Documentation and Evaluation of International Case Studies

Compiled within the European research project

Deriving effective least-cost policy strategies for alternative automotive concepts and alternative fuels – ALTER-MOTIVE

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INTELLIGENT ENERGY EUROPE
FOR A SUSTAINABLE FUTURE

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THE ALTER-MOTIVE PROJECT

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I INTRODUCTION

This report is the update of D6 “Analysis of case studies of pilot projects” which was implemented in WP4 within the EU-project “Deriving effective least-cost policy strategies for alternative automotive concepts and alternative fuels” (ALTER-MOTIVE).

The core objective of the project is to derive an action plan for implementing effective least-cost policy strategies (for the EU, specific countries & regions) to achieve a significant increase in innovative alternative fuels (AF) and corresponding alternative more efficient automotive technologies (AAMT) to head towards a sustainable individual & public transport system. AF comprise bioethanol, biodiesel, synthetic fuels, biogas, hydrogen, renewable electricity, LPG & natural gas, whilst AAMT include biofuel, fuel cell & electric vehicles and various types of hybrid systems as well as systems based on natural or biogas.

A major step towards this target is the documentation and evaluation of lessons learned from recently practically implemented case studies. This step is conducted in WP4 of ALTER-MOTIVE. It aims at analysing cases from the past in order to extract information which is important for future policy decision-making regarding alternative fuels and powertrains in passenger car transport. An important target of ALTER-MOTIVE is to find out least-cost solutions. This shall avoid costly dead-end developments as well as establishment of inferior solutions (kept alive by market power or regulations).

In a first step, cases available on the website http://www.eltis.org were examined. These cases were updated, and new information and knowledge, which arose since realisation of the projects, was included. In the next step, additional cases, which were found in a wide variety of media (newspaper, internet, television etc.) were examined.

The main criteria for the selection of these cases were on the one hand to cover all kinds of alternative fuels, and on the other hand to reach a good geographical coverage and include cases from as much European countries as possible. The work included the assessment of old cases leasing to corrections and entering new ones. For selected cases, contact persons were found and asked to fill-in a questionnaire regarding the economic and ecological experiences and findings of these projects.

This document shows full coverage of all the case studies collected or modified within WP4 plus the case by case evaluation which is included in the case description.
Targeting more insight into the cases WP4 was based also on a survey. The results of this in-detail evaluation are shown in D12 of WP4.

In the annex of this document all cases are described as they were prepared by the partners to be shown on the ALTER-MOTIVE website. For each case a short description, background information, major targets, major results, lessons learned, and evaluation-results are given.

II OVERVIEW AND SHORT OVERALL EVALUATION

In this brochure the cases selected for ALTER-MOTIVE are described in detail including a short evaluation. A detailed evaluation is given in a separate report (D12 Summary Report). Here we concentrate on an overview.

Figure 1 gives a survey by country of origin of the case studies. The case studies are based in 20 EU member states and some non-EU countries with Germany and Sweden representing the majority. The shares of the AF and AAMT applied in the case studies are illustrated in Figure 2. CNG (methane) and (battery) electric vehicles clearly dominate.

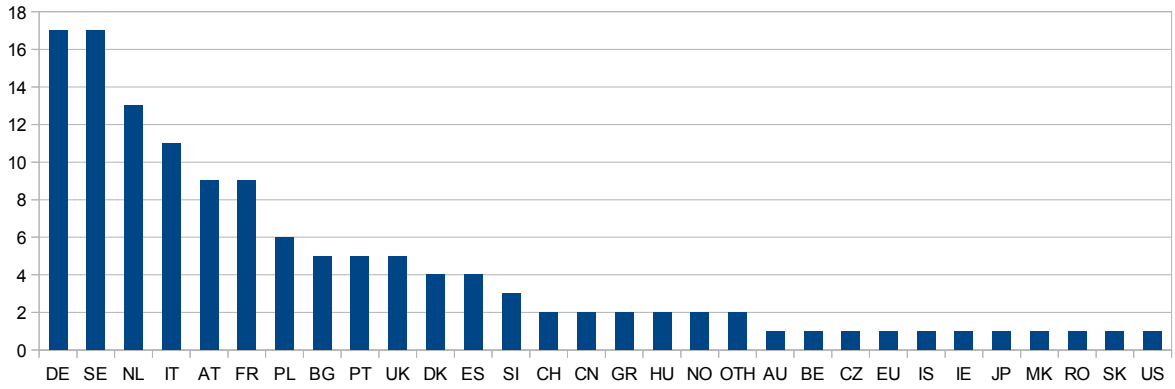

Figure 1 Case studies by country

Legend:

DE	Germany	DK	Denmark	CH	Switzerland
SE	Sweden	ES	Spain	CZ	Czech Republic
BG	Bulgaria	FR	France	CN	China
NL	Netherlands	HU	Hungary	GR	Greece
IT	Italy	SI	Slovenia	IE	Ireland
JP	Japan	BE	Belgium	IS	Iceland
PL	Poland	GB	Great Britain	MK	Macedonia
AT	Austria	NOR	Norway	PT	Portugal
				RO	Romania
				SK	Slovakia
				US	USA

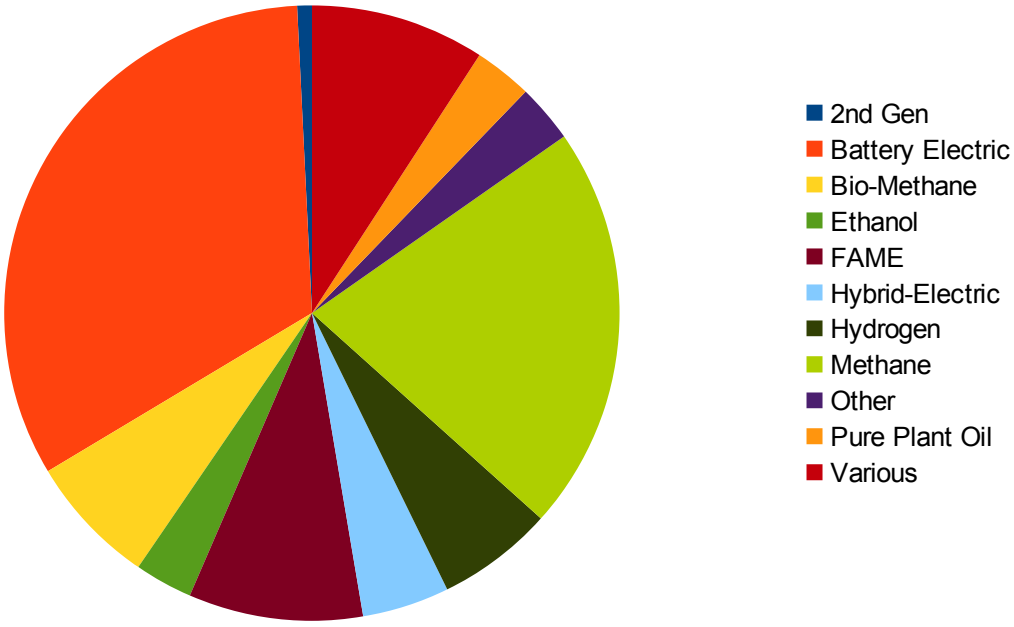

Figure 2 Case studies by fuel

The cases were evaluated in a short sentence with is included in the case presentation of the ALTER-MOTIVE website. On overall this analysis points to the following perceptions which are detailed in D12:

- In most of the case studies acceptance by clients was high, lower by own employees;
- About 90% of the case studies were initiated with public support, monetary incentives are a big motivation – (local) air quality improvements an important target;
- Co-operation with and presence in mass-media is an important criteria for the success of implementing programmes;
- Regarding success – meeting the initial objectives of the project – it can be stated (at least for the projects that are nearly completed) that the project targets are reached to an extent between 80% and 100%.

Especially attractive were projects that led to lower over-all fuel cost and lower operating expenses, e.g. for CNG (methane), biogas, electricity.
Near the end of the Alter-Motive project a lot of starting projects concerning new electric mobility (contrasting existing trams and trolley buses) were added. Only very few 2nd generation fuels appear in the list, even after searching for them was intensified. Even if

the new member states are operating the largest fleets for electrically driven buses, they are reluctant to show them as cases (trolley buses).
Since the cases presented are described by the stakeholders in most cases, and few ambiguities could not be resolved because of lacking reply or non-acceptance of proposed changes an evaluating sentence was added by the editors. The in-depth evaluation presented in D12 was done on the basis of a survey, extracting more details from the cases than is disclosed by the stakeholders in the case descriptions. This is the benefit of anonymous data.

III List of cases included in D6

The following table serves as directory- you might search for a country or fuel and then go to the case which number is displayed near the right top of the case sheet. Some cases (related to urban transport) will be reworked further, translated and data kept actual on the eltis.org portal even after the end of the Alter-Motive project.

Case Numbers by Fuel

With some cases the policy was not fuel specific, with some, changes appeared.

2nd Gen	98										
Battery Electric	15	20;	22	23	24	31	32	33	34	35	38
	42	43	44	48	53	63	73	75	82	83	84
	87	88	89	90	91	92	93	94	95	96	97
	99	104	108	112	118	119	120	124	125	129	
Bio-Methane	5	7	19	36	79	80	103	107	127		
Ethanol	10	17	78	102							
FAME	13	45	47	50	55	56	62	69	77	85	
	101	116									
Hybrid-Electric	6	54	105	106	113	130					
Hydrogen	4	21	37	40	51	81	126	131			
Methane	1	2	3	12	25	26	27	29	30	39	49
	52	59	60	61	65	66	67	68	70	71	72
	74	76	100	117	121	122					
Other	8	14	123	128							
Pure Plant Oil	41	57	58	86							
Various	9	11	16	18	28	46	64	109	110	111	
	114	115									

Fuel	Title	Country	Case N#
Methane	CNG - high time for cheap refuelling (South-Eastern Poland)	Poland	1
Methane	Complete replacement of diesel bus fleet by CNG buses in Frankfurt Oder (Germany)	Germany	2
Methane	CNG-Fleet of TNT Express in Germany	Germany	3
Hydrogen	Hydrogen Sweden - a partnership promoting the use of hydrogen (Sweden)	Sweden	4
Bio-Methane	Biogas Väst- regional project on Biogas in the west area of Sweden, Göteborg	Sweden	5
Hybrid-Electric	Renova- World's 1st hybrid electric refuse collection truck in Göteborg/Sweden	Sweden	6
Bio-Methane	Scandinavia's first liquefied biogas production facility and LBG filling station in Sundsvall (Sweden)	Sweden	7
Other	Hythane - a mixture of H2 and CNG for use in public transportation buses in Malmö (Sweden)	Sweden	8
Various	Sunfleet Gothenburg - 37 carsharing pools using environmental friendly cars only (Sweden)	Sweden	9
Ethanol	More than 400 ethanol buses in Stockholm (Sweden)	Sweden	10
Various	Bonus compensation system for suppliers of transport service, using renewable fuels, in Östhammar (Sweden)	Sweden	11
Methane	Conversion of five public transport diesel vehicles to environment-friendly vehicles running on methane in Gorna Oryahovitsa, Bulgaria	Bulgaria	12
FAME	Biofuels and clean vehicles in Donostia - San Sebastian (CIVITAS ARCHIMEDES Project)	Spain	13
Other	Alternative fuel bus fleet in Suceava (Romania) - End of the SMILE project	Romania	14
Battery Electric	Green postal delivery services in Italy, Belgium, Hungary and Bulgaria	Europe-wide	15
Various	Municipal Transport Company in Tarnow with the most ecological bus fleet in Poland	Poland	16
Ethanol	La Spezia and Magenta, bioethanol in Italian bus fleets	Italy	17
Various	LPG boats and CNG buses in Venice	Italy	18
Bio-Methane	Erection of a local bio gas station - not connetced to the grid - on St. Margarethen am Moos (Austria)	Austria	19
Battery Electric	Electric cars used for postal delivery in Stavanger	Norway	20
Hydrogen	HyFLEET:CUTE - hydrogen busses in Berlin's public transport (Germany)	Germany	21
Battery Electric	Better Place Denmark	Denmark	22
Battery Electric	Purchase of electric vehicles in Copenhagen (Denmark)	Denmark	23

Fuel	Title	Country	Case N#
Battery Electric	Electric Vehicles put into practice in Frederiksberg	Denmark	24
Methane	EcoBus: the promotion of natural gas driven buses in Skopje (Macedonia)	Macedonia	25
Methane	LNG powered buses in Krakow's municipal transport - an innovative project of the Vehicle Transport Company in Krakow	Poland	26
Methane	CWS-Boco Germany introduces CNG-powered vehicles to its fleet	Germany	27
Various	Alternative fuels usage in the non-electric public transport in Debrecen (Hungary)	Hungary	28
Methane	Hamburg Wasser transits its gasoline-powered fleet to CNG	Germany	29
Methane	The first methane powered intercity buses in Burgas (Bulgaria)	Bulgaria	30
Battery Electric	FUTUREMOTION - An E-mobility project in Prague (Czech Republic)	Czech Republic	31
Battery Electric	Electric Mini-Buses in Portugal	Portugal	32
Battery Electric	VLOTTE - a large electric mobility demonstration project in Vorarlberg (Austria)	Austria	33
Battery Electric	ELECTRODRIVE Salzburg (Austria)	Austria	34
Battery Electric	E- mobility demonstrator in Berlin (Germany) showcasing Smarts	Germany	35
Bio-Methane	Biogas powered mobility in the Bioenergy Region Wendland - Elbetal (Germany)	Germany	36
Hydrogen	Hydrogen Buses in Dunkerque, France	France	37
Battery Electric	Mid size electric vehicle fleet test in Munich (Germany)	Germany	38
Methane	EBRD loan for CNG bus fleet in the city of Plovdiv (Bulgaria)	Bulgaria	39
Hydrogen	Fuel cell busses in Amsterdam, the Netherlands	The Netherlands	40
Pure Plant Oil	Public transport buses on PPO in the region of Eindhoven, the Netherlands	The Netherlands	41
Battery Electric	Electric vehicles for distribution of goods in Rotterdam (The Netherlands)	The Netherlands	42
Battery Electric	E - Mobility in the Alps (Switzerland)	Switzerland	43
Battery Electric	VEL1 - Pioneer electric vehicle fleet in Mendrisio (Switzerland)	Switzerland	44
FAME	Vehicles of municipality using biodiesel in Breda, the Netherlands	The Netherlands	45

Fuel	Title	Country	Case N#
Various	Waste processing company driving on PPO and biodiesel in Ede and Wageningen, the Netherlands	The Netherlands	46
FAME	TPG Post Pakketservice running 56 vehicles on 100% biodiesel in Amsterdam	The Netherlands	47
Battery Electric	Electric bus the Whisper in Apeldoorn (The Netherlands)	The Netherlands	48
Methane	Target Implementation of CNG Vehicles and CNG Filling Station in Laupheim/Germany (GasHighWay)	Germany	49
FAME	Bio Bus and cooking oil recycling project in Kilmarnock (UK)	United Kingdom	50
Hydrogen	Passenger bus on hydrogen between towns in province of South Holland	The Netherlands	51
Methane	CNG bus fleet in the city of Athens	Greece	52
Battery Electric	Electrical utility vehicles in the city of Piran / Pirano (Slovenia)	Slovenia	53
Hybrid-Electric	Hybrid propelled taxi fleet in the city of Ljubljana (Slovenia)	Slovenia	54
FAME	878 Taxi fleet using Biodiesel from used cooking oil in Graz	Austria	55
FAME	City of Graz - biodiesel from waste oil for public bus fleet	Austria	56
Pure Plant Oil	Pure Plant Oil Use in Cork City Council Municipal Fleet (Ireland)	Ireland	57
Pure Plant Oil	PPO (pure plant oil) fueled buses in Hasselt (Belgium)	Belgium	58
Methane	Rzeszow - the biggest CNG municipal bus fleet in Poland	Poland	59
Methane	CNG used in public transport vehicles in Sofia (Bulgaria)	Bulgaria	60
Methane	CNG buses operating in Bourgas (Bulgaria)	Bulgaria	61
FAME	Recycling cooking oils into biofuels in La Rochelle, France	France	62
Battery Electric	Electric vehicles for companies in Stavanger, Norway	Norway	63
Various	Electric and Hybrid Waste Collecting Vehicles in Sevilla, Spain	Spain	64
Methane	Results of the Project 1000 Green Cabs for Berlin, Germany	Germany	65
Methane	CNG buses in Bratislava, the capital city fo Slovakia	Slovakia	66
Methane	CNG cars used by a pizza delivery service in Dresden, Germany	Germany	67
Methane	Bus powered by CNG in Slupsk, Poland	Poland	68
FAME	B30 usage in public transport buses of RATP Paris (France)	France	69
Methane	The city of Gdynia, Poland uses CNG buses, meeting the EEV standard	Poland	70

Fuel	Title	Country	Case N#
Methane	CNG vehicles for parcel delivery used by DHL in Germany	Germany	71
Methane	CNG buses in Szeged, Hungary	Hungary	72
Battery Electric	Gruppo Torinese Trasporti (GTT) uses electric minibus in Turin (Italy)	Italy	73
Methane	Logistic food distribution utilising CNG vehicles in Torino (Italy)	Italy	74
Battery Electric	Electrical utility vehicle in the city of Celje (Slovenia)	Slovenia	75
Methane	Augsburg an exemplary city for gas powered vehicles	Germany	76
FAME	Alternative Fuel Usage in the Municipal Transport Company (EMT) of Valencia S.A.U.	Spain	77
Ethanol	An E85 bioethanol cluster in Somerset County, United Kingdom	United Kingdom	78
Bio-Methane	Green gas in Gothenburg (Sweden)	Sweden	79
Bio-Methane	Biogas as fuel for transport in Linköping (Sweden)	Sweden	80
Hydrogen	ECTOS - hydrogen buses in Reykjavik, Iceland	Iceland	81
Battery Electric	Electric vehicles in the Municipality of Reggio Emilia, Italy	Italy	82
Battery Electric	City of Trento (Italy) - public electrical car fleet	Italy	83
Battery Electric	Electric boat on the lake of Bourget	France	84
FAME	B30 (blend of 30% fatty acid methyl esters and 70% Diesel) in the truck fleet of Greater Lyon city administration (France)	France	85
Pure Plant Oil	Local pure plant oil for trucks in Marmande (France)	France	86
Battery Electric	Austrian Mobile Power	Austria	87
Battery Electric	Electric car demonstrator in Berlin (Germany) showcasing Minis	Germany	88
Battery Electric	E- Tour Allgäu (Germany)	Germany	89
Battery Electric	E- Mobility initiative for Italy	Italy	90
Battery Electric	Rotterdam - Project Power Surge (The Netherlands)	The Netherlands	91
Battery Electric	Electric vehicle deployment in the Edison project (Denmark)	Denmark	92
Battery Electric	Model Region Rhein-Ruhr (Germany)	Germany	93
Battery Electric	PEDELEC rental system deployment in Styria (Austria)	Austria	94

