	Avensis, Centry, Corolla, Hi Ace, 1998 on (Biofuels not available in Portugal)
Citroen	10 % ethanol	Berlingo, 1998 on	Chevrolet	85 % ethanol	S10 Pick up flexifuel, model 2,000 and on
Citroen	10 % ethanol	ZX, 1998 on	Trucks		
Ford	10 % ethanol	Escort, Fiesta, Ka, Focus, Mondeo, Puma, Scorpio, 1998 on	Scania	5% RME	All models
Honda	10% ethanol	All	DAF	30% RME	Euro 3 engines
Mazda	10% ethanol	1987 on	Other vehicle types		
Opel	10% ethanol	All	BOVA-VDL	Biodiesel mix	Putina & Magiq (All countries)
Saab	10% ethanol	9-5 2.0, + all exhaust catalyst models	Coach	30% RME	
Suzuki	10% of ethanol	All models	Ford Van	10% ethanol	Transit
Volvo	10% ethanol	S/V 40, S/V 70, S/V 70 2.5 GLT, 1998 on, S80 & other models, 1982 on	Paggio LDV's	0% of any biofuel	All
Mitsubishi	10-15% ethanol	MPI engine, 1989 on	Torberg Special duty Trucks	0% of any biofuel	All models
Renault	15% ethanol	Clio 19, Espace, Laguna, Megane, Twingo	Fiat	Biogas	Multipia B, Doblo B, Ducato B, Punto B (Mainly Italy & Germany), sales per year 7,500, sold until now 40,000
Fiat	ETBE additive (EN 228) 15%	All (all countries), sales per year 1,170,000 (EU 25)	Hyundai	5% ethanol	-
Fiat	20-21 % ethanol	Pala, Doblo, S10 Sp, Uno, Fiorino 156 / 147 (Brazil)			
Ford	85% ethanol	Focus Flexifuel (2001 on), Taurus (1994 on)			



2 Current market situation

Vehicles

The publication of the Biofuels Directives in 2003 created an important market impetus, and Member States are now in the process of defining strategies for further market support .

The partners in the Opet Consortium have collected information on the makes and models of cars which can use biofuels. It should be noted that at present many vehicles can be run on petrol (or diesel) mixing in a low proportion (5-10%) of a biofuel. The table on page 11 gives an updated overview of the suitability of many makes and models of cars to run on biofuel mixes.

Future developments will be determined not only by technical developments but also by business alliances (for instance, between biofuel producers and car manufacturers) and by national and EU political developments. Currently, across Europe, there are many vehicles available which can run on low percentages (5 -15%) of RME or ethanol without invalidating the manufacturer's guarantee. There are however big differences between car brands (and even amongst different markets for a given brand) in the levels of biofuel tolerated by the engines. Moreover, there are still very few vehicles specifically designed to run on mixes with higher proportions of biofuels.

Fuels

The production of biofuels in the EU has grown rapidly in recent years. Indeed, in the near future, it seems unlikely that European countries will need to import biofuels from outside the Union. EU commitments to reduce CO₂ emissions as well as a desire to use fallow land and/or agricultural residues is motivating Member States to produce their own biofuels. The agricultural capacity of the new Member States will be an important resource.

Likewise, most of the biofuels produced within the European Union appear to be consumed within the EU Member States. An International Energy Agency (IEA) report *Biofuels for Transport - An International Perspective* (2004) estimates that, given current technologies and processes (citing feedstock, crop yield and fuel conversion data for the EU, US and Brazil), 5% of gasoline could be replaced by ethanol (8% ethanol by volume) over the next 10-20 years without major disruptions to domestic crop markets or food supplies.

For biodiesel however, despite rapid growth, production volumes remain relatively low. Achieving diesel fuel displacement greater than 3-5% may well require major increases in biodiesel crop production and significant land re-allocation.

Finally, the target of 5.75% of transport fuel displacement by 2010 has to be achieved in the context of persistent rapid growth in vehicle use.



European biofuels production-current figures

At present, the EU Member States producing biofuel have only a small share in the overall global production of biofuels (around 6% or 890,600 tonnes in 2000).