Fuel	Title	Country	Case N#
Battery Electric	Integrated Electric Mobility Concept in Wachau (Lower Austria)	Austria	95
Battery Electric	BETTER PLACE infrastructure roll-out in Canberra (Australia)	Australia	96
Battery Electric	Electric Taxis and battery exchange tested in Tokyo (Japan)	Japan	97
2nd Gen	BioFuel Region - an initiative to develop an industry based on renewable cellulose-based fuels, Sweden	Sweden	98
Battery Electric	Portuguese made Electric Buses	Portugal	99
Methane	Fleet of Natural Gas Buses in Porto (Portugal)	Portugal	100
FAME	Waste collection trucks fuelled with rapeseed-based biodiesel (RME) in Gothenburg (Sweden)	Sweden	101
Ethanol	BioAlcohol Fuel Foundation (BAFF) a knowledge organisation focusing on bioethanol (Sweden)	Sweden	102
Bio-Methane	Biogas use in public transport buses in Lille (France)	France	103
Battery Electric	Car sharing in La Rochelle (France) offering battery electric utility vans	France	104
Hybrid-Electric	Serial Hybrid Busses for a Public Transport scheme in Brescia (Italy)	Italy	105
Hybrid-Electric	Hybdrid taxis circulating in San Francisco since 2004	USA	106
Bio-Methane	Bio-methane powered vehicles and filing station in Sheffield	United Kingdom	107
Battery Electric	China as forerunner for ultralight battery electric vehicles	China	108
Various	Policies for green cars in Gothenburg (Sweden)	Sweden	109
Various	Green municipal fleets in Gothenburg City (Sweden)	Sweden	110
Various	National policy: Tax reduction on green vehicles (Sweden)	Sweden	111
Battery Electric	China´s first EV taxi fleet in Shenzhen	China	112
Hybrid-Electric	London buses go hybrid-electric - including the double-decker buses	United Kingdom	113
Various	Pilot Application of Clean Vehicles in the City of Thessaloniki: The “IMMACULATE” Project	Greece	114
Various	Biogas and biodiesel operated waste collection trucks in Kungsbacka (Sweden)	Sweden	115
FAME	Cleaner and more efficient B10 and hybrid electric urban buses in Vitoria-Gasteiz	Spain	116
Methane	Lisbon waste collectors compactors	Portugal	117
Battery Electric	Electric vehicles (buses) for the cities of Cesena and Forlì “Green 2 Transportation” (Italy)	Italy	118

Fuel	Title	Country	Case N#
Battery Electric	Bonus to citizens acquiring electric vehicles in Modena (Italy)	Italy	119
Battery Electric	Electric Mobility E-Moving Project in Milan and Brescia (Italy)	Italy	120
Methane	Egypt's Clean Fuels Initiative	Egypt	121
Methane	Natural Gas Vehicles in Grenoble	France	122
Other	World leader in automotive LPG usage - large initiative to introduce CNG buses	Korea	123
Battery Electric	Amsterdam Electric - stimulating electric transport in Amsterdam	The Netherlands	124
Battery Electric	Mobi.E: The Portuguese Programme for Electric Mobility	Portugal	125
Hydrogen	Hydrogen HyMove project in Arnhem, the Netherlands	The Netherlands	126
Bio-Methane	Taxis on green natural gas in the east of the Netherlands	The Netherlands	127
Other	More environmentally benign busses in Vienna (Austria)	Austria	128
Battery Electric	Power Surge Programme in Rotterdam, the Netherlands	The Netherlands	129
Hybrid-Electric	Hybrid Bus Implementation in the VRR (Germany)	Germany	130
Hydrogen	Industrialisation of fuel cell scooter -field testing (Great Britain)	United Kingdom	131

No. 1

CNG - high time for cheap refuelling (South-Eastern Poland)

The gas company in southern Poland promoted CNG as fuel for motor vehicles by subsidizing conversion from fossil motor fuel to CNG for existing cars and also with subsidies for new cars using CNG.

Background

The action of promoting the CNG as vehicle fuel was carried out by the Karpacka Spolka Gazownictwa Sp. z.o.o. (Carpathian Gas Company, Ltd), located in Tarnow (Malopolskie voivodship). The activity covered four Polish regions: Malopolska, Podkarpackie, Swietokrzyskie and Lubelskie voivodships.
This project was carried out between 15 September, and 31 December 2006. In that time period the vehicles owners who fulfilled the following criteria:
a) has installed the CNG gas installation is their cars,
b) has bought CNG powered CNG used car, or
c) has bought CNG powered CNG new car,
received a grant of the amount of 1000 PLN (ca. 250 EUR) from Karpacka Spolka Gazownictwa.
The eligible participants of the Action were the owners of passenger and light- commercial vehicles, residents of the operational territory of Karpacka Spolka Gazownictwa, or those who had the commercial activity registered there.
At the same time, Karpacka Spolka Gazownictwa developed the the CNG distribution network in its operational territory.

Major targets

The target of this action was to increase the volume of sales of CNG and motivate car users to use CNG as the alternative fuel, by considering environmental benefits and competitive price.

Major results and lessons learned

The number of participants was 220, including 70 individual and 150 institutional car owners.
The action was promoted by advertising in media, billboards and leaflets.
The distribution stations were built in Debica, Krakow, Kielce, Mielec, Tarnow, Rzeszow, Zamosc, Lublin and Sandomierz.
The CNG is becoming increasing popular as motor fuel, because of its competitive price and it is more environmental friendliness compared to other types of fuels. They are estimating, that performed action increased the sale of CNG by 387 thousands cubic metres annually.

More Information

http://www.ksgaz.pl/
kise@kise.pl

Evaluation

Although having a limited "campaign" character the case proved that financial incentives for end users do help boosting transition to alternative fuels.

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within the ALTERMOTIVE project

No. 2

Complete replacement of diesel bus fleet by CNG buses in Frankfurt Oder (Germany)

The local public transport company of Frankfurt Oder (SVF) replaced their whole bus fleet by CNG buses in 2002/03. A main driver for this conversion was the non-interest-bearing credit of the German Bank für Wiederaufbau (KfW) after winning the competition initiated the federal ministry of environment.

Background

In March 2001 the federal ministry of environment tendered the competition *Anspruchsvolle Umweltstandards im ÖPNV-Wettbewerb* (ambitious environmental standards for public transport). Motivated by the high age of their old busses of 11 years and its missing barrier-free design, SVF took part in this competition, because the buses had to be replaced within the next few years. The aim of this competition was to support projects achieving the EEV standard (enhanced environmentally vehicles) in public transport.

Major targets

Due to the competition of the federal ministry for environment which was in place at the same time as the bus fleet had to be renewed, there was the chance for financial support for a procurement of CNG busses. Without winning the competition no CNG busses, but conventional diesel buses would have been purchased. Nevertheless, as it was possible to buy CNG busses, the major targets were

- preventing climate change
- improving the local air quality and
- improving the company™s green image.

Major results and lessons learned

By winning the competition, the SVF could finance the new CNG busses (total costs: 6.4 million Euro) by the non-interest-bearing of the KfW (2.8 million Euro), by GVFG-aid of the federal state Brandenburg (3.2 million Euro), because the CNG buses undercut the actual environmental standards, and by selling the old bus fleet (400,000 Euro).
The extra costs of the CNG buses compared to conventional Euro 3 buses amounted to 979,000• in sum (single bus: 24,000• per bus or 0.06• per kilometre; articulated bus: 65,000• per bus or 0.16• per kilometre) without sponsorship.
Due to the call for tenders for 11 single buses and 11 articulated buses, the development of natural gas buses was accelerated by the bus manufacturers. One example is the new 310 hp CNG turbo engine developed by MAN for their articulated buses. This engine became necessary because the 245 hp CNG engine could not achieve the requirements of the schedule in the hilly countryside of Frankfurt Oder.
The fuel consumption of the buses is at approx. 37 respectively 47 kg per 100 kilometre natural gas, the emissions are over fulfilling the requirements of the EEV standard.
The buses contribute to an increased customer acceptance caused by improved comfort and safety. Furthermore, the buses are accepted by the employees which can be seen in the driver's motivation for an energy efficient driving.
The required CNG filling station was built by the local energy provider in front of the depot of the SVF. Technical data of the filling station: three-stage bank: 250 bar, capacity of 3,200Nm^3/h in 162 bottles, 5 fountains (2 for bus, 3 for car) 2x 350 Nm^3/h, hydraulic double-acting compressor, public using possible.
Smaller additional costs in the transition to CNG were only caused by special repair tools and a gas alarm system in the garage.
More time for refilling (approx. 8 minutes) causes no extra costs for the SVF because the technical service is done in this time for the bus.
The conversion to CNG buses was a big success for the SVF. The 22 buses passed the test in the last 5 years.
The condition for the success was the support of Frankfurt™s policy-makers with a successful participation in the ministry™s competition resulting in financial support by winning it. Especially since it is not easy to earn the extra costs for the CNG buses only by reduced fuel consumption because the mileage of the buses is relatively low (approx. 45,000km p.a.).
However, over-fulfilment of environmentally standards can be to the company™s advantage in regard to call for tender procedures referring on an decision of the EUGH(European court). The conversion to CNG busses is a sustainable lighthouse decision for public transport companies.

Evaluation

Intelligent timing of the measure allowing for a cost efficient transition to alternative fuels. Interesting to see that maintenance cost for CNG buses not necessarily increase over those when using fossil diesel. The case shows a full blown and successful approach.

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within the ALTERMOTIVE project

No. 3

CNG-Fleet of TNT Express in Germany

Fleet-conversion from Diesel to CNG, mostly vans, but also some estate cars. In 1999 the first pilot started in Berlin. It was very difficult to convince the subcontractors conducting the deliveries to buy CNG-Vans.

Background

TNT Express delivers 4.4 million parcels, documents and pieces of freight a week to over 200 countries using its network of nearly 2,400 depots, hubs and sorting centres. TNT Express operates over 26,000 road vehicles and 46 aircraft . In Germany TNT employs 4.400 people in 31 depots. TNT™s subcontractors operate about 1,800 vehicles per day. 75 % are vans, the rest consists of trucks, cars and estate cars of several automakers. The vehicles are used to deliver and collect shipments of the customers on all kinds of roads. The max. daily mileage is about 600 km per day.
In the year 2003 TNT Express GmbH in Germany received the Ludwig-Erhard-Price, the most important award in the German economy for outstanding performance based on Business Excellence.
In 2000 TNT tested a DC Sprinter with vegetable oil drive. The cost of conversion was to high and there was no financial/fiscal incentive. In 2001, TNT started testing a DC Sprinter with a battery drive, but the range was to low. The CNG-project proved that presently CNG is the only kind of alternative that profits from financial incentives, and has an acceptable range and sufficient dense network of filling stations.
Until 2008 the number of CNG vehicles increased so that in mid-2008 157 vehicles were running on CNG. However, nowadays the number of CNG vehicles is falling. In 2009, the TNT subcontractors operate about 100 CNG vehicles.

Major targets

The reasons to invest in a CNG-Fleet were

- responsibility for the environment
- the price comparison of CNG and Diesel
- the necessity to avoid driving bans in cities because of increased limits in relation to particulate matter, etc.

Major results and lessons learned

TNT experiences prove that only manufacturer equipped models are suitable (no after sales conversions). One of the most important questions is validity of the automakers warantee. Some of the production models were very unreliable. Not the CNG-components, but the petrol-engines. But the most available production models are very solid. The most reliable model was the Sprinter NGT. The max. daily mileage is about 180-350 km. The driver has to refuel the vehicle two times a day at most. The biggest challenge for the project was the lacking availability of the vans of Mercedes, Ford and Fiat until 2007 or rather 2008.
The biggest obstacle so far was the under-developed network of service stations.

More Information

http://www.sauberer-fuhrpark.de/pdf_files/TNT.pdf
http://www.eu-interaction.de
http://www.fav.de/DOCS/TVW_03_Weil.pdf

Evaluation

The project was enumerating problems operating fleets on a commercial basis transiting to CNG. Problems which might disappear with time like the improvement of the packaging with regards to the CNG tanks. Also LNG solutions could be investigated. The increase of last mile distribution transport and the unwanted side effect in terms of air quality problems in cities makes it absolutely necessary to increase pressure for operating such fleets with clean vehicles.

Posted: 10/2009
Last update: 11/2010
within the ALTERMOTIVE project

No. 4

Hydrogen Sweden - a partnership promoting the use of hydrogen (Sweden)

Hydrogen Sweden (former HyFuture) is a non-profit organization with the aim of promoting hydrogen as an energy carrier in Sweden. This is done by disseminate knowledge and information as well as initiate demonstration projects within the area of hydrogen production, infrastructure and vehicles.

Background and Objectives

Hydrogen can become a new, efficient and environmentally friendly energy carrier. It can be produced from a number of energy sources and with different processing technologies. Major industries in Europe support the development of hydrogen for transport, aiming to replace fossil fuels with sustainable alternatives. This is a process of development and one way to progress is through demonstration projects.

Hydrogen Sweden is a non-profit Public Private Partnership (PPP) with members and financiers from industry, academia, NGO's and local, regional and national government. The PPP was founded in 2007 and promotes a balanced and pragmatic approach to hydrogen. Hydrogen Sweden currently has approximately 40 members and financiers, who wants to promotes hydrogen as a clean energy carrier for cars and develop a public hydrogen refueling infrastructure.

Major targets

Hydrogen Sweden's mission is to share knowledge and facilitate the introduction of hydrogen as an energy carrier in Sweden. To do so Hydrogen Sweden initiate demonstration projects, disseminate information and strengthen the collaboration between actors from various fields with a joint interest in hydrogen. The association is also open to explore synergies with other alternative fuels and technologies.

Hydrogen Sweden aims for:

- Increased knowledge and awareness about the potential of hydrogen as an energy carrier.
- More practical applications and demonstrations of hydrogen and fuel cell technologies.
- More involved actors with interests in the hydrogen area.
- Hydrogen being included to a larger extent in political strategies, regulations and legal framework as well as in research programs.
- Economical growth and more working opportunities, related to hydrogen, in the industry.

Major results and lessons learned

Hydrogen Sweden has been involved in several successful project and project ideas of implementing hydrogen and fuel cells for different applications. Local, regional and international contacts, partnerships and projects have been formed and performed.

Hydrogen Sweden is the Swedish representative in the European Hydrogen Association.

Within this collaboration Hydrogen Sweden has been involved in a study about combining electricity and hydrogen as energy carriers for the transportation sector. The results points out that very energy-efficient cars and buses can be developed by combining batteries and fuel cells in the same vehicle.

Hydrogen Sweden is also a part of the Scandinavian Hydrogen Highway Partnership, SHHP, whose vision is to make the Scandinavian region one of the first in Europe where hydrogen is commercially available and used in a network of refuelling stations. Currently seven filling stations has been built with more to come. Hydrogen Sweden™s role in the project is to coordinate the Swedish contribution and to communicate the progress.

It is clear that the initiative has been successful and success factors are e.g., the experience and enthusiasm within the partners, the transfer of knowledge and know-how, and the practical applications and demonstrations of hydrogen and fuel cell technologies. One important factor is also that the partnership has had access to concept hydrogen fuelled cars that have been demonstrated at different conferences and driven by numerous interested persons. A valuable tool for information dissemination is the Hydrogen Sweden™s newsletters.

More Information

Hydrogen Sweden
Scandinavian Hydrogen Highway Partnership
Hydrogen Sweden™s information folder

Evaluation

Well developed and marketed solution which is applicable for some part of Europe having a high share of low C energy available. This way the well to wheel GWP balance may be improved. Otherwise only the zero emission character may be exploited at very high cost.

Documents

shhp brochure.pdf SHHP_2008.pdf

Posted: 10/2009
Last update: 10/2010
within the ALTERMOTIVE project

No. 5

Biogas Väst- regional project on Biogas in the west area of Sweden, Göteborg

Biogas Väst is a regional collaborative project with the overall aim of stimulating market development within biogas production, distribution and the development of the gas-powered vehicle market. The project involves 30 companies and organisations. The decision to develop a new strategy to increase the use of Biogas comes from the Swedish government.

Background

Biogas West is the name of a cluster in the field of methane for vehicles in the Göteborg region and western Sweden. 30 companies and organizations are taking part in the project headed by Business Region Göteborg (e.g. AB Volvo, Renova, Göteborg Energi AB, FordonsGas and LRF). The project commenced in 2001 to pursue market development within biogas production, the distribution and expansion of gas fuelling stations and the use of gas-powered vehicles.

Biogas Väst is also seeking to develop expertise in concepts that could be exported. The goals set by the EU Commission to replace 20% of the fossil fuels by 2020 implies that 20 million cars should operate on sustainable sources of fuels.

Implementation

The Swedish government has decided to develop a new strategy to increase the use of Biogas, the assignment will be executed by the Swedish Energy Agency. Biogas will play an important role in reducing the climate impact from the transport industry. As the fuel is produced locally it opens up for sustainable growth, where biogas can generate new job opportunities.

The Swedish Energy Agency together with the Swedish Board of Agriculture and the Swedish EPA are going to develop a cross-sectional long term strategy and advice on actions to increase the usage of biogas in short and long term.

The proposals will structure the common platform for the future development within biogas production, distribution and use of biogas in Sweden. The assignment will be presented to the Government Offices of Sweden no later than 12th May 2010.

Conclusions

When Biogas Väst started in 2001 there where nine gas fuelling stations and approximately 800 vehicles in Western Sweden. The main goals and visions for 2009 is to set-up and establish 45 tank stations, 10 000 cars operated on biogas and a production and a net sales corresponding to 100 GWh of biogas.

More detailed information is available at: Biogas Väst

Evaluation

Successful approach not showing acceptance problems of citizens for biogas digester seen elsewhere. Shows a way out of the gap between first and second generation biofuels.

Posted: 10/2009
Last update: 03/2011
within the ALTERMOTIVE project

No. 6

Renova- World's 1st hybrid electric refuse collection truck in Göteborg/Sweden

In order to meet the Euro 5 standard, a hybrid-electric vehicle for refuse collection has been developed by Volvo, Renova, Norba and the Energy Authority.

Background

Many years of collaboration between Renova, Volvo and Norba, with financial support from the Energy Authority, have resulted in the launch of the world™s first complete hybrid refuse collection truck in 2008, Gothenburg.
It is driven by electricity or diesel and always loads and compacts with electric power and meets the Euro 5 standard. A separate battery for loading and compacting is charged overnight using plug-in technology.

Major targets

To meet the Euro 5 standard and to develop a new refuse collection truck fleet, thereby increasing sustainable growth in the western Sweden.

Major results and lessons learned

The combination electric and diesel propulsion with electrically operated loading and compacting with plug-in charging results in a total reduction in fuel onsumption of at least 30 per cent compared to a conventional refuse collection truck, probably more. Emissions such as those of carbon dioxide, nitrous oxide and particles are also reduced correspondingly. Moreover, the electric engine is practically noiseless. A refuse collection truck is stationary and loads and compacts the refuse 60-70 per cent of its operating time. It often moves only short distances in built-up areas, and consumes most fuel when starting and when accelerating up to 20 km/h. At precisely these times the new hybrid truck uses electricity only, which reduces total fuel consumption substantially, thereby resulting in much lower carbon dioxide and other emissions such as nitrous oxides and particles.

The new truck will be fully operational at Renova in Gothenburg from August 2008 and two years later the truck will be ready for series production. Christian Baarlid, Renova™s MD: -Our new hybrid refuse collection vehicle is a milestone in the development toward more environmentally friendly heavy vehicles. The hybrid technology we are now using and developing is pointing the way to a future, environmentally friendlier fleet of vehicles - and not just in the field of waste handling.

More Information

web site Renova

Evaluation

Successful demonstration of the savings which may be achieved using hybrid power trains in specialized heavy duty vehicles. However steps for making the hybrid electric technology more affordable are needed.

Documents

Worlds first htbrid refuse collection truck.pdf

Posted: 10/2009
Last update: 11/2010
within the ALTERMOTIVE project

No. 7

Scandinavia's first liquefied biogas production facility and LBG filling station in Sundsvall (Sweden)

Scandinavia's first biogas liquefaction facility was opened in Sundsvall, in June 2010, for the production of Liquid BioGas (LBG). The filling station was opened one year earlier and has initially supplied Liquid Natural Gas (LNG). The LBG will first and foremost be used to fuel waste collection trucks in Sundsvall.

Background

Gaseous fuels have so far not been a realistic option for long distance heavy traffic due to the fuel™s low energy density indicating a need for large fuel storage tanks. Liquefied gas increases the energy density and thereby increases the driving distance between fuelling. Liquid fuels also contribute to a more energy-efficient and less costly fuel distribution, since it is possible to distribute five times more liquid gas compared to compressed gas. The easier distribution further indicates that the LBG to a larger extent can be produced where the raw material is and used where the fuel demand is. Compared to compressed biogas, LBG is also a cleaner fuel containing approximately 96% methane (since impurities and carbon dioxide are separated during the cooling process).

The LBG production facility will first and foremost produce biogas from the municipal sewage treatment plant with an annual production of approximately 600 000 Nm^3 liquefied biogas, which correspond to approximately 600 000 litre diesel. After the anaerobic digestion the gas is cooled down in four steps to minus 110 degrees by using cryogenic technology operated by Scandinavian Gastreatment Service (SGtS). This method is commonly used for liquefying natural gas but so far not for liquefying biogas. The liquid biogas is then distributed in cooled tanks to the filling station. A small fleet of waste collection trucks in Sundsvall have been rebuilt to be able to store the LBG onboard and use it in their daily routes.

The LBG production facility is a result from collaboration between the municipal water company MittSverige Vatten, Fokusera Utveckling Sundsvall as well as Scandinavian GtS and the gas company AGA who are all owners to the facility.

Major targets

The main motivation behind investing in the LBG production facility lies in the society™s goal of preventing climate change by reducing carbon dioxide emissions. Important is also the possibility of supplying a transportation fuel that can be used for both the passenger and the freight sector. LBG is one of very few fuels that can be used for long distance trucks. A separate target is also to test and develop new technologies which can lead to valuable insights and help other municipalities in their decisions.

Major results and lessons learned

The additional cost for liquefying biogas has been judged to be cancelled out from the economical savings of more efficient distribution and use. The savings of 600 000 liters of diesel correspond to a reduction of 1380 ton fossil CO2 emission.

The municipality of Sundsvall has defined their LBG production facility, and filling station, as successful investments. They already plan to expand the LBG production to also use biological municipality waste as well as waste from the local pulp and paper industry. In future they can see collaboration with the Östersund municipality to enlarge the LBG production even more.

LBG production and filling stations are planned to also be built in other main Swedish cities, e.g., Uppsala, Stockholm, Gothenburg, Malmö, Lidköping and Helsingborg. The facility in Helsingborg is projected to produce LBG corresponding to 15 million litres of diesel and is planned to be opened in early 2012.

More Information

- www.scandinaviangts.com Scandinavian Gastreatment Service (SGtS)
- Dutch GtS presenting the Swedish case
- Press release, May 2010 (in Swedish)
- Sundsvall municipality

Evaluation

Bio LNG initiative, promoted by industry. Innovative solution at an early stage of market diffusion. Using LNG overall energy intensity of transport is improved - having a smaller tank volume allowing more cargo space and weight. GWP is not that affected by additional energy demand (for liquefying and keeping it cold) since biogas is CO_2-reduced from the beginning.

Posted: 10/2009
Last update: 11/2010
within the ALTERMOTIVE project

No. 8

Hythane - a mixture of H2 and CNG for use in public transportation buses in Malmö (Sweden)

Develop and demonstration of hydrogen and compressed natural gas mixtures as fuel in CNG buses.

Background

Development and use of more efficient alternative fuels in cooperation with the local public transport fleet. It is aimed to reduce greenhouse gas emissions efficiently on the one hand and increase the operability on the other hand. Furthermore, cooperation between the local public transport authority and E.ON Nordic had to be ensured.

Major targets

The purpose of the project was to test hydrogen mixed together with natural gas for local city buses. Hydrogen production as well as hythane infrastructure was also built. The hydrogen production plant and the filling station were opened in September 2003. Two city buses have used the hythane fuel with 8 vol% hydrogen. This has been done without any modifications of the engines. The buses could then also use CNG as fuel if needed. The heavier mixture with 20 vol% hydrogen in the CNG has been used since the beginning of year 2005 in two additional hythane buses.
The hydrogen is produced by electrolysis in direct connection to the filling station. The electricity is produced in a nearby windpower plant and distributed to the plant via the electrical grid.

Major targets for the project are:

- Improve engine efficiency by 5-7%
- Decrease NOx and CO emissions by at least 10%
- Decrease greenhouse gas emissions by 10-20%

Major results and lessons learned

It was possible to use existing lean-burn CNG buses for the hythane fuel (8% H2 and 92% CNG). However, for the mix of 20% H2 and 80% CNG small adjustments have been done, e.g modifications of the mapping of the engine both for ignition and the air/fuel ratio as well as connecting a PC for adjustments of the control system of the bus engine. No hardware modifications have been necessary. The routes for the hythane buses had to be adjusted to be sure of bringing enough fuel.

Conclusions from the use of hythane (8%) in buses, using a Volvo TG100 engine, after one year were:

- Higher efficiency
- More stable combustion, due to a faster combustion (less cycle to cycle variations)
- A slight increase in power
- Lower HC and CO emissions because of higher combustion efficiency
- Higher or similar NOx emissions (with no changes applied to fueling or spark)
- Slightly higher knock tendency

Hythane allows for lower fuel consumption, reduces GHG emissions and can easily be used in buses running on CNG. Also a blend of 25% is possible if the fuel system is optimised. Hythane can be distributed in the existing CNG grid. The two first hythane buses have lead to a CO2-reduction of 1,632 tCO2 per year, to higher or similar NOx emissions and to lower HC and CO emissions (because of higher combustion efficiency).

The long term vision is to use a mixture of hydrogen and CNG in all the city buses running in Malmoe. Since the test period showed very good results the energy company E.ON Gas will enlarge the test to 50 city buses (running on 8% H2) and one new filling station. The CNG part will change from pure fossil natural gas to a mix of 50% renewable biogas and 50% fossil natural gas. Several passenger cars have tested the low-grade 8% hythane fuel with good results. There is a foreseen project to test 10 passenger cars including taxis and other service vehicles running on hythane for a longer test period.

However, E.ON Nordic has recently announced that they will terminate all activities within the field of hydrogen for transportation purposes and thus the hythane filling station in Malmoe will likely close down.

More Information

Folder: Malmö Hydrogen and CNG/Hydrogen filling station and Hythane bus project

Evaluation

Low profile approach which could be revisited in regions with the possibility to produce cheap hydrogen. Some technical advantages should be developed engine wise, taking up the high fuel quality - may be blending with low methane biogas is more cost efficient?

Posted: 10/2009
Last update: 10/2010
within the ALTERMOTIVE project

No. 9

Sunfleet Gothenburg - 37 carsharing pools using environmental friendly cars only (Sweden)

All cars belonging to *Sunfleet*™s car fleet in Gothenburg fulfil the Swedish Road Administration™s requirements for eco cars, e.g., cars running on ethanol, biogas, biodiesel and/or having new advanced engine technologies such as battery electrical cars or hybrids. There are currently 37 car pools in Gothenburg open for business and private persons including students.

Background & Objectives

The idea of a group of people shares a number of cars (carsharing) originated in Switzerland during the 1980s and has since spread to many countries in Europe and the rest of the world. A car pool reduces the number of cars needed. Carsharing also reduces the costs such as purchase, taxes, insurance, and service since the costs are shared. As a member in carsharing, one pays only a subscription fee and a fee when one uses the car.

Sunfleet Carsharing began in 1998 and has since then become established as the only carsharing in the world with only environmentally friendly cars. *Sunfleet* Carsharing is a part of Hertz Sweden and Volvo Car Corporation as well as local stakeholders.

Unique for *Sunfleet* carsharing is their user-friendly booking and administration system. The telematic technology, which is installed in every *Sunfleet* car, allows for wireless communication between car, mobile phone and *Sunfleet*™s data server.

In 2008 the idea of having car pools explicitly aiming for students at universities and colleges was established. Therefore a *Sunfleet* pool was set up in connection to Chalmers University of Technology and is now in use providing beneficial price levels for students.

Major targets

The major target has been to increase the use of environmentally friendly cars and by sharing cars contribute to reducing the demand for car travels. One particular target has been to attract young drivers to influence their preferences regarding cars, towards environmental friendly cars.

Major results and lessons learned

Sunfleet is continuously growing, and is currently available in 25 Swedish cities with over 95 pools in operation, whereof 37 in Gothenburg. Today *Sunfleet* has more than 11,000 members and over 7,000 trips per month. *Sunfleet* is used by municipalities, municipal housing companies, big companies, private persons and students. Since *Sunfleet* is a cheap alternative for students to get access to cars, the car pool connected to Chalmers has been very successful. Students find it natural to use, and fill up, cars running on renewable fuels such as ethanol, biogas and biodiesel.

More Information

Sunfleet car sharing

The 37 *Sunfleet* car pools in Gothenburg can be found here.

Evaluation

Car sharing allows a hands on experience with alternative propulsion without financial risks.But it should be secured that only mature products are offered.

Documents

Sunfleet_complete_student_pricelist_eng_090429.doc

Posted: 10/2009
Last update: 11/2010
within the ALTERMOTIVE project

More than 400 ethanol buses in Stockholm (Sweden)

Sweden has a long and good experience of ethanol buses. The Stockholm Public Transport Authority introduced ethanol buses in the city bus fleet in the middle of 1980's. Since then, diesel buses have successively been replaced with ethanol buses, and the Stockholm fleet has now expanded to over 400 ethanol buses. The aim is that at least 50% of the two thousand buses should run on renewable fuels in 2011 and 100% in 2025.

Background

Ethanol buses can be a cost efficient way to reach low emissions of CO2, nitrogen oxides (NOx), carbon monoxide (CO), hydro carbon (HC) and particulate matters (PM) at the same time. Stockholm Public Transport Authority (SL) is responsible for all public transport in the Stockholm County, a city with 1.6 million inhabitants. There are about 2000 buses in the SL fleet and buses are an important part of the public transport system in Stockholm. SL introduced ethanol buses in the city bus fleet in the middle of 1980's. Since then, diesel buses have successively been replaced with ethanol buses, and the Stockholm fleet has now expanded to over 400 ethanol buses.

Ethanol buses have a compression engine, modified for ethanol. It runs on ED95, where the "D" indicates that the ethanol is meant to be used in Diesel engines. ED95 contain 95% ethanol and 5% ignition improver. When using ED95 in modified diesel engines the vehicles become as energy efficient as conventional diesel engines. That is although that the energy content in ethanol is lower than in diesel, but the energy efficiency of the ethanol bus engine and diesel engine is comparable.

Stockholm is one of the partners in BEST (Bioethanol for Sustainable Transport), which is a project financially supported by the European Union. Several of the investments and some of the work done got support from EU. The bigger part, however, has been financed by the project partners. The aim of the project is to put more than 10.000 ethanol cars and additional 160 ethanol buses in operation as well as to open more E85 and ED95 fuel stations.

In August 2010 additional 85 Scania ethanol-powered buses was delivered to Nobina, which operates on behalf of SL. The ethanol buses will help SL fulfil its decision to invest only in buses that operate on renewable fuels. The buses are equipped with Scania's third generation five-cylinder 270 hp ethanol diesel engines, which meet Euro 5 and EEV emission standards.

Major targets

The goal for SL is to have at least 50% of renewable bus fuels in 2011 and 100% in 2025. Renewable fuels apart from ethanol are for example biogas from anaerobic digested municipal waste (in 2010, 90 SL-buses were fueled by biogas). Emission targets for SL are that by the end of 2011 that maximum 55 gCO2/pkm should be emitted from SL's bus fleet, and that the NOx and PM emissions should be reduced by 15% and 25% respectively per pkm (compared to 2006). Regarding energy efficiency SL has set a target on at least 5% fuel reduction per pkm. Further, the electricity used within SL (e.g., for the trams and metro) should remain 100% renewable.

Major results and lessons learned

It has been proven that there are emission benefits from using ethanol in buses compared to using diesel. Tests have showed that regulated emissions such as NOx, CO, HC and PM from ethanol buses are substantially reduced compared to diesel buses (without considering upstream processes). PM emissions were found to be 10 times lower than Euro 5. Compared to a conventional diesel engine, ethanol-powered vehicles can reduce fossil carbon dioxide emissions by up to 90%.

Ethanol has lower energy content, which involves about 60% higher fuel consumption compared to diesel.
Additional cost of buying an ethanol bus is about 11.000-22.000 Euro. SL, who operates the largest ethanol bus fleet in Sweden, estimates the increased operation costs to about 7.000 Euro/yr. Cost comparison made in May 2006 showed that the total cost for ethanol buses were slightly higher than diesel buses, while the fuel cost per km was almost identical (see link to the comparison under "more information" below). The ethanol price and fuel taxes are an important factor for the total cost.

This Swedish Scania-SL-experience of ethanol buses is now exported internationally via the Ethanol Bus Buyers' Consortium. Madrid, Rotterdam, La Spezia, Sao Paolo and Nanyang have already decided to introduce ethanol buses. Ethanol buses of a new generation from Scania are running in Oslo, Nottingham, Redding, Milan and Östersund. Other Swedish cities having fleets of ethanol fueled buses are for example Umeå, Gävle, Örnsköldsvik and Falun. The interest for ethanol buses is growing around Europe and the world.

As an attempt to further reduce emissions, noise and fuel consumption, SL has initiated a project they call "The world's first ethanol electric hybrid buses". A fleet of 6 ethanol electric hybrid buses and a reference ethanol bus started to run in Stockholm in 2009. Behind the project were Scania, Nobina, SL and Swebus. Unfortunately the project ended in July 2010, one year earlier than planned due to a problem with the electric engines. A new test fleet will likely come in future.

More Information

Press release 21 June 2010 "World's largest ethanol bus fleet grows by 85 new Scania buses": http://www.ethanolbus.com

A comparison of the costs between three ethanol buses and three comparable diesel buses (Swedish prices and taxes) can be downloaded here.

Read more about the ethanol buses in Stockholm at the following websites: http://www.ethanolbus.com, http://sl.se, http://www.scania.com

Evaluation

A successful demonstration of E95 with buses-disseminated widely also by the Ethanol Bus Buyers Consortium . Although there is a 15 years positive experience with E95 there are no other bus makes on the market to choose from which makes it difficult for followers apart from organising E95 supply. Ethanol also was badly damaged by the food or fuel debate and acceptance for public transport as basic need has to be raised.

Posted: 12/2009
Last update: 11/2010
within the ALTERMOTIVE project

No. 11

Bonus compensation system for suppliers of transport service, using renewable fuels, in Östhammar (Sweden)

To increase the use of renewable fuels and environmental friendly vehicles in Östhammar (Sweden) the municipality has incorporating a bonus compensation system in the municipal transportation service sector. The suppliers using renewable fuels should be compensated by a bonus depending on vehicle type and distance travelled.

Background

In the municipality of Östhammar an action plan with the purpose of reducing greenhouse gas emissions was established in 2002. Emissions within the transportation sector would be reduced by more coordinated and efficient transport and improved public transport. Further, professional drivers should be educated in eco-driving and the traveling policy for municipal employees was changes into the following priority order, for short and medium long distances: (1) bike, (2) public transport, (3) official car, and (4) own car, whereas for longer distances (1) train, and (2) aircraft. Östhammar municipality made a procurement of the transportation services in 2007 leading to a contract valid for at least three years. One example of transport needed within the municipal service is the mobility service for handicapped and elderly people. In the bidding process between different suppliers, Östhammar also included a bonus compensation system if the supplier used environmentally friendly vehicles. Using such vehicles was not compulsory for winning the contract but could act as a carrot for suppliers to change their vehicle fleet. If the supplier fulfilled any of the following points the supplier would be compensated afterwards.

- For DIESEL cars and mini buses the supplier holds a bonus compensation of 0.10 SEK/km for vehicles using particle filter. At most 1500 SEK/year and vehicle (approximately max 150 EUR/vehicle).
- For vehicles operating on GAS (methane) the supplier holds a bonus compensation of 0.25 SEK/km. At most 10 000 SEK/year and vehicle (approximately max 1000 EUR/vehicle).
- For ETHANOL driven cars the supplier holds a bonus compensation of 0.20 SEK/km. At most 10 000 SEK/year and vehicle (approximately max 1000 EUR/vehicle).
- For ELECTRICAL hybrid cars the supplier holds a bonus compensation of 0.25 SEK/km. At most 10 000 SEK/year and vehicle (approximately max 1000 EUR/vehicle).

To get the bonus compensation, each supplier should also be able to show that the environmentally friendly vehicles had been run on renewable fuels for at least 80% of the time.

Major targets

The main target with introducing the bonus compensation system is to increase the use of environmentally friendly vehicles and the use of renewable fuels in Östhammar, which is one small step towards the long-term target of reducing global greenhouse gas emissions to prevent climate change.

Major results and lessons learned

The bonus compensation system has lead to an increased use of renewable fuels and thus decreased emissions of greenhouse gases from the municipal transport service sector in Östhammar. The bonus compensation system for the suppliers of municipal transport services were found to be one important factor to meet the targets of reducing greenhouse gas emissions.

The bonus compensation system was, however, not sufficient to meet the targets set up in the action plan. Changes have also been done in the municipality of Östhammars own fleet. In 2009, the municipality of Östhammar possessed 97 passenger cars whereof 55 were defined as environmentally friendly. All of them of the type *flexifuel*, fuelled with E85 or any blend of ethanol and gasoline. The cars were not allowed to emit more than 120 gCO2/km and maximum 5 mg particles per km. The *flexifuel* vehicles were not allowed to have a fuel consumption over 0.92 litre per 10 km.

However, from the evaluation report it can be seen that Östhammar could have done even more in their way towards a greener transportation sector. They could for example have introduced a carpool system which usually reduces the demand for travelling with cars. To encouraged the use of environmentally friendly passenger cars among Östhammar citizens in general the municipality could have introduced a system of reduced parking fees, which has been done in many other cities.

More Information

Östhammar as one of many examples of green passenger transport.
Report fipraktiska exempel - persontransporterfl (in Swedis
Evaluation report flMiljöbilssituationen i Östhammarfl (in Swedis

Evaluation

The compensation of higher expenses for low GWP-fleet services for tenderer on a regional level is unparalleled and absolutely necessary if the national fiscal bodies are not active enough. Otherwise parallel regional and national incentive schemes create too much regulations to take into consideration.

Posted: 10/2009
Last update: 01/2011
within the ALTERMOTIVE project

No. 12

Conversion of five public transport diesel vehicles to environment-friendly vehicles running on methane in Gorna Oryahovitsa, Bulgaria

The Municipality of Gorna Oryahovitsa is implementing measures for sustainable transport development in the city within the frameworks of the CIVITAS-RENAISSANCE project. As a pilot project, five of the conventional diesel buses used for urban transport needs will be converted into methane ones.