Ethanol constitutes the majority of global biofuel production (14.6 million tonnes in 2000), the largest producers being the USA and Brazil. European production of ethanol for use as an automotive fuel has increased from 47,500 tonnes (1993), to 216,000 tonnes (2001).

However, Europe is the world's major producer of biodiesel and major production and use of this biofuel has developed over the last 5-10 years.

European biodiesel production/ thousand tonnes	
1993	80
2001	780
2003	1,434
2004	1,933

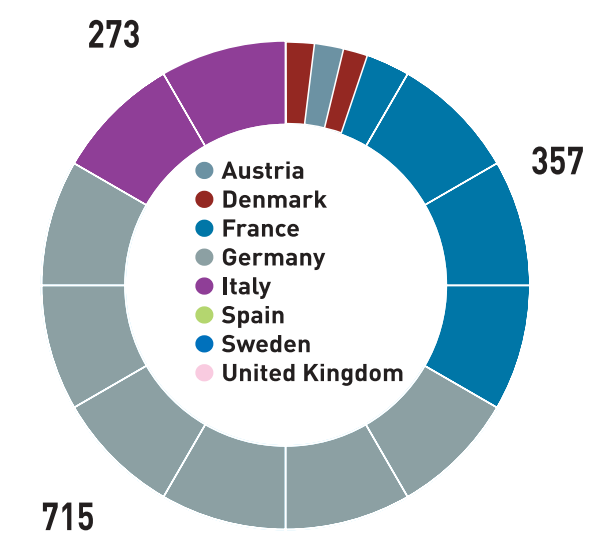
(source: European Biodiesel Board)

In 2000, consumption of ethanol and biodiesel combined accounted for less than 1% of consumption of gasoline and diesel in the EU.

The major EU producers are Germany, France, Italy and Austria for biodiesel, and France, Germany, Italy and Spain for ethanol. There is less biofuel production activity in Belgium, Finland, Greece, Ireland, Luxembourg, The Netherlands and Portugal.



Biodiesel production 2003 (000 Tonnes)



3 Demonstrating new technologies

A significant number of demonstration and pilot projects have been identified by Consortium partners, underlining the relative maturity of some technologies. However, very few EU level public-funded research and development projects on biofuels for transport have been carried out over the past five years.

Under a range of EU programmes, the main European-level work in this area was implemented between 1978 and 1995. The research accomplished during this time helped bring to the market both bioethanol (from sugar or starch) and biodiesel (from rapeseed). It also highlighted the cost and technical difficulty of lignocellulose hydrolysis, currently being tested in Swedish pilot plants.

A more recent area of research activity is the production of hydrogen from biomass.

For more information:
www.biohydrogen.nl



Using cellulosic raw materials:

The Centre for Swedish Development of Ethanol Production, is a pilot plant being built in Örnsköldsvik to develop and verify technologies used to produce ethanol and lignin from lignocellulose.

By 2008, the base should have been established for the production of ethanol and lignin from lignocellulose, which will be associated with CHP and/or industrial-process plants.

The pilot plant represents a significant increase in scale towards full production in comparison to previous laboratory production. The plant is also able to run the entire process from raw material to final product.

A two-step process will be followed; a combination of diluted acid and enzyme-hydrolysis. The capacity will be two tonnes of dry substance producing 500 litres of ethanol every 24 hours. A complete plant with recirculation of process streams will be used.

The pilot plant has been established in Sekab's Domsjö factory premises in Örnsköldsvik. It is fully equipped but will not produce ethanol for sale. The development company, Etek Etanolteknik AB was formed to build and operate the plant. The owners of Etek are the Övik Energi AB, Skellefteå Kraft AB, Umeå Energi AB (all regional energy companies) and Sekab. The pilot plant will work as a research and development centre in cooperation with Lund University, Chalmers University, Umeå University, Mid-Sweden University and others.

For more information:
www.etek.se

Taxi fleet in Graz converts to biodiesel

Supported by the CIVITAS Trendsetter project, this measure focuses on the large-scale introduction of biodiesel in a fleet environment. Some 60% of the 120 cars in the fleet of TAXI 878, a taxi company in the Austrian City of Graz, will shift from diesel to biodiesel.