Background and Objectives

The city of Gorna Oryahovitsa is an important transport node in the North-Central Bulgaria where road, rail and air transport are available. Due to its crossroad location and the economic development of the municipality and the region, the road traffic and especially the heavy one transiting the town is constantly growing, harming in this way the living and natural environment.

New transition strategy towards clean vehicle fleets will be implemented in order to test the possibility for conversion of the available public transport diesel vehicles to environmental-friendly vehicles running on LPG/bio-diesel. As a pilot project, five of the conventional diesel buses used for urban transport needs will be converted into methane ones. The overall objective of the project is to implement a transition strategy towards clean vehicle fleets and to contribute to the decrease of air pollution in the city of Gorna Oryahovitsa.

Implementation

The project envisages purchase of 5 new LPG/bio-diesel engines and conversion of the existing diesel buses into LPG/bio-diesel buses, used for the needs of the urban public transport in the city of Gorna Oryahovitsa. The purchase of the engines will be organised through an open public procurement tender.
Tenders will be carried out also for the establishment of the necessary infrastructure for bio-diesel storage and distribution.

Conclusions

The expected results are as follows:

- Conversion of 5 PT buses from diesel to LPG/bio-diesel fuel
- Reduction of CO2 and other transport related harmful emissions in urban area
- Increase of passenger-km served using clean vehicles in the urban area
- Production of info-pints on clean fuel.

More Information

http://civitas-initiative.org/
http://www.g-oryahovica.org/
http://esteast.unep.ch

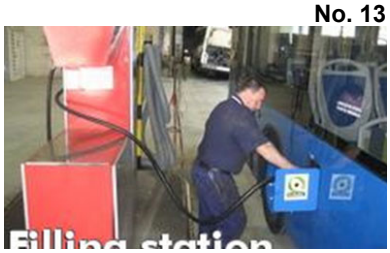
Evaluation

Attempts matching the financial possibilities of the new member states involving producers in the retrofitting. CNG might be the easiest way taking also into account the market of used CNG vehicles. But it makes also sense often to develop an existing trolley bus systems not replacing it by diesel and then CNG buses.

Posted: 10/2009
Last update: 03/2011
within the ALTERMOTIVE project

No. 13

Biofuels and clean vehicles in Donostia - San Sebastian (CIVITAS ARCHIMEDES Project)



The aim of the ARCHIMEDES project is to reduce the emissions of air pollutants and GHG by operating biodiesel buses in the CIVITAS corridor. The demonstration of the bus fleet is expected to have an awareness raising effect on other local fleet operators and individual citizens.

Background

This project has started in October 2008 and will last until October 2012. The City itself is the leader in the CIVITAS project, and the Municipal Bus Company of the city is the leader of some of the measures of the project and one of them is fiBiofuels and Clea Vehiclesfl indeed

The objective of the measure is to test energy-efficient public transport fleets at a significant scale in the CIVITAS corridor and serve as a local showcase for the use of alternative fuels.

Major targets

The use of Biodiesel in the local buses will serve as a local showcase and promotional actions are planned to convince also other fleet operators and individual car users to switch.

During ARCHIMEDES the San Sebastián public transport company (CTSS) will gradually introduce biodiesel in its fleet. Over time both the number of vehicles using biodiesel and the blend levels will increase according to the following: during ARCHIMEDES all 70 buses of the CTSS will run at least with a 20% blend of biodiesel. A part of the fleet, namely 20 buses, will run on 100% biodiesel.

In the case of the measure related to "Biofuels and clean Vehicles", there are some necessary changes in infrastructure: New fuel pumping - mixing station.
The municipal police will introduce at least 7 hybrid cars as part of the ARCHIMEDES demonstration project, but the additional cost of these vehicles are not included in the ARCHIMEDES budget.

Major results and lessons learned

A biodiesel mixing station is operational at CTSS since December 2008 and gives excellent results. The mixing station will provide the possibility to adapt the percentage of biodiesel mix to the technical needs of each individual bus.

The overall costs for the measure related to biofuels and clean vehicles are about 800.000 EUR and the amount subventioned by the project is about 50%.
During ARCHIMEDES the CTSS will gradually introduce biodiesel in its fleet. Over time both the number of vehicles (30 EEV buses until 2011) using biodiesel and the blend levels will increase.

During the project more than 6,64 mil. litres of fossil fuels will be substituted by biodiesel.

The promotion of the extension of the use of biodiesel beyond municipal fleets (to private fleets and individuals) will be carried out by ADS (the city government) by implementing the following actions:

- Information and promotion campaign to stimulate take-up of biodiesel;
- Develop incentive measures that favour the users of biodiesel (e.g. reduced prices for parking in the city).

A promotion campaign on "autobuses ecológicos" has been launched.

Evaluation

Positive older example where EU funds ease the decision to transit to alternative fuels. Now we have new challenges - the biofuel bashing is to be re-mediated, particle trap solutions when using biofuels developed further.

Posted: 11/2009
Last update: 10/2010
within the ALTERMOTIVE project

No. 14

Alternative fuel bus fleet in Suceava (Romania) - End of the SMILE project

Within the period of 4 years (2004-2008) the city Suceava was taking part on the SMILE project, which aimed at improvement of urban air quality and creating of a sustainable, safe and flexible traffic system that improves the quality of life, following the policies of the CIVITAS II programme. The main activity was the introduction of an alternative fuel bus fleet. This activity was divided in two stages: LPG buses were to be introduced in the first stage and followed, if feasible, by the introduction of the biogas buses concurrent with the development of biogas facilities.

Background

Program: SMILE, 2004
Area covered: All the city of Suceava
The program initiated by the Local Transport Company
The incentives were:

- The need to offer an alternative mode of local transportation with focus on clean vehicles and fuels to reduce impact on environment.
- The rehabilitation of the Wastewater Treatment Plant, setting basis for the further use of sludge Pressure of motorised traffic on environment,
- Increased price and general costs of the conventional fueling political support - EU™s membership committed Romania to meet the provisions of environmental related directives

Major targets

-40% of all Euro 3 buses owned by the public transport company to use LPG or biogas fuel
-20% of all Euro 3 minibuses (vans) owned by the public transport company to have FPT (filter particulate traps) systems
-Emission and noise reduction
-Improve the infrastructure concerning the passengers' safety, convenience and information (new bus stop shelters, boards with information, VMS systems, CCTV cameras, new traffic lights with updated technology etc) to increase the number of passengers.

Major results and lessons learned

Some results were:
-Increase in number of PT passengers by 756.77%, and setting up of a new urban public transport company in the city of Suceava.
-Reduction of emissions caused by LTC vehicles (a) initially with the fleet renewal and later by converting half of the entire fleet from diesel fueling to LPG fueling and (b) with the integration of filter particulate traps in minibuses.
-Good acceptance levels for the measures implemented and creation of a base for the new urban mobility culture, from where other related measures can be built upon.
-Improved quality of the PT service.

The program costs reached 70.520 •.
30 new buses fueled by LPG and 2 minibuses equipped with FPT system are now part of the fleet, reducing the emissions and improving the energy consumption.

More Information

-www.eltis.org
-Narciza Nenec

Evaluation

Example where targets using alternative fuels were not met. Existing fuels (LPG) not reducing GWP had a better standing because they were sold as alternative fuels.

Documents

Data Collection Form_Policy_final_Suceava.doc

Posted: 11/2009
Last update: 06/2010
within the ALTERMOTIVE project

No. 15

Green postal delivery services in Italy, Belgium, Hungary and Bulgaria

The EU Intelligent Energy Europe Programme supported the project Green Post, aiming at introducing new electric and hybrid vehicles in the postal delivery services in four European countries. Those were Italy, Belgium, Hungary and Bulgaria. The project aimed at exchanging of best practices in postal delivery services using electric and hybrid vehicles.

Background & Objectives

The Green Post project started in December 2007 and has finished in June 2010. It covered the four EU countries Italy, Belgium, Hungary and Bulgaria.

The idea of the Green Post project was to exchange the best practices and lessons learned in postal delivery services with electric and hybrid vehicles with the full collaboration of the transport industry sector.

The objectives of the Green Post project were:
- Improvement of the energy efficiency, reduction of air pollution and CO2 emissions caused by the postal delivery services.
- Raising the general public's awareness in order to influence the social responsibility of major delivery services operators, and stimulate replication of similar initiatives in other European Postal Companies, as well as in the whole EU transport sector.
- Support to the electric vehicle market.

Implementation

The project partners, which include postal agencies and universities, have tested the alternative vehicle, the Free Duck quadricycle, produced by the Italian company Ducati Energia. The tests results, as well as the environmental impact assessments and economic analysis, management and maintenance trainings aimed to corroborate the cost effectiveness and environmental benefits of the investment.

The Free Duck is a lightweight quadricycle, created together with Ducati Energia, in line with European indications on reducing energy costs. It has an attractive shape and is available in two versions:
- a hybrid (petrol/electricity) version and
- a fully electric version.

The vehicle presents a series of advanced features in terms of safety, speed control and braking system. Practical and easy to drive, the vehicle has a steel frame with ABS shockproofed body and a 100cc hybrid four strokes engine. The petrol-driven version has a battery group recharge function. The maximum speed of the vehicle is 45 km/h. The nominal power is 4kW and the battery is recharged fully in about 8 hours.

Conclusions

Experiences gained, lessons learnt and know-how, were being systematized, shared and discussed, among all stakeholders, in order to stimulate the replication of similar initiatives (investments). Through an intensive communication strategy the public was involved in the project.

The results in all four cities (best in Perugia, Italy) in terms of energy consumption and CO2 emissions monitoring, measured within the whole period show, that the fleet electricity cumulative consumption was raising constantly, reaching the amount of 8,470 kWh in August 2009 in Perugia. The distance covered by the fleet in this city was 60,976 km (Rousse: 1,675 km Szentendre: 2,459 km Bruges: n/a).
The saved CO2 emissions compared to old fleet was different in every single city and amounted in Perugia up to 8,659 kg CO2 kWh / km (Rousse: 226 kg CO2 Szentendre: 201 kg CO2 Bruges: n/a).

Graphs visualising detailed results concerning milage, energy consumption and saved CO2-emissions are presented city by city at: greenpostproject.eu

More Information

More information on the Green Post Project is available at the Green post website.

Detailed information on more post service related projects and subprojects are presented at www.posteurop.org.

Within the Post Europe project - the umbrella project of the Green Post project - a GHG Inventory Standard for the Postal Sector has been developed. In this standard postal operators can find:
- The main principles for quantitative GHG reporting (scope, references...)
- The explanation of the indicators „calculation". In each indicator sheet, postal operators can find the procedure for its data collection and calculation;
- The references needed to calculate CO2 emissions (conversion ratio, emission factors).

The GHG Inventory Standard is available for download at posteurop.org >Press room > publications.

Evaluation

A successful demonstration of E95 with buses-disseminated widely Great example to progress in a segment with a logical application of electric propulsion. The offer of usable vehicles however is limited, progress eagerly awaited and clever logistics overcoming autonomy limitation the key to success.

Posted: 11/2009
Last update: 11/2010
within the ALTERMOTIVE project

No. 16

Municipal Transport Company in Tarnow with the most ecological bus fleet in Poland

Over 60% of buses operated by the Municipal Transport Company in Tarnow, Poland (MTC Tarnow) are equipped with alternative drive systems, namely compressed natural gas (CNG) and hybrid (diesel - electric) systems. The usage of the 20 CNG buses results in considerable reduction of atmospheric pollutants.

Background and Objectives

MTC Tarnow claims having the highest share of environmentally friendly buses of all municipal transport companies in Poland, which gives it the leading position in figreenfl bus fleets. Over half of the buses run on CNG or are equipped with hybrid engines (diesel - electric engines).

Improvement of the environment in the region through reducing atmospheric emissions of pollutants contained in exhaust from bus engines constituted the main aim of switching into alternative drive system in buses operated by the MTC Tarnow. Reducing the noise level in the city by use of quieter vehicles was another important factor. Economic issues also proved significant - raising diesel oil prices were increasing operational costs.

Implementation

Within the investment project implemented by the MTC Tarnow about 20 Jelcz buses were modernised and adapted for CNG. Moreover, the company purchased 12 used Volvo buses with a CNG factory-adjusted engine and another 12 used Mercedes buses with a hybrid (diesel electric) drive. The newly-bought vehicles replaced Jelcz and Volvo buses running-down.

The cost of the investment amounted to 8 446 thousand PLN. 5 131 thousand PLN was spent for the modernization and adaptation of 20 buses for CNG, out of which 1 370 thousand came from the EkoFund. The cost of purchasing Volvo buses with a CNG factory-adjusted engine amounted to 1 513 thousand PLN. 12 Mercedes buses with a hybrid (diesel electric Mercedes O520 built in 2000) drive cost 1 802 thousand PLN.

Conclusions

The investment fulfilled the expectations associated with it. Environmental effects for the 20 operated buses assume a considerable reduction of atmospheric pollutant emissions. Annual reductions of respective pollutants are estimated at:

- Carbon dioxide - 15%
- Carbon monoxide - 87%
- Nitrogen oxides - 70%
- Particulate matter - 100%
- Hydrocarbons - 88%

Reduction of operational costs constitutes another significant result of the investment. Annual CNG consumption has reduced diesel oil consumption in the company by 59%, while hybrid engines have reduced fuel consumption even to 30%. Much quieter operation of the new vehicles is also deeply significant for the comfort of passengers and inhabitants.

More Information

www.mpk.tarnow.pl MPK Tarnow

Evaluation

Brave decision to replace totally worn out buses in the new member states by latest technology, paying back investment cost by reduced operational cost. This case shows may be also a late success of *diesel electric* buses - which were not well acclaimed in the old member states.

Posted: 11/2009
Last update: 11/2010
within the ALTERMOTIVE project

No. 17

La Spezia and Magenta, bioethanol in Italian bus fleets

In La Spezia™s public transport service three ethanol-fuelled buses (since 2007) and one ethanol filling station are in operation. ATC - the public transport provider - is the first Italian company using bioethanol in public transport. In another Italian city, Magenta, the local public transport company Atinom S.p.A. also decided to introduce ethanol-fuelled buses in PT (in October 2009).

Background

The local public transport operator of La Spezia is partner in the BEST project (Bio-Ethanol for Sustainable Transport). Aim of the project is the introduction of bio-ethanol-powered buses and the development of a draft standard for ethanol bus engines taking into account the experiences gained in the BEST project.
One of the main problems by introducing bio-ethanol is the taxation. Ethanol has nearly the same taxes as diesel, but the engines need a much higher volume of ethanol than on diesel. Thus tax relief or exemption for the ethanol are essential, otherwise fuel costs will increase substantially and are not affordable by PT operators.

Major targets

Main argues for bio-ethanol are the reductions of exhaust gas emissions as well as of the oil dependency. The implementation of bio-ethanol buses is one opportunity of realizing a sustainable public transport service.

Major results and lessons learned

Three buses running on ethanol are in operation in the PT line Sarzana-Lerici since 2007; the buses are running on E95 bio-ethanol - 95% ethanol from agricultural materials and 5% additives.
The bio-ethanol filling station is situated in the ATC depot.
Furthermore the project was extended to local municipalities who are using flex fuel cars running on E85.

Bus types: Scania *Omni* buses with a 9 litres displacement Scania compression-ignition (diesel cycle) engine. The engines had to be slightly modified. The implemented buses are standard types and are using regular Scania components.
The decision for this bus type has been chosen because it has already been in operation in Stockholm for more than 15 years and was considered a fully proven bus technology by Stockholm.
As long as the scheduled maintenance requirements are followed, no operational drawback is to be expected.
La Spezia is still operating the buses (11/2010), in Magenta the company will be stopping operation.

More Information

Evaluation

Utilising E95 test buses all over Europe is a means to convince fleet owners, but the producers also have to offer them on a wider basis. Also legal and funding issues stood against a success.

Posted: 11/2009
Last update: 11/2010
within the ALTERMOTIVE project

No. 18

LPG boats and CNG buses in Venice

The targets of the program were to increase the number of clean energy efficient vehicles that run with natural gas in the public transport bus fleet, and to introduce the deployment of LPG in the fleet of pleasure crafts (boats) used by private citizens in Venice historical city centre and surrounding lagoon.
Until now the following targets have been achieved:
1. CNG buses:
A reduction in emissions for the ACTV bus fleet
LPG boats:
1. Ten LPG demonstrating pilot boats circulating in the lagoon.

Background

The project was profiting from funding of the CIVITAS program 2002. The Area covered part of Venice.
The program was initiated by the ACTV (local public transport company) and AGIRE (local energy agency).
The main targets were to decrease the emissions and to stimulate the market of LPG boats.

Major targets

CNG buses
CIVITAS-funding allows the company to broaden its natural gas powered fleet through the conversion of 2 buses to natural gas, the purchase of further 35 natural gas buses and the acquisition of 5 natural gas minibuses for park & ride services. This expansion of the fleet is accompanied by a broadening of the necessary refuelling infrastructure (CNG filling station, extension of the natural gas pipeline).

LPG boats
The original targets (20% of the private pleasure crafts converted to LPG) was abandoned due to bureaucratic reasons that made impossible the on time realization of the refilling stations as well as to the fact that, in Italy, only bi-fuelled engines are allowed under current law and it is not possible to use conversion kits in order to convert petrol fuelled engines on LPG engines.
The new targets that were decided were:
1.) Purchasing and field-test of 10 pilot boats fitted with new bi-fuel LPG outboard motors aiming at a full demonstration of the reliability of LPG as a nautical fuel under standard use conditions.
2.) Complete study on the use of LPG in boats, both with new factory-made engines and conversion kits.
3.) Awareness raising campaign, addressing potential customers, policy makers and engines installers.
4.) Local Action Plan for the promotion of LPG in boats, addressing decision makers and possible local stakeholder.

Major results and lessons learned

CNG-buses
As a test 2 buses were converted to dual fuel (CNG/diesel). ACTV decided that **new** CNG buses were more economical and with better environmental performance than the converted. As a result 35 new CNG buses (co financed by MOBILIS) and 5 new CNG mini-buses were purchased.
The reduction in emissions for each bus is considered to be 51.6% for CO, 13% for HC, 7.5% for NOx and 97.2% for PM10.
All new buses introduced into the urban network are methane powered. 35 buses 12 meter lengths are operating. Further, 5 buses with a length of 12 meter lengths and 5 with 18 meter lengths entered the network this year 2010. Alternative fuel operated buses now (11/2009) reach the 15% of the overall fleet (in the year 2005 the share was only 5%).
LPG boats
10 pilot boats with bi-fuel LPG outboard motors were purchased and tested. However due to lack of LPG distributors in the lagoon field the boats were refuelled in a particular manner, the tests were carried out on a day by day basis and the comparison with the petrol fuelled boats is limited.
Regulations for LPG in boats as well as rules for the LPG filling stations are necessary. *Assogasliquidi* (Italian LPG Association) and AGIRE are in constant contact in order to lobby the national authorities to speed-up the regulations approval process.
New fuelling station opened spring 2010 and this is leading to a more optimistic vision of LPG diffusion of such alternative in the Venice lagoon. A more realist target of 10% is foreseen *if* the legislation will allow this option.

More Information

web site Venice Civitas Initiative
Alessandro Tasinato

Evaluation

Monovalent CNG technology is seen as favourable over dual fuel usage (CNG/Diesel) but also with regards to the GWP? Utilising LPG for boats is only a first step. Progressing to Bio-LPG or using Bio-LNG are alternatives.

Posted: 11/2009
Last update: 11/2010
within the ALTERMOTIVE project

No. 19

Erection of a local bio gas station - not connetced to the grid - on St. Margarethen am Moos (Austria)

The biogas processing unit plus biogenic CNG filling station in Margarethen am Moos is the smallest commercially run facility of its kind anywhere in the world. Its simple, compact design has advantages both for operation and economically.

Background

The project —(BIO) gas local fuel stationfi lasted from January 200 to September 2008.
The upgrading plant and the local fuel station where implemented in Margarethen am Moos near Schwechat at the site of a 500kW biogas plant. The biogas plant delivers the additional biogas that is converted into fuel by simply increasing its biomass input.
This project was initiated by TBB Consulting in cooperation with EVM (Energie Versorgung Margarethen am Moos), Vienna University of Technology, AGRAR PLUS, AXIOM, BAUER-Poseidon (fuel station), FIAL and LUKENEDER.

Major targets

The goal of the project fi(BIO) gas local fuel stationfl was to ere Austrias first biogas-upgrading plant in connection with a local fuel station without any connection to a natural gas grid.
The proper technics for the local upgrading plant is the membrane technics. With an average turnout of 33 Nm3 biomethane (methaPUR) it is the smallest commercially running upgrading plant in Europe. Throughout the project the membranes could always deliver the needed gas-quantity and gas-quality. The upgrading plant also was capable to operate in the fisupply on demand modus, by turning off-/on when needed. The offgas from the upgrading plant is reinjected into the biogas plant and converted into heat and power by the installed gas engine. This makes the upgrading station a zero emission plant, because there is no energy loss because of unused offgas.
The fuel station was licensed and built for non public access in self service operation. Therefore every user has to register once, after that he has unlimited access. The fuel station had in 2008 about 20 customers, and it is expected that within three years there will be a fuel consumption of 150.000 kg (approximately 200 cars) a year. This represents the needed fuel output for a profitable operation.

Major results and lessons learned

The project goal has been achieved completely. Currently the fuel station has about 30 customers.
From the beginning the project was funded by the Land NÖ as well as ÖKK and FFG. The total costs of the project of about 642.000 EUR (442.000 investments costs and 200.000 operation and maintains costs) are covered mostly by FFG (94.000 EUR), Land NÖ (150.000 EUR) and ÖKK (143.650 EUR). The remaining costs where paid by the operator of the plant, the EVM.
The public was informed about this project through different activities such as presentations, nomination for fiKlimaschutzpreis 2008fl, well as the win of the fiNÖ Energy Globe 2008f
After the success of demonstration-plant in Margarethen am Moos it is now planned, to find 25 more locations in Austria to construct an upgrading plant und a local fuel station similar to Margarethen am Moos.

More Information

TBB Consulting
DI Harald Bala MSc

www.methapur.com

Evaluation

Very small scale biogas unit where no policy lesson may be deducted. Might be used as forerunner however having very good funding and media coverage.

Posted: 11/2009
Last update: 11/2010
within the ALTERMOTIVE project

No. 20

Electric cars used for postal delivery in Stavanger

From year 2000, the city of Stavanger - together with five other European cities, i.e. Milano, Rotterdam, La Rochelle, Erlanden and Stockholm, participated in the EU/Thermie project, entitled Elcidis (Electric City Distribution Systems). The Elcidis project in Stavanger consisted of 7 cars from Peugeot and Mercedes - all electric vehicles (EV), ranging from normal personal cars to vans.

Background

Five of the cars were used by the city™s mail delivery service to make normal postal and package deliveries to citizens and companies in Stavanger. One car was used in the municipality of Stavanger and one was used by the local energy company. This was the three of the project partners. A combined free parking space and free charging station was set up in the centre of Stavanger as a part of the project, to be used by private costumers with their own EVs.

Major targets

In 2001 the municipality developed specific requirement specifications for desired EVs in cooperation with 5 other cities. 7 vehicles were taken in use with the following objectives; Demonstrate the economic, technical and social viability of postal distribution with EVs; Analyze the environmental benefits of EVs; Gain insight in the technical specification of EVs operating in urban distribution activities; Analyse the logistic efficiency of urban distribution centres; Demonstrate the acceptance of urban distribution with EVs.
The cars entered into the postal service on level terms with the normal gasoline or diesel cars, and were used for normal postal deliveries in and around Stavanger. The larger vehicles provided by Mercedes did give some technical problems, that were due to batteries not working properly. This lead to some of the cars being out of service for longer periods, and after a while damaged the reputation of the EVs. But the cars did work as intended when available.

Major results and lessons learned

The cars in Stavanger have been a social and economic success. The employees were largely happy about the cars, although the size of some of the vehicles was a problem on days with large deliveries.
The cars were a lot more expensive to buy than conventional cars, but due to the relatively low electricity prices compared to fuel in Norway, they were largely an economic success. Because of the long distances covered by the vehicles in the postal delivery service, the cars had a sensible operating economy compared to a gasoline or diesel car. The Elcidis project in Stavanger was not prolonged, but the experiences with EVs lead to recent purchases of EVs used for distribution by the postal service.
The experiences with buying bigger EVs lead the postal service to choose smaller vehicles, specifically designed for urban delivery. The reason behind this was that the experience from the Elcidis project showed that the car supply had to be closely linked with the service from the supplier.
The supplier has a better chance of offering support to each costumer because they fewer costumers, thus a better chance of servicing, than what was experienced with the larger companies during the Elcidis project. The Elcidis project showed that it is possible to deliver mail in urban areas with EVs. The main issue seems to be the service of vehicles, which are supposed to work every day of every year. The present solution with smaller vehicles is succesfull.

Evaluation

Obvious results - the best suited application field for battery electric vehicles are cities. Unfortunately vehicle quality was not sufficient for a regional service and the procurement was stopped.

Posted: 11/2009

No. 21

HyFLEET:CUTE - hydrogen busses in Berlin's public transport (Germany)

The EU-project —HyFLEET: Cutefi is part of the European initiative —Hydroge for Transportfi. 14 hydrogen buses are ran in Berlin. The project aims a developing and demonstrating the advantages of hydrogen busses as well as the refuelling process and technologies and procedures for the production of hydrogen.

Background & Objectives

The most important partners of the Berlin initiative are Berlin™s local public transport company (BVG), the energy companies TOTAL Germany and Vattenfall Europe, the supplier of commercial vehicles MAN AG/NEOMAN Bus GmbH, and the University of Technology Berlin. The BVG is Germany™s largest public transport company and plays a role model function in protecting climate and environment.

The Objectives of the project were:

- Improvements of the local air quality by reducing HC-, PM10- and NOx-emissions
- Reductions of PT related CO2-emissions
- Improvements of its own image as a green transport service company
- Development of a hydrogen powered bus technology in order to reduce the consumption of fuel and energy in the whole transportation system.
- Development of efficient and environmentally 'friendly' ways to produce hydrogen. Researching the technology and development needs to establish a hydrogen refuelling infrastructure.

Implementation

The project started in 2006 and aims at developing and demonstrating the advantages of hydrogen busses as well as developing methods for the hydrogen production and fuelling. Berlin™s fleet of 14 hydrogen buses covers Berlin™s urban districts "Spandaufi and "Charlottenburgf

In the framework of the EU-programme, the purchase of hydrogen buses was financially supported by paying the additional costs of about 80,000 • for each hydrogen bus in comparison to conventional diesel bus. Additionally, a part of the extra fuel costs is covered by the support program. The fuel cost of the hydrogen buses are with 160 • per 100 vehicle kilometres higher than those of diesel buses (about 50 • per 100 vehicle kilometres).

Fourteen hydrogen buses are operating in Berlin. Four of them are hydrogen buses with an aspirated engine and 10 are hydrogen buses with a turbo engine of the motor vehicle manufacturer MAN.

Although the operating ranges of hydrogen buses (about 200 km) are lower in comparison to diesel buses (about 400 km), no additional stops for refuelling are necessary if the lower operation range is taken into account while scheduling the buses.

TOTAL has established a hydrogen refuelling station at the BVG depot in Berlin-Spandau, bears full costs of this station (about 2 million Euro) and operates it.

In comparison to diesel buses, the hydrogen bus fleet emits 751 tons CO2 less per year. Since spring 2006, it is a reduction of 2,253 tons CO2 emissions.

Conclusions

The results show that hydrogen is a possibility to minimizing emissions and noise, but the high investment costs and the lower range of the buses are continuous problems.

Due to the fact that MAN backs out of the hydrogen technology by the end of 2009, it is not possible to enlarge the number of vehicles with identical configuration. Nevertheless, Berlin plans to enlarge the initiative. Additionally, the BVG is highly interested in hydrogen and hybrid buses which are currently developed by the Polish manufacturer SOLARIS.

More informations

http://www.global-hydrogen-bus-platform.com/

Evaluation

Hydrogen, especially fuel cells - having very positive sides for the passengers - was hyped and successfully adopted by stakeholders unless the economic crisis underlined the bad economy of using hydrogen in fuel cells.

Posted: 12/2009
Last update: 07/2010
within the ALTERMOTIVE project

No. 22

Better Place Denmark

The company Better Place plans to develop a nationwide infrastructure for electric vehicles (EV) in Denmark within the next 3 years. The infrastructure is based upon cooperation between the company and the Danish energy sector, and will provide charging infrastructure at home as well as on the road. The process of developing the infrastructure begins in the winter of 2009-10 with a 6 months long, small scale showcase in the municipality of Copenhagen.

Background

The company Better Place is based on a very idealistic and pleasant thought. Quite simply, to make the world a better place - with planning of electric and traffic infrastructure and nationwide introduction of electric cars. The aim of the Better Place Denmark project is to create infrastructure that will facilitate charging both at home and at the site of major connecting points, workplaces, train stations, airports etc., and battery change stations by major roads. It is expected that more than 90% of the charging will be through regular charging stations, and the rest will be used in the battery changing stations. Denmark has been chosen as one of the first countries, mainly due to two national developments: During the 1990™s, Denmark was a leading developer of sustainable energy supply. Wind turbines were the main driver in this development, which saw the part of electricity from sustainable sources rise, and today wind turbines account for 18.9%, soon to be around 25%, of the Danish electricity supply. Secondly the government taxes on cars sold in Denmark are some of the highest in the world. EVs are omitted from taxation in Denmark, so far until the end of 2011, thus making the cars substantially more competitive.

Major targets

The overarching aim of the Better Place project is to combine EVs with sustainable production of electricity. The main challenge for doing so is to enable intelligent charging, which means that the charging will start when the rest of the energy consumption is low or when the production from sustainable energy sources is high. This will potentially mean that the cars will provide additional flexibility in the consumption of electricity, and therefore be able to utilize some of the gaps in the normal consumption of electricity that is known in Denmark, fx. during night hours. If the improved flexibility enhances the effort to build more renewable energy plants, this will lead to reductions in the total CO2 emissions coming from the transport sector and from the energy sector. A very important task for the project is to be a front runner and develop infrastructure for charging, that doesn™t eliminate other possible EV schemes from Denmark.

Major results and lessons learned

Even though Better Place Denmark now is in the process of setting up the first pilot project to test cars and charging stations, the interest is massive from both public and private organisations as well as individuals. Even before the EVs have been introduced, a significant number of agreements with large companies and public institutions have been made. The schedule for project Better Place Denmark sees a pilot project during the COP15 conference in Copenhagen with 50 charging stations, and electric vehicles from Tesla, Renault, Fiat and Citroën. The first battery change station will be put up during 2010. From 2011 the plan is to start building infrastructure around the larger Danish urban areas and introducing EVs to the Danish consumers in the second half of 2011.

More Information

http://danmark.betterplace.com/

Evaluation

Not a lot may be deducted since the project is in its infancies but it seems now more likely that OEMs join battery exchange since they won't sell much vehicles with current battery prices.

Posted: 12/2009

No. 23

Purchase of electric vehicles in Copenhagen (Denmark)

In the period from 1996 to 2000, the municipality of Copenhagen participated in the EU funded project ZEUS (Zero and low Emission vehicles in Urban Society). The municipality prepared a tender together with 5 other European cities. Copenhagen replaced 50 combustion engine cars with 50 battery electric vehicles (BEV). The cars were used by employees of the municipality.

Background

The main target for the project was to help develop better BEVs through, creating demanding for them. The target for the Municipality of Copenhagen was to purchase at least 50 BEVs as replacement for cars in the municipality with a regular combustion engine.

The municipality of Copenhagen was mainly motivated by the prospect of improving the BEV-market supply and the chance to develop knowledge about how BEVs would fit into the everyday work in the municipality. On a broader scale the climate debate was not as present as we see today. This was illustrated by the main drivers behind the project being the reduction of air pollution in the city of Copenhagen and taking a first step towards a future transport system.

Major targets

In 1997 the municipality developed specific requirement specifications for desired BEVs in co-operation with 5 other European cities. Later that year a tender was presented on behalf of all the cities, with the purpose of showing that a demand for BEVs was present among European cities and hopefully giving a push to the market for BEVs in Europe.

The municipality began its focus on BEVs in the early 1990'ies as 20 designated free parking spaces for electric vehicles were established, which also provided free charging of 8-10 hours to fully charge. The ZEUS project contained the purchase of 50 BEVs for the municipality of Copenhagen, and the development of infrastructure that made it possible for employees to use them in their daily work.

In the summer of 1999 the municipality had purchased 20 Citroen Berlingo CityVan Electrique, 17 Citroen Saxo Electrique and 6 Purpose made electric maintenance vehicles. At the end of the project the aim of buying 50 BEVs was reached.

Major results and lessons learned

The cars had a radius of action of just below 100 km. After analysing the use of the vehicles in the administration it was discovered, that average driving use for car was approximately 40 km per day. The experiences from implementing the vehicles were that the BEVs seemed to cover the tasks needed by the staff of the municipalities as well as a conventional combustion engine would do.

The charging of the cars was predominantly taking place during night hours. The main time consuming and expensive part of the project was the preparation of the common procurement. This is also seen as one of the most valuable parts of the project, with regards to the learning process. The challenge to unite the wishes and needs from 5 different cities and to combine these with the possibilities the BEV market presented.

During the period of the project, Citroen withdrew most of its BEV models from the market. This meant that Copenhagen failed to buy BEVs, after this project had finished. The project did not seem to have a long lasting effect on the market.

Further steps:
Currently the municipality of Copenhagen develops a new plan focusing massively on buying BEVs. The plan is to buy BEVs on a small scale this year. From 2011, the municipality will only buy BEVs, in an attempt to achieve 85% BEVs of their total fleet by 2020.

Further Information

web site ZEUS project

Evaluation

Brave initiative of the municipality to transit to zero emission transport. Project just started but might profit from the existing hype.

Posted: 12/2009
Last update: 11/2010
within the ALTERMOTIVE project

Electric Vehicles put into practice in Frederiksberg

The road sanitation and park maintenance department of Frederiksberg Municipality have 7 years of experience with using electric vehicles (EV). The EVs have become popular among the employees and, though expensive, the department continues to replace the conventional diesel or gasoline vehicles with EVs.

Background and Objectives

The municipality of Frederiksberg has 7 year long experience with using electric vehicles. In 2009 the municipal council has decided to add additional 700.000 euro for each of the following two years for purchasing EVs. The vehicles are used in the municipal department for road sanitation and park maintenance. At this moment the department has at their disposal 21 EVs, ranging from normal cars and small buggys to 3 ton heavy trucks. The most recent purchases are two cars of the type Fiat Scudo Van and three Modec Jolly 2000 Electric trucks. The large trucks are the most recent purchases. They have a radius of action of around 110 km on a fully charged battery and a charging time of around 6 hours. The trucks are some of the first large EVs put into practice in Denmark. The Fiat Scudos have a radius of action of around 150 km on each charging, both types of vehicles have lithium batteries.

Implementation

One experience of having EVs for several years is the positive response from the employees in the department. It took some time for the employees to get used to the EVs, but now these cars are some of the most popular vehicles. The prices of the EVs are higher than a combustion engine vehicle. The large trucks are being bought for around 100.000 ?, a price that the municipality estimates to be more than 3 times higher than a diesel model. The supply of EVs is another issue that is highlighted as a main difference from conventional cars. The production is not stream-lined and involves many different suppliers to the car manufacturer. Therefore the municipality usually visits the factory to test the car before it is delivered, to make it easier to solve some of the most common problems.

The Municipality has experienced problems with their vehicles, but mostly this is discovered before they leave the factory. One of the major benefits is explained by the department as the simplicity of the EV-technology, compared to the combustion engine. Apart from the steering and brake systems the EVs requires little maintenance. As explained by the head mechanic, the workload is substantially lower on an EV compared to the other vehicles.

Conclusions

The forthcoming winter will present a decisive test to the trucks, as they enter into the winter tasks. This means that they will be on the road around 14 hours per day, in case of snow. For this purpose the department has bought additional batteries for each of the trucks along with battery changing equipment. This means that the trucks can be on the roads spreading de-icing salt in 5-6 hour shifts and then the batteries can be switched during the half hour breaks in between. The department predicts a bright future for the larger EVs, that is, if the trucks can withstand the heavy usage during winter. The possibility to switch batteries means that they are on a par with the conventional trucks during the busy winter months. If the next couple of winters show successful results, the department promises to replace more of their vehicle fleet with EVs within the following years.

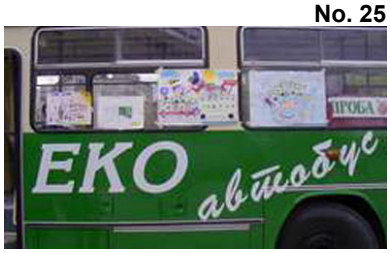
Evaluation

Technological forefront fighting with compatibility and cost problems. It might be useful to head for biofuel operated range extenders to ease logistics.

Posted: 12/2009
Last update: 08/2010
within the ALTERMOTIVE project

No. 25

EcoBus: the promotion of natural gas driven buses in Skopje (Macedonia)



As part of a project JSP Skopje (public transport company) has converted more than 30 buses into eco-buses allowing to run on a mixture of compressed natural gas (CNG) and diesel.

Background and Objectives

In the city of Skopje main source for harmful emissions like particulate matter (PM), nitrous oxides (NOx) and hydrocarbons (HC) are public buses. Therefore a project was initiated to convert those buses into eco-buses in order to achieve significant emission reductions. Initially the project aimed to introduce 30 eco-buses during the first phase, and 100 during the second phase.
This project is based on public-private partnership between JSP Skopje (public transport company) and AD Makpetrol Skopje (private fuel company).

Implementation

The first phase of the project took place between 1st January 2003 and 30th June 2003. In this period two eco buses have been introduced.
In the second phase of the project which is between 1st January 2006 to 31st December 2006, additional 30 eco buses have been introduced with a goal to reduce harmful emissions from public buses in the city of Skopje.
As part of the project JSP Skopje (public transport company) has converted more than 30 buses into eco-buses that is, they run on a mixture of compressed natural gas (CNG) and diesel (natural gas fuel tank on the roof of buses and connections with engine).
These were introduced along with a large scale promotion campaign, to convince transport users about the importance of sustainable urban transport.

The start of the project was accompanied by a public awareness campaign. The one day activity was targeted towards the citizens of Skopje. Its main activity was to introduce the principle of work of these two buses and to inform people about the consequences of usage of cars.

For the public awareness campaign, a multimedia happening in the centre of Skopje was arranged. Two of the converted buses were open to visit for citizens. Furthermore 500 info stickers and radio commercials were produced.