The large-scale introduction of biodiesel in a taxi company will make it possible to gather information about repair, maintenance and service needs when using biodiesel. In this context, a central decision to change fuels is not enough, since most taxis are franchised to individual operators. Facts and information are needed to convince these individuals to change fuels.

Taxi 878 is working to reduce its environmental impact. All its drivers are introduced to environmental issues as a part of a one-day training programme covering the entire company. In order to facilitate the shift to biodiesel, a biodiesel refuelling station has been established at Taxi 878 headquarters. This refuelling station is also open to the public, thereby encouraging other companies, as well as citizens, to use biodiesel.

The Taxi 878 drivers are the first target group of a planned information campaign in support of the initiative. The campaign addresses subjects such as the quality of biofuel and its compliance with existing DIN norms, use of the fuel on cold winter days and biodiesel use in general. Other taxi companies in Graz and in the region of Styria will learn from the experience gained by Taxi 878.

Graz has also converted most of its bus fleet to run on biodiesel.

For more information:
www.trendsetter-europe.org
<http://trendsetter-graz.fgm.at>



4 The next generation of biofuels

The so-called 'second generation' biofuels will provide a sustainable option, offering high CO₂ reduction and avoiding competition with the food chain. Possible routes are biomass gasification, followed by a synthesis step, resulting in a diesel substitute such as 'Sunfuel' and hydrolysis of lignocellulosic biomass, resulting in bioethanol.

Two of the most promising future biofuels are Fischer Tropsch (FT) diesel and lignocellulosic bioethanol. The estimated cost of FT diesel (excluding agricultural subsidies) in the medium term is around € 0.75 per litre and, in the longer term, around € 0.40/l. By comparison, ethanol from ligno-cellulosic biomass is estimated at € 0.60/l and € 0.38/l respectively.

The cost of greenhouse gas avoidance by using FT diesel, in the medium term is around € 180/tonne CO₂-equivalent and € 35/tonne CO₂-equivalent in the long term. In the case of LC bioethanol, this is around € 300/tonne CO₂-equivalent in the medium term, and around € 100/tonne CO₂-equivalent in the longer term.

A biofuels market with a stable long-term incentive system should lead to the establishment of much higher industrial R&D budgets, able to fund the innovation needed to achieve the cost levels outlined above.



Relevant publications

Broek, R. van den, et al., *Biofuels in the Dutch market: a fact-finding study*, November 2003, SenterNovem & Ecofys, The Netherlands

Lopes, C. and Hoogma, R.J.F., *Overview of R&D Projects in Biofuels for Transport*, July 2004, STEM / SenterNovem, Sweden / The Netherlands

Mulder, F.W.J., *State of the art biofuel vehicles*, May 2004, SenterNovem, The Netherlands

SenterNovem and Viewls, *Clear Views on Clean Fuels: Data, Potential, Scenarios, Markets and Trade of Biofuels*, SenterNovem, The Netherlands

VITO, *Policy framework for further support of the EU biofuel market*, May 2004, Belgium

Warrington, A., *Overview of the Production of Biofuels in the EU*, May 2004, Dulas Ltd, United Kingdom

International Energy Agency, Biofuels for Transport, *An International Perspective*, 2004, IEA, France

Good Practice: VIEWLS



The purpose of VIEWLS (*Clear Views on Clean Fuels*) is to provide a clearer view of information on biofuels and their future prospects. This project aims at assisting policy-makers, NGOs and industrial decision makers to select optimal pathways for the development of biofuels in Europe and their introduction in the market.

The main objective is to assist policy makers and industrial organisations to identify possibilities and strategies for large-scale sustainable production, use and trade of biofuels for the transport sector in Central and Eastern European countries.

Specifically, it aims to:

- Promote better understanding among European stakeholders of the economic and environmental performance of biofuels
- Promote greater understanding of the potential of biomass in Europe, West and East
- Identify promising international trading chains for biofuels
- Increase understanding of socio-economic impacts on the agricultural, industrial and transport sectors in Europe.