Conclusions

In the beginning of the project in 2003 two dual fuel engine prototypes that run on approx. 40 percent of diesel and 60 percent of CNG have been built. As a second step 30 buses were converted to eco buses. The conversion costs per bus were ca. 10,000 EUR, investment in fuel station was 800,000 EUR. So the total cost of project is about 1,100,000 EUR excluding administrative and research costs.
The operation of the converted buses contribute to significant emission reductions in the city of Skopje for all measured substances.
The realisation of this project was supported by City of Skopje, Ministry of Environment and physical planning, JSP Skopje, AD Makpetrol Skopje, NGO Proactiva Skopje.

The information, provided through the public awareness campaign, encouraged citizens to carefully consider what type of transportation to use, and to use those means of transport which contribute the least to the degradation of the standard of living.

Evaluation

Very interesting approach using adapted technology to clean up the environment and utilise alternative fuels blending CNG and diesel. Good media coverage.

Posted: 12/2009
Last update: 11/2010
within the ALTERMOTIVE project

No. 26

LNG powered buses in Krakow's municipal transport - an innovative project of the Vehicle Transport Company in Krakow

The Vehicle Transport Company, JSC (VTC) specialises in passenger transport as well as freight transport and forwarding. In the middle of 2009 the company won a tender for operation of seven municipal transport lines in Krakow, becoming the third passenger transport company in the city. The company™s success was brought by application of environmentally-friendly innovative technological solutions - buses running on LNG (Liquefied Natural Gas). This allowed the VTC to beat the four competing companies. As a result, 31 modern buses in the VTC colours have appeared on the city™s streets.

Background and Objectives

Municipal transport in Krakow - a city of 750,000 inhabitants and one of the largest university centres in the country - is based on tram and bus transport. Despite the ongoing upgrade of the fleet, only five buses with an alternative drive system operate in the city. These buses run on compressed natural gas (CNG). Therefore the VTC's offer, which was received with large interest and appreciation, will constitute a breakthrough in the city's environmental strategy and will lead the way on the path to sustainable public transport.

Implementation

Within the project the company purchased 15 articulated buses SM18 LNG and 16 standard buses SM12 LNG. The buses were supplied by the Polish company Solbus and equipped with Cummins's engines from the USA. The cost of one bus exceeds 7 million Euro. Another necessary project component is construction of an LNG filling station. This task is implemented by the company KRI S.A. - a supplier and producer of gaseous fuels from Wysogotowo near Poznan. The cost of the filling station amounts to around 0.4 million Euro.

Due to application of the latest technological solutions, filling will take only around 5 minutes, which is an excellent result compared with the filling time for CNG buses. Buses are equipped with fuel tanks of 330 litres, which is enough to cover 400 - 500 kilometres for 18-metre and 12-metre long buses respectively. This means that the buses will have to be filled every two days on average.

Conclusions

LNG constitutes one of the cleanest fuel types. The process of liquefaction requires very thorough purification of natural gas from carbon dioxide, nitrogen, propane-butane, humidity, helium, etc.. This process allows to obtain an environmentally-friendly fuel with a high octane number 130 (the highest number so far in bus drive systems). 97% of this fuel is methane. The problem of exhaust gas emissions is especially acute in Krakow, as the city is located in a basin and has intense car traffic. Therefore, such investments are particularly required, as they allow to reduce atmospheric emissions of harmful substances, improving the standard of living in the city.

More Information

www.pts.auto.pl

Evaluation

Very ambitious project introducing a new fuel and selling its benefits to the public. As forerunner it experienced homologation and safety problems.

Posted: 12/2009
Last update: 11/2010
within the ALTERMOTIVE project

No. 27

CWS-Boco Germany introduces CNG-powered vehicles to its fleet

CWS-Boco, a German service provider with focus on hygene, worked with a major German car manufacturer to lease 175 customized dual-fuel vehicles powered by CNG. The vans make up almost a third of its fleet of 600 vehicles and were implemented in less than 12 months.

Background and Objectives

In 2008, CWS-Boco implemented 175 dual-fuelled CNG-powered vans into their fleet of over 600 vehicles in Germany. The decision to use alternative fuels was taken at the executive level in an effort to further improve the environmental commitment made by CWS-Boco. The initiative appeared in early 2008 and has since progressed to a point at which the company regards alternative fuel vehicles as an integral part of their fleet.

Implementation

CWS BOCO aims to extend its fleet with more CNG powered vehicles. The company leadership is committed to alternative fuels and vehicles.

Conclusions

The CWS-Boco fleet covers the whole of Germany and, prior to the implementation of CNG-vehicles, primarily ran and is still running most of their vehicles on biodiesel. The new CNG powered vehicles are deployed across the country except for those areas, in which the density of CNG refuelling stations is too low or non-existent. This was singled out as a major obstacle in extending the fleets operation to the whole of Germany. The vehicles in CWS-Boco™s German fleet are all leased. The costs of leasing are not exceptionally different compared to those of regular vans.

CWS-Boco worked closely with Mercedes to develop customized dual-fuelled vans which can run both on CNG and regular gasoline. This has translated into a 13% reduction in biodiesel consumption and 485 t CO2 savings in 2009 compared to 2008. Despite a reduction in the cost of biodiesel, CWS-Boco is confident that running on CNG will prove beneficial both in terms of fuel costs and CO2 reductions.
Acceptance was excellent across all stakeholder groups. CWS-Boco will expand its CNG-powered fleet both in Germany and across Europe as part of its commitment to improve the environment. Major reductions of CO2 emissions may be expected over the next few years as the company continues to expand its fleet with CNG-powered vehicles.

Evaluation

CNG has gained momentum in part due to tax incentives and mature vehicle technology in serial production. The company aims to continue its deployment of CNG vehicles even if financial incentives may be retracted soon.

Posted: 01/2010
Last update: 08/2010
within the ALTERMOTIVE project

No. 28

Alternative fuels usage in the non-electric public transport in Debrecen (Hungary)

Seven public transport conventional diesel buses were converted into CNG ones, some further ones into biofuel vehicles, running in the inner city center of Debrecen, the second biggest city in Hungary. The overall objective was to improve local air quality through establishing an integrated system for alternative fuel production, supply and utilization.

Background and Objectives

Debrecen is the second largest city in Hungary, the economic and trade centre of north-eastern Hungary. Before 2004 Debrecen did not have a transport plan and sustainability was not taken into account when decisions regarding transport were made.

In 2005 the city joined the CIVITAS MOBILIS project, which lasted until 2009. It included setting up a programme for creation of a sustainable mobility framework for all transport modes, aimed at the improving of the quality of life for the citizens by raising the standards of urban mobility.

Implementation

The overall objective was to improve local air quality through establishing an integrated system for alternative fuel production, supply and utilization. In order to reach the project objectives, strong co-operation was established between the city™s Mayor and the different transport stakeholders.

Some of the measures that were implemented within the context of the project, were the operation of bio fuel and CNG vehicles and setting up of framework conditions for alternative fuel use. The project dealt with the technical feasibility of using biogas and biodiesel in public transportation in order to establish a unique integrated system for alternative fuel production, supply and usage including local public transport, waste management, electricity production and central heating.

Conclusions

Project results:

- conversion of 7 conventional diesel buses to CNG ones
- test and state license procedure
- analysis of framework conditions for local bio-diesel and bio-gas production and usage and implement recommendations
- demonstration of bio-diesel and bio-gas usage in PT buses and road maintenance vehicle

The total budget of the city of Debrecen for this measure was 850 000 Euro.

During the experiments, 2400 l biodiesel were used in form of 10%, 20% and 50% mixture in 7 diesel buses instead of the normal blend of 4,4% biodiesel. The reduction of use of normal diesel was very low, because of the trial research.

Despite the success of the measure implementation, it was decided to use modern diesel buses with EURO-5 motors for the future.

More Information

http://civitas-initiative.org/measure_sheet.phtml?lan=en&id=195

Evaluation

The experiment underlines that it is tremendously difficult now using biodiesel while complying with EURO5 exhaust limits.

Posted: 01/2010
Last update: 08/2010
within the ALTERMOTIVE project

No. 29

Hamburg Wasser transits its gasoline-powered fleet to CNG

In late 2007, Hamburg Wasser, a water utility servicing the city of Hamburg, set out to purchase 80 new CNG-powered cars. The vehicles are used in the city centre of Hamburg and help reduce overall CO2 emissions of the company by 20% and contribute to sizable annual fuel cost reductions.

Background and Objectives

The attractiveness of the CNG-powered vehicles lies in their environmental friendliness, cost-reductions and the ability to switch between gaseous conventional and alternative fuels. Aim of Hamburg Wasser was to improve its environmental image through adapting new and clean technologies. Besides this significant reductions of fuel cost were aspired.

Implementation

Initially, Hamburg Wasser purchased 45 new CNG-vehicles in 2008 and expanded its fleet to a total of 80 vehicles in 2009 deployed within the city of Hamburg and surrounding areas. The initiative was supported by a voucher scheme offered by a local CNG-provider and was encouraged through voluntary EMAS certification.
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There are plans to power the CNG fleet on biogas generated in waste of Hamburg Wasser. The monovalent Opel vehicles used in the company are able to run on natural gas, bio-methane or a mix of both. Hamburg Wasser invested about 1 million EUR for the 80 CNG vehicles which are planned to save up to EUR 40,000 in fuel costs per year and are supported by a local voucher scheme. Anual average CO2 emission reductions were estimated to amount to 20% (Opel 2009).

Conclusions

Hamburg Wasser estimates that 40 t CO2 were saved since the introduction of the vehicles in 2008. The original consumption of regular fossil gasoline was around 56 000 liters/year which was substituted and subsequently reduced by about 95% through the introduction of CNG.

The switch to CNG was well perceived by the public and customers alike. The initiative was seen as a success and may be complemeted with further purchases of electric vehicles in cooperation with an electric utility in Hamburg.

More Information

Source of information: Opel (2009) "Ressourcen schonen"
Available online: http://www.opel.de

Evaluation

The utility is determined to mitigate the effects of climate change by switching its fleet to CNG. Their vehicles are primarily deployed in an urban area. However, in stop&go traffic the CO2-balance of CNG vehicles might not be positive compared to diesel!

Posted: 01/2010
Last update: 02/2011
within the ALTERMOTIVE project

No. 30

The first methane powered intercity buses in Burgas (Bulgaria)

The biggest Bulgarian transport company MBus, operating in the region of the Black Sea city of Burgas, introduced for the first time in the country custom-made intercity CNG buses (CNG - Compressed Natural Gas). Through the introduction of the CNG buses, MBus wanted to profit from the environmental and economic advantages meeting the Euro 5 emission standards reducing harmful exhaust gases to a minimum; also the fuel costs per kilometre are significantly lower compared to the formerly used diesel engines.

Background

In September and October 2008 the two CNG buses TEDOM L12 G, ordered by the Bulgarian private transport operator MBus, were delivered and put into testing operation on the quite busy regular line between Burgas and the town of Aytos (about 31 km). Before that, the manufacturer had been producing buses only for the needs of the inner city transportation. The custom-made vehicles have an increased number of seats (from 32 to 46), and the bigger capacity of the tank allows daily mileage of up to 600 km.

Through the introduction of the new CNG buses, MBus profited from their environmental and economic advantages. The new buses meet the Euro 5 emission standards and bring emissions of harmful exhaust gases down to a minimum.

Major targets

Facilities
The new buses are very comfortable - they are air-conditioned, equipped with low-floor tilted platforms, which makes them accessible by wheelchairs and prams. Furthermore, they have sound signalization for blind people.

Specifications
- Length 12030 mm
- Width 2550 mm
- Height 3354 mm
- Unladen Weight 12100 kg
- Capacity(Seating/Parking) 42/43

Power Units

Motors
- Engine TEDOM TG 210 AH TA 04
- Engine Power 210 kW

Transmissions
- Transmission ZF 6S 1701 BO
- Type Manual
- Number of gears 6+1
- Transmission Voith Divan 5
- Type Automatic

For refuelling of the buses, the MBus uses public methane stations.

Major results and lessons learned

Fuel consumption of the buses is about 27-30 kg CNG per 100 km, combined with low CNG prices this results in drastic fuel cost savings per kilometre compared to the previous diesel buses.

Noise levels of CNG buses are generally three to six dB(A) lower than that of comparable diesel engines.
The initiative with a total investment of about 500,000 EUR is 100% private and no incentives or support by the policy makers are involved.

The more economic buses allow to keep the price of the tickets stable (the tickets prices sharply increase, on the one hand, at the beginning of the summer vacation season, and on the other hand, in connection with the fluctuations in the prices of the conventional fuel, which, in both cases results in a draw back of the number of passenger travels by bus).

Evaluation

An attempt to head for regional transport using CNG. Price difference compared to diesel speaks in favour of CNG.

Posted: 01/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 31

FUTUREMOTION - An E-mobility project in Prague (Czech Republic)

The Czech energy utility company (ÈEZ) is starting with an e-mobility project in Prague and with a fleet testing of up to 100 electric Peugeots in 2010. The project is part of ÈEZ's environmental *Futuremotion* initiative unveiled in September 2009, which focuses research on electric cars, the development of smart grids and investment in electric mobility.

Background and Objectives

The first phase of the project was started in the second quarter of 2009 in Prague. The 2nd phase will start in 2010.
In the first phase the project is focused on Prague while the second phase will enlarge the testing area also to the city of Ostrava.
The project was initiated by CEZ, the Czech energy production and service company which is the 7th largest player on the European market according to customers. The task of CEZ is to set up the charging infrastructure and provide the necessary energy to the customers.

The targets for the first phase of the project are:

- Making a fast public statement regarding e-mobility in CZ/CEE and secure a first mover position
- Communicating externally CEZ´s short and long term plans regarding e-mobility
- Improving image perception of CEZ and its partners

The targets for the second phase of the project are:

- Test long-term business model
- Test EVs, battery, intelligent charging infrastructure, billing and monitoring system in real conditions
- Test consumers behaviour
- Target B2B & B2C customers

The motor company Peugeot is joining the 2nd phase of the project in 2010. Its task is to provide up to 100 electric vehicles and to establish the maintenance for the vehicles.

Implementation

In the 1st phase Micro- Vetts are in use, for the 2nd phase Peugeot joins the project with up to100 electric vehicles planned. The first charging station will be installed by the end of 2010.

For the 2nd phase the installation of up to 500 charging points is planned. 2 types of charging stations are planned: a normal charging (up to 230V/32A) and a fast charging (up to 100kW). The identified B2B/B2C customers will also strongly influence the models and types of electric vehicles which will be in use up from 2011 on.

Conclusions

CEZ commits a budget of EUR 20 million until 2012. In the first phase 20 EVs are provided to local NGOs. The major of Prague expressed his commitment to the project in public.

More Information

web site CEZ

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Evaluation

Notifiable large approach involving additional fleets of NGOs. Example of beneficial inclusion of utilities, Global warming potential (GWP) and sustainability questions were not mentioned, although the Czech republic is depending heavily on coal for power production.

Posted: 02/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 32

Electric Mini-Buses in Portugal

21 Electric Buses "Gulliver" (11/2010) are running regular urban bus lines in 6 capital of districts in Portugal right now. The introduction of electric Bus in Portugal was promoted by several years of events and demonstrations at local authorities. This was crucial to the acceptability of EV´s. Surveys of quality of service show very high rates of acceptance in every city.

Background and Objectives

The adoption of electric buses was the result of a Road Show that took place in 2000. It was a partnership between the Portuguese Institute of Mobility and Land Transport and the Association of Electric Vehicles. The European Day fiIn town without my car! (after 2000) and the European Mobility Week (after 2002) provided an opportunity for APVE - Portuguese Electric Vehicle Association - to promote electric vehicles.

These events were an opportunity to draw the attention to the press and public opinion to the need of a sustainable mobility and to show that EV™s can be a reliable alternative. These initiatives complemented by others involving municipalities all over Portugal, attracted the press attention and generated a favourable public opinion towards new forms of mobility and EV™s.

Implementation

Since September 2001, for two and half years, a major demonstration action was developed by APVE and funded by DGTT - The Directorate-General for Inland Transport - a central government institution. The demonstration involved two electric mini-buses running experimental lines for a period of six weeks each. This demonstration action travelled to 25 Portuguese cities, allowing several municipalities, transport operators and users to experience this type of vehicles and the potential of EV™s in providing a better urban quality of life. This project was targeted to Local Authorities - responsible for supplying urban mobility services.

This action was divided in two phases; the first, that included all the preparatory activities and preliminary tests, ran from September 2001 till February 2002. During this first phase, two buses were tested in several different places and conditions: the fiOREOS 55H hybrid midibus, manufactured by Gépebus, and the fiGULLIVER mini-bus, manufactured by Tecnobus. During the second phase, which ran from June 2002 till January 2005, two electric fiGULLIVERfl mini-buses were purchased and put into service f periods of four to six weeks, in twenty four Portuguese cities, having travelled more than 74.000 kilometres.

Technical details of Gulliver bus:

- Capacity - 14 standing + 8 seating places;
- Length 5.30m; Width 2.07m;
- Maximum Speed 33 km/h
- Consumption (100 km) - 75.5 kWh;
- Batteries autonomy - 4 to 6 hours;
- Time required for replacing the Batteries - 4 minutes;
- Manufacturer - Tecnobus;
- Selling price - 150.000•

Many of the cities adopted the operation system known as fiblu linefl (invented in Bordeaux), which means that the circuit is define by a blue line painted on the pavement - there are no stops to enter or exit the bus, neither defined schedules. The passenger only needs to manifest intention to enter or exit the bus to the driver at any point of the fiblue linefl. The time gap between buses programmed to be approximately ten minutes long, which results on an average waiting time of five minutes (ficustomers might forget th timetable frequency and hop in as suitedfl)

Conclusions

As a result of this demonstration action, three Portuguese cities, Coimbra, Portalegre and Bragança, implemented regular public transport services in their historic centres, with electric mini-buses. Furthermore, two cities, Viseu and Viana do Castelo, decided also to adopt this type of service. More recently (September 2006) Funchal also adopted 4 Gullivers with new Zebra batteries (lasts for 10 hours). There were 18 Gulliver buses operated on regular routes in 6 Portuguese towns.
Although electric vehicles (EV) are locally zero-emission vehicles, the electricity production to power them, presents environmental impacts - even power-stations using renewable resources also cause disturbances in the surrounding ecosystem.
Surveys of quality of service show very high rates of acceptance in all cities. The mean time between failure is a challenge for this new technology. Recently (11/2010) two more buses were acquired by Almada Local Authority, one by the city of Serpa and are already serving the city's historic quarters.

More Information

www.imtt.pt Web site IMTT - Instituto da Mobilidade e dos Transportes Terrestres, IP

Evaluation

Successful bus trial at various locations. The use of battery electric mini buses in historical centres may be seen now as state of the art, thanks to such projects, but needs funding to allow coping with the higher initial cost. Sustainable electricity production would further increase sustainability but also cost, unfortunately.

Documents

case study EV Gulliver Portugal.doc

Posted: 02/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 33

VLOTTE - a large electric mobility demonstration project in Vorarlberg (Austria)

The utility company of the federal state of Vorarlberg started an initiative to become a model region for electric mobility. The project covers the setup of an infrastructure of charging points and the availability of electric vehicles. The slogan is to provide fair mobility in accordance with the nature.