Through an integral analysis the project seeks to provide to the European Commission, as well as industrial and other stakeholders a sound information basis, for future decision-making, policy formulation and information dissemination activities, in order to facilitate the successful introduction of biofuels into the European energy system.

www.viewls.org

Policy recommendations



Develop

- Economic instruments that stimulate the market for biofuels, preferably linked to CO₂ performance and with a long-term perspective.
- Biofuels standards (e.g. CEN/TC 19: European Standardisation Committee on petroleum, fuels, and alternative fuels). Standards on quality specifications for different biofuels, as well as for the handling, safety and health issues related to these fuels are all needed for further development and greater availability of biofuel vehicles.
- An overall EU biofuels platform that involves all biofuels actors: biofuel producers, biofuel projects, municipalities, industrial and commercial fleet owners, biofuel technology stakeholders, etc.

Establish

- A High-Level Biofuels Group to investigate the needs and possibilities for Member State and EU biofuels R&D funding programmes, and the requirements for an ERA-Net (European Research Area-Net) for biofuels R&D stakeholders.
- An independent monitoring system to assess and evaluate ongoing and future biofuel projects. This monitoring system should be able to report confidentially to the Commission, as well as provide more general information to biofuels stakeholders.

Under the previous and current research Framework Programme, the EU has prioritised clean urban transport, most recently through the CIVITAS initiatives for demonstration of integrated strategies. Testing of new technologies, traffic and mobility management and innovative goods distribution solutions are supported by large-scale demonstration projects.

New technologies for buses include diesel exhaust after-treatment, alternative fuels and drive systems, and new vehicle concepts. Local decisions to adopt new energy technologies can be complicated, since services are often organised through several partners, some public, some private. Where there is competition, individual operators are reluctant to undertake investments which could put them in a less favourable position than their competitors.

The OPET Consortium has looked at an instrument for evaluating new bus technologies in several EU countries. The aim is to stimulate public transport authorities and through them the operators, to consciously assess the energy and environmental aspects of their services and plan for gradual improvements. Through such initiatives, the consortium partners are supporting the dissemination of EU and national research on energy technologies for buses.

1 Prioritising clean urban transport

Currently, the EU prioritises clean urban transport through the CIVITAS initiatives for demonstration of integrated strategies.

Promoting low emissions technologies for public transport buses poses a threefold challenge:

- **Information:** Stakeholders (authorities, transport providers, industry) need to be informed about the existence and performance of these technologies. Performance is related to ecological benefits and financial costs.
- **Evaluation:** Stakeholders need to be assisted to compare options and weigh up the environmental benefits against the added costs of the clean alternatives.
- **Timing:** Decision makers need support at the appropriate moment in the decision process.

In consequence, energy and environmental aspects are often neglected in the tendering procedure.

Competitive tendering aims to combine an element of competition with effective regulation, to ensure high quality and environmental standards while reducing costs. The successful operator is awarded exclusive rights to operate a route or a network of routes. The authority may also grant subsidies to compensate for the fulfilment of specific public service requirements.

Environmental aspects included in tendering: SIPTRAM

The Sustainability in the Public Urban Transport Market (SIPTRAM) project aims to encourage local and regional authorities across Europe to improve the environmental and quality standards in urban public transport through the competitive tendering process.

This approach has been successfully implemented across Europe. The Scandinavian countries were early adopters. For example, the Swedish City of Gothenburg has achieved a 7.5% increase in passenger numbers, whilst reducing public subsidies by 30%.

In addition to policy tools such as spatial planning, price incentives and transport infrastructure investments, there are a number of factors crucial to the success of competitive tendering and improving environmental and social standards in urban public transport:

- Public transport plans should be based on a long-term vision for integrated sustainable urban transport, consistent with other policies and approved by citizens.
- Emphasis should be placed on ensuring public transport access to all large land use developments.
- It is essential to work with key providers and develop a dialogue between procurement agencies, suppliers, manufacturers, regulators, transport development organisations, businesses and citizens' groups.

For more information:
www.increase-public-transport.net



2 Clean buses: current options

The range of possible alternative propulsion technologies depends on the overall weight of the vehicle. Currently, there are three propulsion technologies available for buses: diesel (possibly in combination with a soot filter), LPG (liquid petroleum gas) and CNG (compressed natural gas) engines. In addition, biodiesel, bioethanol and biogas can also be used to fuel buses.

3 The benefits of retrofitting older buses with soot filters

In order to minimise the emissions of soot (PM₁₀), a so-called 'soot filter' - a system which catches soot in a filter and converts it by means of catalysis - may be used with a diesel engine. This may oxidise soot by placing catalytic materials in the exhaust system, by combustion or heating of the soot.

Depending on individual circumstances, the engine type (older engines emit more soot, compared to newer engines) and the percentage of sulphur in the fuel, a soot filter can reduce the emission of particles by up to 80-90%. A soot filter can easily be fitted to existing vehicles.

4 STEPUP

Authorities wishing to adopt new technologies will normally wish to point to precise figures concerning environmental benefits, additional costs, available technologies, maintenance etc.

For this reason, SenterNovem has developed a software application: the *Strategic Tool for Ecological Public Transport* (STEPUP), which was developed and first tested in The Netherlands, and is a computer programme that can be used to:

- Determine feasible energy and environmental objectives in the call for tender, by comparing the costs and benefits of different compositions of a bus fleet.
- Evaluate bids from different public transport companies, by comparing the costs and benefits of different bids.
- Monitor the ecological performance of public transport companies.

Experiences in the Netherlands

IMOVA, (the Dutch name for STEPUP) has been applied in cities like Haarlem, Utrecht and Tilburg.

Haarlem decided to ask for Compressed Natural Gas (CNG) engines in the tender requirements, but did not take the extra costs into consideration. But in a second attempt the city has granted the concession for the operation of an all-CNG bus fleet starting end of 2005.

Utrecht made a request for (second-hand) Liquid Petroleum Gas (LPG) buses in their requirements to the operator.

Tilburg wanted to ask for CNG buses, but initially only asked for cooperation in a follow-up study on CNG buses introduction. Here too, lessons learnt led to a successful second attempt. The bus fleet will be switched to CNG in 2006.

Five more authorities in the Netherlands are preparing to request CNG buses in public tendering of their local public transport.

STEPUP: the Strategic Tool for Ecological Public Transport

This tool comes in the form of a *Handbook for local Authorities* which provides a thorough evaluation of the 'pros' and 'cons' of specific drive technologies in combination with the different fuels.

The vehicles used in urban and regional public transport contribute considerably to poor urban air quality. Moreover, emissions from regional and local buses have demonstrable damaging effects on public health, especially from nitrogen dioxide (NO₂) and particulate matter (PM₁₀). Buses also contribute to the emission of CO₂ which speeds up the damaging process of climate change.

Local authorities have a major role to play, acting as an example to both residents and the business community when it comes to solving these environmental problems.

In the field of traffic and transport, public authorities can demonstrate their commitment to energy solutions by including ecological requirements in their specifications for competitive tender bids by urban and regional public transport operators.

Tender recommendations:

- Environmental aspects can be introduced in tender policy documents, in specifications and in other documentation. Environmental aspects should also be assessed as part of the control and monitoring of the concession.

The environmental focus should be included as a critical criterion in the specifications (schedule of requirements). Including environmental impact as an additional quality mark in the specifications may also be worthwhile, as well as indicating that this factor will play a key role in the evaluation procedure.

Relevant publications

Motshagen, R.E., *STEPUP: Strategic Tool for Ecological Public Transport (Software)*, January 2004, SenterNovem, The Netherlands

Hoogma, R.J.F. and Motshagen, R.E., *STEPUP: Strategic Tool for Ecological Public Transport: Handbook for authorities*, February 2004, SenterNovem, The Netherlands

Good Practice: CIVITAS

The CIVITAS initiative addresses the challenge of effecting a radical change in urban transport, by combining technology with policy-based instruments and measures.

Pilot cities participating in CIVITAS (see map below) implement a policy mix, with *leader* cities adopting large-scale schemes and the so-called *follower* cities implementing more limited schemes.



Each aims for the same result but the policy mix chosen by each city differs to take into account local circumstances.

In this way, each city develops an original approach to the implementation of specific CIVITAS measures. However, the evaluation of the impacts is undertaken in a similar way in each city.

For more information:
www.civitas-initiative.org

One of the CIVITAS projects is 'Trendsetter', involving the cities of Stockholm, Lille, Graz, Pecs and Prague. Amongst the many positive initiatives of this project is the introduction of new biogas buses in Lille.