Background

The project covers the area of the Rheintal and started in the beginning of 2009 after the application of Vorarlberg for funding of the Climate & Energy Funds of the Austrian government for a model region for electric mobility. The leading partners in the project are the federal state government of Vorarlberg, the Illwerke VKW, the public transport system Vorarlberg, The Vorarlberg insurance company, the Raiffeisen Leasing, the Energy Institute Vorarlberg and Kairos (a private company), which originated the ideas of the project in its project fiminus 99 - carbon neutral mobility i Vorarlbergfl. The Climate and Energy Funds is funding 30% of al investments in vehicles, charging points and photovoltaic modules to a maximum extend of EUR 4.7 Mio.

Major targets

The vision of the project is to present and really use the electric mobility as a solution for the continuous expansion of the public transport and the problems of climate change and CO2 emissions which come along with it. In addition to a potential reduction of individual traffic, the mobility of the future has to become more gentle and environment- friendly. Since 16th of June 2009, thirty vehicles are on the road in daily traffic. Within the first year of VLOTTE project it is planned to have 100 electric vehicles in use. In doing so, profound experiences about practicability, consumption, cruising ranges, service costs, different accumulator technologies, the actual use of the charging infrastructure as well as different car types and changes in mobility behavior will be gained and evaluated. The fleet currently consists of mainly Norwegian Th!nk vehicles but also contains redesigned models of Renault Twingo, Fiat Panda, Fiat 500 and Mazda 2.

Major results and lessons learned

After one year of project Vlotte 75 electric vehicles are on the road and 32 charging points were implemented. The total driving distance of the whole fleet exceeds a 150,000 kilometers range. An even bigger success of the project was not possible because of the bottleneck of missing electric vehicles on the market. As a consequence the 2nd phase of the project called Vlotte II was started and will be again supported by the Austrian "KLIEN Fonds" (climate and energy fund) with EUR 551,000. The target of this phase is to enlarge the project area to the whole federal state of Vorarlberg. The idea is to establish mobility hubs for renting out electric cars, motorbikes and bicycles. A first hub was founded in Lech/Arlberg. The total volume of the follow-up project Vlotte II is 250 vehicles including motorbikes and bicycles.

More Information

www.vlotte.at
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Evaluation

Showing the problems of state of the art battery electric vehicles struggling with various problems in this early phase of the application of the technology. The project went into a second round successfully and profits from the upswing for battery electric technology.

Posted: 02/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 34

ELECTRODRIVE Salzburg (Austria)

Electrodrive Salzburg is a project which is run by the utility company of the federal state of Salzburg, namely the Salzburg AG. The goal of electrodrive Salzburg is to replace part of the traffic of the city Salzburg with electric vehicles of all kind and on this way to achieve a major part of the climate goals of the region.

Background & Objectives

The project Electrodrive was started in 2009 with the offer to the inhabitants of Salzburg city to switch to electric mobility. At the end of the year 2009 the project was additionally funded by the KLIEN Fonds, which grants EUR 1,9 Mio. and declared as a role model for electric mobility.

Implementation

At the beginning Pedelecs, electro scooter and segways are offered and combined with an attractive leasing package, which even gives the possibility to return the vehicle after the agreed contract duration. At the end of the first project year 150 vehicles (90% pedelecs and 10% electro scooters) were using these services.

18 charging points are installed on strategic important and easy accessible hot spots in the city center of Salzburg and there are additional two more in the rural areas of the Salzburg state. To use the charging points, all electrodrive participants receive a charging card, which allows charging for free while having a walk in the city or during shopping.

From a technique perspective the charging points cover all requirements of modern ISO security standard and continue to work under wet or snowy conditions and are also to a 100% safe for small children. According to the CEO of Salzburg AG, Mag. Hirschbichler the project should be a role model for the future mobility of the federal state of Salzburg.

The energy is produced and delivered by the Salzburg AG and is 100% renewable, coming from hydro, biomass and wind power and with the help of this commitment to absolute green energy the energy balance of the electric vehicle concept is even better.

Conclusions

The project responsibles are very satisfied with the development so far and the expectation for 2010 is to have even more clients and to increase the product range with electric vehicles. The ambitious goal set by Salzburg AG is to have 400 electric vehicles in use by the end of 2010.

More Information

http://www.salzburg-ag.at/
office@electrodrive-salzburg.at

Evaluation

A follow up project still struggling with availability of battery electric cars and thus focusing on scooters and PEDELECs then. Innovative approach with regards to ownership.

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within the ALTERMOTIVE project

No. 35

E- mobility demonstrator in Berlin (Germany) showcasing Smarts

RWE and Daimler are starting with climate friendly electric vehicles in a big joint venture project in the German capital Berlin, which is with 100 electric vehicles and 500 charging points, the world's largest project and the first project ever which is testing the technique of electric vehicle and the infrastructure together.
All vehicles are equipped with the latest technology of lithium-ion batteries and use 100% renewable electricity. The project is benefiting from previous results of the 1st generation test fleet of smart-for-two in London and is is massively supported by the city of Berlin and the German government.

Background and Objectives

The project was started in September 2008 with a press conference in Berlin. The initiative was started by RWE and Daimler, but is supported by the city of Berlin and the German government.

Daimler is taking care for the fleet of 100 electric vehicles. RWE , an international utility company is providing the energy from regenerative sources and also established the first 500 charging points within the city of Berlin.

Above all the project should deliver results out of practice to be able to introduce electric mobility into reality. The pilot solution which is tested in Berlin should also represent an example and possible solution for the international standardisation of the interface between the vehicle and the charging point.

Implementation

Phases of the project
In the 1st phase of the project Daimler is launching 100 smart-for-two electric drive of the 2nd generation.

As a 2nd step electric models of Mercedes vehicles will be tested for the first time.

All vehicles are equipped with the latest technology of lithium-ion batteries. The project is already benefiting from results of the 1st generation test fleet of smart-for-two in London.

The vehicles are equipped with on board units, which is linked to the charging points. As a result the battery is charged automatically with the cheapest energy available (such as energy with night tariff or if there is an energy surplus from alternative energy).This saves money and the environment. The energy used is from 100% renewable energy sources.

RWE is taking care of the construction and the service of the charging infrastructure (with around 500 charging points), the availability of the energy and the central system steering.

The charging points are installed at the clients' homes, at office buildings and in the open parking areas. In addition to that, business to business partners such as shopping centres, parking garages or large fleet clients are involved in the infrastructure.

Conclusions

At the current stage 100 vehicles are involved.

The project is massively supported by the city of Berlin and the German government. The German chancellor Mrs. Merkel was participating at the opening ceremony of the project and declared herself as a believer and fan of electric mobility.

More Information

More detailed information on the project is available at www.rwe-mobility.com and on www.daimler.com.

Evaluation

Demonstrator being a test bed for German OEMs mainly trying to catch up in electric mobility-heavily supported by the public bodies targeting also standardisation for charging.

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within the ALTERMOTIVE project

No. 36

Biogas powered mobility in the Bioenergy Region Wendland - Elbetal (Germany)

The region Wendland-Elbetal has successfully implemented numerous reference projects in the renewable sector. The aim of the new project is to expand the existing vast network structures and long experience on the topic "Renewable Energies" in the region and the regional value-added bioenergy.

Background and Objectives

The region already has major experience with the operation of the first biogas filling station in Germany and due to its success a second one is to enter in operation in 2010 under the framework of the Bio-energy region: Major milestones and measures include a feasibility studies on a Biogas train and Biogas buses as well as mobility campaigns as described in the subchapter conclusions.

Major targets

- Bioenergy in the mobility sector: 10% Market share until 2012.
- Subtarget PT: 2% market share in public transport. (Conversion of 25% of the regional ÖPNV Buses to gas-fuelled transmissions.)
- Feasibility study for the conversion and operation of a biogas train.
- Subtarget MIT: 8% market share in individual transport - continued support for market introduction of bio-methane as fuel for transport (WEGAS) with the objective that at least every fourth new individual car licensed have a methane drive train.

Target groups:
Mobility campaigns are costumed for car dealers and for end users. Further target groups include biogas producers, farmers and biogas fuel station operators.

Conclusions

The bio-energy region has been established with the funds of the Ministry for three years from 2009.
Until now the number exact of vehicles involved is not available. Sales figures from first experience presenting the amount of alternative fuel used are outstanding.

The action is widely supported by (local) policy makers, various majors as well as the administrative district (Landeskreis) are involved in the initiative and assist it.

Acceptance by public groups:
Currently in the region 10% of the new passenger car admissions have a biogas power train while in Germany this quota is just over 0.01%. This reflects tha high regional acceptance for Natural Gas and Biogas passenger cars. However, the current acceptance needs to be improved by activities of the region itself.

Mayor milestones and actions of the region were:
- Bioenergy Regions Initiative from 2009 until 2011 - Region: Wendland - Elbetal
- Winners of the federal competition on Bioenergy Regions of the Federal Ministry for Food, Agricul-ture and Consumer Protection. Involved organization: Haus der Wirtschaftsförderung.
- The Bioenergy centers obtained aid for their financial plans - up to 400.000 • for the whole period beginning in May 2009. Investments are not eligible, only costs covering personnel, travel and operation (apply also for Mobility with Biogas).

Further examples for eligible measures are:
- The setting up of network offices or regional management.
- Measures to develop networking and cooperation structures, public relations.
- Measures for participation of stakeholders and to strengthen the voluntary work (workshops, moderated meeting).
- Measures to cooperate with other projects, regions, networks, universities, etc.
- Measures for the dissemination of knowledge (know-how transfer) and the characterization of expensive studies, concepts and evaluations.

More Information

More information (German only) on the region Wendland-Elbetal and on its efforts around renewable energy are available at:
www.bioenergie-wendland-elbetal.de and
www.biogastankstelle.de

Evaluation

The case shows an approach focusing on the widest implemented alternative fuel - namely methane, but including local methane production reducing GWP massively. Low filling station density poses a problem as well as the slow uptake of the erection of biogas (digester) plant and their economical balance being very sensitive towards raw material prices.

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within the ALTERMOTIVE project

No. 37

Hydrogen Buses in Dunkerque, France

a blend of natural gas and hydrogen (known under the name of fiHythanef represents a relevant and pragmatic transition solution to introduce hydrogen in the public transportation system (buses) in Dunkerque (France).

Background & Objectives

The ALT HY TUDE project led by Gaz de France intends to demonstrate the use of an innovative fuel, called Hythane, a blend of natural gas and hydrogen. Hydrogen is considered to have a great potential as friendly environmental fuel, especially when hydrogen is produced from renewable energies (like wind or biomass).

The project started in 2005 in the Communauté Urbaine de Dunkerque (18 local authorities and 210 000 inhabitants). The launch of the effective station was planned by the end of 2006.

The objectives of the project were:

- To provide immediate benefits with reduction of urban pollution and greenhouse gases,
- To test a blend of natural gas and hydrogen.

There are still today numerous barriers related to the introduction of hydrogen in the current vehicle fuel pool. Vehicle technology still requires consequent technological breakthroughs while infrastructure has to be demonstrated and deployed, with the adequate regulatory framework and agreement from the society. Therefore transition solutions are of crucial importance to test experimental solutions.

Implementation

The hydrogen is produced locally at the refuelling station and then mixed with natural compressed gas. A blend of 20% of hydrogen is mixed with natural gas on demand during the filling.

The new refuelling station takes place by the existing NGV station in order to take advantage of the NGV infrastructures, eg the compressed NG and the bus depot. A new H2 generator has been added with a mixing equipment. In Dunkerque the choice has been made to produce hydrogen with a small electrolyser supplied with some green (wind renewable energy) electricity. The electrolyser has a capacity of H2 production of 4 Nm3/h designed to fill the two Hythane buses of the demonstration. The H2 is afterwards compressed and stored before the filling with the compressed NG.

Dunkerque has provided two new NGV buses (used for public transportation) from Iribus for the demonstration. After a first step of experimentation the first results were finally checked on buses with passengers in order to test reliability of the solution.

Conclusions

Ecological/Environmental issues
According to the fleet owner the CO2 savings in 2008 were equal to CNG (approx 20 %) considering the whole energy chain.

Energy issues / economic issues
According to the fleet owner the results for the environmental impacts and for the price (depending on the origin of hydrogen) are much higher. Hence one of the main factor for the success of the project was to find subsidies.

Legal barriers
According to the customers (acceptance of the project) many questions are still remaining about safety and price. The project has been stopped during a long time because of administrative issues.

This experimentation represents an important first step to experiment a blend of natural gas and hydrogen. Currently it is now possible to check the first results with customers.

Evaluation

Testing the blend of hydrogen and methane, revealing legal and saftey problems. Continuation depends on funding.

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within the ALTERMOTIVE project

No. 38

Mid size electric vehicle fleet test in Munich (Germany)

With the beginning of July 2009 Mini E cars powered with E.ON energy are driving in the city of Munich and surroundings . E.ON is installing the infrastructure of public charging stations and is taking the task to provide to all test drivers a sufficient number of charging possibilities. The energy is coming from hydro power and for this reason CO2 free.

Background

The project started in July 2009 and it is planned to run until July 2010 The project was initiated by BMW and E.ON and covers the area of the Munich and surroundings.

Major targets

Main goals are to learn about user requirements, charging technology and practical aspects of operating charging infrastructures. BMW is providing 15 Mini E for the project to private clients. The energy for the charging is coming from hydro power plants and it is produced without CO2 emissions. E.ON is installing the necessary infrastructure, meaning charging points in the city area and charging equipment for the garages of the testing persons. At the moment 15 public charging stations are installed and available. E.ON is also participating in the standardization of the charging plugs. Another point of interest is the charging of the vehicles without the use of cabeling with a so called inductive system.

Major results and lessons learned

E.ON is covering the costs but as the project is ongoing no final figures are public. The public interest in the project is big and the 2 companies are receiving a lot of positive feedback.

More Information

www.eon-energie.com
mobilitaet@eon-energie.com

Evaluation

One make served as mule for technology development. Focus however on charging and not testing a useful vehicle.

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within the ALTERMOTIVE project

No. 39

EBRD loan for CNG bus fleet in the city of Plovdiv (Bulgaria)

The European Bank for Reconstruction and Development (EBRD) extended a loan of 6 millions Euro for renewal of the bus fleet and for launching of e-ticketing in Plovdiv, the second biggest city in Bulgaria. The loan has been used to purchase 30 new buses running on natural gas to replace the old diesel buses, used in the city.

Background and Objectives

The new CNG buses began servicing the bus routes in Plovdiv in September 2009. The loan of 6 mil. EUR has been granted to the privately owned regional transport company fiHebros Busfl, whi provides public transport services in Plovdiv and in southern Bulgaria, for the purchase of the buses. The Bank™s credit has been complemented by grant funds from the Dutch government for introduction of an electronic ticketing system. Additionally, fiHebro Busfi has indulged itself to invest 1,3 mil. EUR for building of ow refueling station for the needs of the new bus fleet and for refurbishment of two interurban bus stations.

The major targets of the project were:

- Promotion of private sector participation in the provision of public transport services, through offering of high quality services in accordance with the EU environmental, health and safety standards;
- Assisting the city of Plovdiv in adopting an EU-compliant Public Service Contract for all public transport operators in the city and introducing an electronic ticketing system to improve the transparency and accountability of the urban transport system.;
- Positive environmental impact.

Implementation

The 30 CNG city buses are of the Citelis range, manufactured by fiIrisbus Ivecofl, Italy. They offer integral low floor throughout t whole length of the vehicle, inward swinging doors or sliding doors give access to large platforms.

Passengers can move easily inside the vehicle, thanks to the large width of the corridor. The buses inside are fully equipped to fulfil the needs of the passengers with reduced mobility. In addition, a special care is given to air conditioning as well as noise insulation for better passenger comfort.

Conclusions

The bus engines have outstanding environmental performances - they feature EEV level, which is the most stringent for public transportation.
Along with the environmental benefits, the new buses will help the company reduce its operating costs by 500,000 EUR annually, due to the lower fuel and maintenance costs.

More Information

hebrosbus.com

Evaluation

Positive example of enabling the clean up of European cities by giving European loans- on top of that sustainable methane production could be a chance for the new member states if natural gas prices allow.

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within the ALTERMOTIVE project

No. 40

Fuel cell busses in Amsterdam, the Netherlands

Since 2003, 27 fuel cell powered buses were tested in nine European cities as part of the European project Clean Urban Transport for Europe (CUTE). Three of these busses are operated by the Amsterdam public transport company GVB between 2003 and 2008.

Background and Objectives

GVB wants to contribute to a sustainable society and reduce negative effects of its activities on the environment. Given the potential benefits of this type of propulsion (zero emission of polluting gases and less noise) it is very important that this technology will be further developed and tested in real life. The GVB fleet consists of about 300 buses. All vehicles are operated in the city of Amsterdam. The buses are equipped with soot filters and the fuel used (diesel) is sulphur free.

Implementation

Three fuel cell buses of the type Citaro (Mercedes Benz) were operated in Amsterdam between 2003 and 2008. The partners of GVB in this project were EvoBus, who provided the fuel cell buses, Hoek Loos responsible for the installation and maintenance of the H2 production unit, Nuon providing green electricity, Shell Hydrogen as consultant, the Environmental & Building Department of the Amsterdam municipality as advisor on safety and environmental aspects and SenterNovem, the Dutch energy agency.

Equipment and technical details:
The Hydrogen (H2) is produced through electrolysis by using certified green electricity. The energy efficiency of the on site production unit calculated as the energy usage relative to the lower heating value of the H2 produced is between 50 and 60%.

The fuel cell system and the (nine) compressed-gas bottles are located on the roof of the vehicle. Each cylinder contains 205 litre of hydrogen stored under a pressure of 350 bar. The hydrogen is used to produce the electricity for the 200 kW electric motor. The range of the fuel cell buses is about 200-250 km (half the range of a diesel bus).

Staff preparation:
The drivers received a training on aspects like refilling, safety and use of the on board diagnostic computer system.

Conclusions

From 2003 the buses drove about 47,000 km each. The operational performance was better then expected: noise is much less than diesel, acceleration a bit better and hardly any failures.

The hydrogen buses can operate half of the usual operational period (6.00AM-12.00Midnight) without refilling. This means halfway the operational period the buses have to be changed, since the filling-point is not along the route.

The image of hydrogen as being a dangerous fuel has improved, not by intensive campaigning but by just starting and taking all possible measures to prevent any -even small- accidents.

Within a few days from the start of the project, passengers were very interested to drive with these buses.
Due to the equipment on the roof (the buses are 40 cm higher then normal buses) the routes had to be chosen carefully, given the height of some underpasses.

At the moment using fuel cells is only feasible with subsidies. When (serial produced) hybrid fuel cell buses will become available in some years, the use of fuel cell propulsion will be more feasible.

contact

Originally written by Rob Jeuring for ELTIS
Edited by Ynke Feenstra (feenstra@ecn.nl)

Evaluation

Shows once more, that fuel cells running on hydrogen are only feasible in distant future. Large tanks on the roof caused height problems in practice.

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within the ALTERMOTIVE project

No. 41

Public transport buses on PPO in the region of Eindhoven, the Netherlands

Between 2005 and 2007 the bus company BBA performed a trial project with two local buses running on Pure Plant Oil (PPO). The buses were fitted with two fuel tanks (PPO and diesel). The buses were used on all BBA routes in the Eindhoven region. The trial was ended due to the high costs and the large amounts of soot emitted.

Background & Objectives

BBA is a Dutch bus transport company operating about 600 buses for public transport purposes in urban, mixed as well as in rural environments. The propulsion and fuel used in the fleet - beside the two PPO buses - is conventional.