128 new biogas buses in Lille:

The Syndicat Mixte des Transports, Lille's local public transport authority, is to increase fourfold the number of biogas buses in its municipal fleet. The share of such buses in the fleet will rise to 50% by 2005. The authority plans to gradually increase its use of biogas, utilising biogas produced in a planned organic waste fermentation plant in a new and adjacent bus depot.

Currently, 13% of Lille's buses are gas-powered, most using natural gas and a few using biogas produced in a pilot facility at a sewage sludge treatment plant. The large-scale introduction of biogas buses is a result of positive experience with currently operational buses.

At the launch of Trendsetter, a total of forty-two gas buses were already in operation in Lille. By October 2003, a further sixty five buses had been purchased from Irisbus, the manufacturer.

Lille will also build a natural gas and biogas refuelling station for up to 150 buses. A similar facility will be introduced at the planned biogas bus depot.





Good Practice: CUTE



Clean Urban Transport for Europe (CUTE) is an EU initiative to test three purpose designed low noise fuel-cell powered Mercedes-Benz Citaro buses in nine European cities (plus Iceland and Australia).

The project aims to demonstrate the feasibility of an innovative, highly energy-efficient, clean urban public-transport system. This requires the establishment of appropriate regional hydrogen production and refuelling infrastructures.

This kind of public transport system will contribute significantly to the reduction of overall CO₂ emissions. In addition the elimination of local nitrogen oxides (NO_x), SO₂ and particulate emissions will improve urban health and living conditions.

The project also hopes to raise public acceptance of hydrogen fuel-cell transport systems.

For more information:
www.fuel-cell-bus-club.com
and click on the CUTE logo



Policy recommendations



- Encouraging public authorities to consider environmental performance as a requirement when tendering for public transport services
- Setting targets for proportions of public transport fleets to run on clean fuels
- Developing European standards for clean transport vehicles

Conclusions

The work of the OPET Transport Consortium has undoubtedly helped raise the profile of road transport energy-saving possibilities . Whilst only a first step, with much remaining to be done, there are certainly many issues in which, in both the EU and China, the work of the partners has raised awareness amongst stakeholders via sometimes relatively simple measures. From the Chinese stakeholders' point of view, there is both the need and desire for greater cooperation with EU partners.

There has been a significant development of interest in 'eco-driving'; developing a more fuel-efficient style of driving (also reducing wear and tear on vehicles). There is growing support for the installation of fuel saving in-car devices, with the recognition that these need to be factory-fitted in new cars to encourage take-up.

Currently in Europe, many vehicles are capable of running on low-percentage (5 - 15%) biofuel mixes, using RME or ethanol, without violating the car manufacturers' guarantees.

The STEPUP instrument, to encourage the use of alternative fuels in buses, has been developed to assist in evaluating and setting environmental requirements for public transport fleets.

Finally, the OPET Network has been recognised widely as a viable entity, with a significant contribution to transport energy issues . However, the Consortium has had only limited success in increasing the involvement of other OPETs in transport issues.



Spin off possibilities

- Several OPETs will continue to work together in new projects and on proposals, although not necessarily within the OPET Network.
- The TREATISE project - Knowledge transfer and training of local actors concerning 'eco-driving', cleaner vehicles and fuels and mobility management - has been launched by Consortium partners.
- Further proposals on mobility management, alternative/biofuels and 'eco-driving'/in-car devices will be prepared.
- Another project to be started soon by a Consortium including a number of OPETs is the 'Ecodrive' project, which will promote ecodriving especially in the New Member States.

The OPET Thematic Brochures: Results of activities 2003-2005

The collection comprises 8 brochures and covers the following technological topics:

- Energy Technologies in the Building Sector
- Energy Technologies for the Generation of Electricity from Renewable Energy Sources
- Combined Heat and Power Generation (CHP) and DHC (District Heating and Cooling) Technologies
- Clean Fossil Technologies Within the Energy Market
- New energy technologies and efficiency measures in transport
- Mediterranean Cooperation for New Energy Technologies
- Modern and Clean Energy and Transport technologies in Latin America and the Caribbean
- Accelerating Market Introduction of Promising Early Stage Technologies for Transport and Energy

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