In addition to the fact that BBA wished to contribute to the use of sustainable energy: average figures from the company Solar Oil indicated an average reduction compared to diesel of CO2 (72%), soot (50%) and sulphur (almost 100%).

The pilot was also started to discover what effect the long-term use of PPO has on the lifespan of the bus engines. Some data were already available on using PPO in engines for long journeys (indicating no significant change), but not for local buses, which have to make a lot of stops.

Implementation

Two buses were fitted with two fuel tanks: one for PPO and a new (smaller) one for diesel. This is necessary because the viscosity of PPO is less then diesel and therefore it is not yet possible to start a cold engine using PPO. The engine starts on diesel oil. Then the heat exchanger is warming up the PPO to about 65 degrees Celsius, which takes 10-15 minutes. The driver gets a signal when to switch from diesel to PPO and when to switch back from PPO to diesel (at the end of the day or when the PPO is almost finished).

The bus transport company has installed a special fuel tank for this project at the bus depot in Reusel. The company De Oliemolen in Delfzijl supplied the PPO: this has recently become the first Dutch company to produce rapeseed oil for the Netherlands market. Two other companies (Solaroilsystems B.V. and EMA Autobedrijven B.V.) were also involved in setting up this project.

Conclusions

The buses used around 150-200 litres per day. In the Netherlands there was a tax exemption on PPO for a limited number of projects. BBA was one of these projects. Therefore the price of the PPO for the project was about 0,75 euro per litre (price of PPO at the first public PPO filling point is 1,00 euro price of conventional diesel is about 1,05 euro per litre).

The costs for converting the conventional diesel buses to PPO were about 6.000,- per bus. Oil and filter change intervals (every 20.000 kilometres) are shorter then conventional diesel (every 60.000 kilometres).

An overall evaluation was made in 2007. Due to the high maintenance costs and the large amounts of soot emitted, the company decided to end the trial and rebuild the buses back to convential fuel busses.

An interesting spin-off was that the local authority has leased 8-12 hectare of land to the company CSV to be used to grow rapeseed crops every year and to produce PPO from it. This PPO was not used by BBA or the Oliemolen, but the pilot contributed to this decision of the municipality.

Contact

Original written by Jacqueline de Jong for ELTIS
Edited by Ynke Feenstra (feenstra@ecn.nl)

Evaluation

Example of learning by doing setting up a working solution without OEM support. Demonstrates also the absence of internal combustion technology capable to process pure plant oils.

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within the ALTERMOTIVE project

No. 42

Electric vehicles for distribution of goods in Rotterdam (The Netherlands)

Demonstrate the viability of using vehicles for biodiesel for urban distribution and stimulate further spin-off in commercial fleets.

Background

Three transport companies are responsible for the distribution of 70% of all parcels & packages in Rotterdam. Small trucks and vans are used for the distribution of goods in and out of the city. Seven electric vehicles for urban distribution were introduced for deliveries of parcels & packages. The vehicles had to prove themselves in the existing logistic systems of the three participating companies. A vehicle serves up to a hundred addresses a day in one single trip, which demands a payload of 1000 - 1500 kg. This type of electric vehicles has not yet been widely tested in practice, which means that TELLUS offers a unique opportunity for doing so.

Before TELLUS, the small-scale demonstration in the local site ELCIDIS project in Rotterdam could only be performed till August 2002. The extension of the
demonstration period enables a better understanding of using this new technology. A successful use of this technology will create more understanding for policy measures like access restrictions and for the use of clean vehicle technologies in general, also at private companies.

Major targets

It was decided that the only suitable vehicle to fulfil the needs was the Mercedes-Benz 308 E Sprint, with ZEBRA batteries. The range of the vehicles is 50 km with two battery packs and 75 km with three battery packs. In the previous project period only 2 out of 7 vehicles are still operating and that is no sound base for a more extended implementation of such vehicles.

Major results and lessons learned

Despite all efforts of DaimlerChrysler to prevent breakdowns the technical reliability remained a continuous problem. During the test period there were technical failures of the electric system, controlling the battery management.
DHL was nevertheless willing to continue the test, as a result of the agreements made with DaimlerChrysler regarding replacement of broken down vehicles.

Based on the experiences with the seven vehicles an introduction plan for clean vehicle procurement in private distribution fleets was foreseen to be realised around February 2005. Due to the severe technical problems, but also due to newly retrieved information from involved parties and external developments, an altered approach was followed for the final reporting of this work package and for the planned introduction plan to support the deployment of clean vehicles in the fleets of distribution companies.

More Information

www.dsv.rotterdam.nl

Originally written by Henk Kamphuis for CIVITAS TELLUS
Edited by Ynke Feenstra (feenstra@ecn.nl)

Evaluation

Showed technical problems and also high procurements costs because of the early stage of the industrialisation of battery electric propulsion. But EU funds are used develop the technology further.

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within the ALTERMOTIVE project

No. 43

E - Mobility in the Alps (Switzerland)

The project offers solutions for sustainable mobility in the field of tourism for the San Gottardo region. The realization bases on an universal approach using all opportunities for sustainable mobility for tourists. The project continues the spirit of the early days of the mountain pass roads and wants to revive a environmental friendly adventurous spirit in mobility. One of the goals of the project is the electric mobility and the first vehicles were climbing the Grimsel pass in summer 2010.

Background and Objectives

The project started in October 2009 and the pilot phase in summer 2010. It covered the region between Luzern, Brig, Chur and Bellinzona with the passing of San Gottardo in its centre. The special topography with several valleys and passes is a special challenge for the electric mobility.

Initiative

The project was initiated by *Progetto San Gottardo*, *energieregionGOMS* and the power plant Oberhasli. *Progetto San Gottardo* is a joint project of the cantons Uri, Tessin, Wallis and Graubünden and its target is to develop a connected region for living and economy. The power plants Oberhasli is an energy producing and servicing company which also has some initiatives in the tourism. The *energieregionGOMS* is the first region in Switzerland which has a detailed future-oriented view on the regional consequences of climate change. The focus is on the use of renewable energy and the efficient use of existing energy.

The economic goals are the increase of the added value of the region, the creation of additional jobs, the strengthening of the tourism and an increase of the image of the region as living and tourism area.

Implementation

Sources of Energy for the project

The first vehicles in use were electric vehicles and were provided by the powerplants Oberhasli. Due to the demanding landscape several producers of electric vehicles are interested in a collaboration. At the end of the day the project owners want to offer a wide range of electric vehicles starting from Pedelecs and ending up with electric sport cars.

The energy for this project is also coming out of the region and consists of hydro power, wind power and PV power, with an aim reduce CO_2 emissions and respirable dust (particulates) and last but not least noise reduction.

Infrastructure Concept

The infrastructure concept is based on several *movePOINT*s, at which electric vehicles are offered.

The vehicles can be booked with a jointed booking and information system and are promoted by a joint marketing campaign. *MovePOINT*s can be found at railway stations, petrol stations, postal offices, hotels or buildings which are constructed for the purpose of the project.

All tourists can explore the region with electric vehicles. For the tourist agencies it´s an additional way to promote the region. For the local population additional jobs are created and emissions and noises are reduced. Energy utility companies can involve themselves into the project and support the building of the infrastructure. Producers of electric vehicles can test and promote their products and potential clients can test them.

Conclusions

The project is ongoing, and will be extended. During the 2010 summer 60 vehicles were in operation and returned safely by the end of the season. For 2011 the number of rental stations being now many - having one to five vehicles per station - will be reduced facilitating operation. Also the number of 4 seat vehicles will be increased further improving utility of the system for the tourists.

More Information

alpmobil.ch
homepage: www.energieregiongoms.ch
mail: info@energieregiongoms.ch

Project Manager: Dionys Hallenbarter

Evaluation

This project proofs that it possible to operate a fleet of zero emission vehicles under adverse weather conditions and altitude differences. This is a blueprint for all regions where air quality is essential, e.g. in tourism areas.

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within the ALTERMOTIVE project

No. 44

VEL1 - Pioneer electric vehicle fleet in Mendrisio (Switzerland)

VEL1 was the first and so far the biggest project about electric vehicles, which was initiated by the Swiss government and carried out in Mendrisio (Switzerland) from 1994 until 2001. All in all approx. 400 vehicles from different producers were used within an area of 20,000 inhabitants. Local politicians and regional famous people were involved into the project out of marketing purposes.

Background and Objectives

The project was started as early as 1994. It was carried out in the community of Mendrisio, which is located in the South of Switzerland and has a population of 20,000 inhabitants. Major target was to be world wide the first community to practice and proof that electric vehicles and the respective infrastructure are working in reality. The project was initiated by the Swiss government and Mendrisio won the contest for the project against 33 other communities.

Implementation

The staggering number of 400 electric vehicles were sold to an extent of 2/3 to private customers. The big advantage is that there was a broad variety of vehicles and storage systems. A lot of education was made to teach the clients how to save energy while driving, when to recharge the batteries with the cheapest tariffs or how do drive a car to make it noiseless.

Concerning the infrastructure it is a key success indicator to start with the establishment of the infrastructure as early as possible to reduce the fear of the clients concerning the range. Additional it is very important to offer a full mobility guarantee to the clients to be able to cope with long distance drives or car sharing. Home charging systems were installed and with the help of intensive training people were taught to use those tools.

Concerning sales the project was also very well structured and for this reason favourable for the customers. The clients had the possibility of 3 testing days before purchasing, there was an attractive possibility to resell the vehicles to minimize the risk for early adopters and last but not least important was a clearly structured bureaucracy including financial aid from the public and its preconditions.

Conclusions

400 EV were sold within an area of 20,000 inhabitants, which has brought a market share of 8%. Interesting statistics were generated, such as that 89% of the time the vehicle is parked. 9% of the time the vehicle is charged and only 2% of the time the car is used. It was very important for the project that there was a variety of brands and products to minimize the threat of being dependent on one single producer.

Additional boost for the selling of the vehicles was the battery renting system, which decreased the initial purchase costs. The total amount of charged energy is 4,260 kWh and the charging was done with 2/3 probability during day time (all amounts are referring just to the open access charging points). Local politicians and regional famous people were involved into the project out of marketing purposes.

The follow up project VEL2, targeting 4000 vehicles in the Tessin region, was experiencing a heavy down-swing of electric vehicle appreciation and thus the number of vehicles stayed at 400. The Na-S battery technology developed and tested then is still used in projects like VLOTTE.
In Mendrisio also a light vehicle fleet was rolled out with the help of partial 50% financial support. The charging infrastructure proved to be lasting (15 years of operation) but necessary more for psychological support when buying an electric vehicle.

More Information

More detailed information as well as consulting based on the experience from the project concerning all the topics needed to put an added value to EV pilot projects and product implementation is offered by Protoscar.
web site protoscar.com

Evaluation

First fleet test using standard battery electric sized cars in a bigger roll out. Outstanding results (8% market share) for a small town compared to the big followers. Unfortunately follow up projects had to cope with limitations of first generation battery electric vehicles and ultralight pedal hybrid vehicles - being less depending on those constraints - were not accepted to a higher degree.

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within the ALTERMOTIVE project

No. 45

Vehicles of municipality using biodiesel in Breda, the Netherlands

In 2007 the municipality of Breda tested the use of locally produced biodiesel from waste products in three vans and one waste collection truck of the municipality for two month.

Background and objectives

The main target was to test the biodiesel in practice in the daily work of the municipality vehicles. A second aim of the project was to encourage the local biodiesel production.

Implementation

In spring 2007 three Volkwagen Transporter vans and one MAN waste collection truck of the municipality of Breda, have been used to test the use of locally produced biodiesel in practice. For the tests a blend of 20% biodiesel and 80% fossil diesel had been used. This percentage does not require any techical adaptation of the vehicles.

The biodiesel was produced by a local company from waste products (for example residual fat from a local slaughterhouse). The initiative was organised by the municipality and received support from the provincial government via a subsidy of 10,000 euro.

Conclusions

The trial project lasted for 2 months. During this period 13,000 liters of biodiesel were used by the vans and the truck. The muncipality was satisfied with the results for the vans and therefore decided to increase the amount of vans driving on biodiesel to 10.

The experience with the truck were less positive because it used relatively a lot of biodiesel (increased fuel consumption) and was therefore not environmental friendly.

More Information

Website of the municipality: www.breda.nl
Website of the biodiesel producer: www.biodsl.nl

Evaluation

Example where the fleet managers did not understand fuel characteristics after a too short test period using B20.

Posted: 02/2010
Last update: 01/2011
within the ALTERMOTIVE project

No. 46

Waste processing company driving on PPO and biodiesel in Ede and Wageningen, the Netherlands

In 2006 and 2007 the waste processing company Afvalcombinatie de Vallei (ACV) performed a trial with two waste collection trucks running on pure plant oil (PPO - rapeseed oil) and two trucks on bio diesel.

Background

Afvalcombinatie de Vallei (ACV) is a waste processing company operating in the municipalities of Ede, Veenendaal Renkum and Wageningen. At the time the fleet consisted of 70 vehicles, operating mostly in urban environments. The propulsion and fuel used in the fleet - besides the 2 PPO and 2 Bio Diesel Trucks - was conventional diesel.

Major targets

The aim of the project was to test different alternative fuels in practices in the waste collection trucks to reduce the emissions of the trucks and improve the air quality in the inner cities were the trucks are driving and for the employees who are working near to the trucks. Herefor two waste collection trucks were converted for driving on PPO in the beginning of 2006. Because it is not possible to start an engine with PPO dual fuel tanks are needed. The engine starts up on conventional diesel and after warm up it is switched to PPO. The costs for converting were 2,500 euro per truck. The extra (fuel) costs for driving on PPO were about 6,000 euro per year. The PPO is purchased from the company SolarOil Systems.
Two other waste collection trucks were running on bio diesel since the beginning of 2006. They didn.t needed to be converted. There was no change in the warranty conditions from the factory (DAF Trucks). ACV has purchased a special bio-diesel fuel pump. The costs were about 20,000 euro. The extra costs for driving on bio fuels during the first year are financed by the municipalities of Ede and Wageningen.

Major results and lessons learned

There were no significant start up problems and the first impression was that operational characteristics like acceleration, top speed and time to repair didn't change significantly. During this first year ACV monitored and evaluated the impacts on fuel consumption, the filter change intervals, the fuel pump and the emission of CO2 and fine particulate matter.
ACV used the results of the evaluation to make an investment choice for the longer term regarding the use of bio fuels. Because the decrease of CO2 emissions was lower than expected and other technologies seemed to be more successfull, the company decided not to continue with these fuels. Instead the company bought newtrucks which are driving on natural gas because these are proven technologies causing less emissions.

More Information

Originally written for Eltis by Rob Jeuring (rob.jeuring@ecorys.com)
Edited by Ynke Feenstra

Evaluation

Another example where the attractiveness of pure plant oil was destroyed by technical problems using it in non adapted engines. Low emission capability when using CNG was favoured over reduction of GWP.

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within the ALTERMOTIVE project

No. 47

TPG Post Pakketservice running 56 vehicles on 100% biodiesel in Amsterdam

In 2006-2007 the 56 delivery vans of TPG Post Pakketservice that are used to deliver packages six days a week all around the Amsterdam area are running on 100% bio diesel. The project aims to make the vehicles more environmentally friendly.

Background

The fleet of TPG Post Pakketservice consisted in 2006 of 650 delivery vans of the type Volkswagen LT. Besides the 56 vans in Amsterdam on bio diesel all vans were running on conventional diesel. The vans are operating mostly in urban and to a lesser extent in mixed and rural environments.

Major targets

The decision to start with the bio diesel trial in Amsterdam fitted within the TNT philosophy regarding sustainable and responsible entrepreneurship. The target for the trial was a 50% reduction of particulate matter (pm10) and CO2 emission. (Bio-diesel itself is CO2 neutral, but due to production losses the target was set at 50%).

Main reason to choose bio diesel was that the present vans (Volkswagen LT) could drive on bio-diesel without modification. When using EU certified bio diesel there is no change in the warranty conditions.

The 56 delivery vans use around 120,000 litres of bio diesel per year. On the average the vehicles drove about 40 kilometres a day. Wiersma & Zn Oliehandel in Sneek is supplying the bio diesel, made from rapeseed oil. The drivers refuel the vehicles at the two depots in Amsterdam containing bio diesel fuel pumps.

Importer Pon VW and owner Athlon Car Lease Nederland were also involved in the project, and monitor whether the use of pure bio diesel resulted in extra maintenance or other problems.

Major results and lessons learned

The first experiences were positive. A first impression was that the operational characteristics (like acceleration) didn't change significantly. An advantage was that the drivers don't need to fill at a public gas station anymore but can refill at the 2 bio diesel filling points at the own depots.

This project was part of the Driving Clean programme, an initiative of the parent company, TNT. In addition to driving on biodiesel, a trial is also being conducted into fitting soot filters to the existing fleet of vehicles, and 176 lorries have been ordered with Euro V engines.

Because the experiences with this second trial were more positive, the company decided not to continue with biodiesel because improved soot filters created the same effect on emission reduction and were much cheaper to install.

More Information

Originally written for ELTIS by Rob Jeuring
Edited by Ynke Feenstra

Evaluation

Failure to implement a clean biodiesel solution. Even for processed biodiesel the fuel characteristics does not allow using current engine and exhaust treatment technology.

Posted: 02/2010
Last update: 07/2010
within the ALTERMOTIVE project

No. 48

Electric bus the Whisper in Apeldoorn (The Netherlands)

Since July 2009 electric city buses, called the Whisper, are driving in the city of Apeldoorn. It's a trial with 5 buses which have an electric motor directly connected to the wheels.

Background

The municipality of Apeldoorn is thinking about creating emission free zones in the inner-city. The Whisper bus would be a perfect solution for this because it can run without emissions nor noise. The company E-traction uses this two year trial with 5 city buses in Apeldoorn to monitor and evaluate the work of their wheel engines in practice.

Because of the direct connection of the engine to the wheel no gear wheels are needed and almost no energy is lost. The efficiency of the engines is about 95% (in the best case). The project is funded by the national government.

Major targets

The major target of the trial is to test the 'direct drive' technology of the engines in the wheels in practice in 2009 and 2010 and improve the technology further.

The batteries of the engines are charged during the nights by a charger and during the day every time the bus brakes. Additional charging during the day is done by a small generator switched on and off by the driver. This generator makes it possible to drive a full day on electricity.

The buses are built specifically for this trial and do not have a conventional motor or fuel tank.

Major results and lessons learned

Apart from testing the technology, the trial shall also give insights in the fuel use and costs for driving the buses. All data are currently monitored by TNO together with students of nearby schools.

Since the introduction of the Whisper several companies and countries have shown interest in the technology. However it may take a few more years before the technology becomes commercial.

My mid 2010 the first bus went into scheduled service for Veolia Transport and further four buses will follow.

More Information

More information about the Whisper: www.thewhisper.nl
More information about the company E-Traction: www.e-traction.nl

Evaluation

Outstanding example where local initiative tried to change vehicle technology not waiting on the OEMs to step in- technology wise the problems of the high unsprung masses of hub motors are sorted out. The implementation with a small sample may allow for an successful industrialisation if venture capital is given.

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within the ALTERMOTIVE project

No. 49

Target Implementation of CNG Vehicles and CNG Filling Station in Laupheim/Germany (GasHighWay)

The long-term objective of the project is to promote the realisation of a comprehensive network of filling stations for biomethane and natural gas.This project addresses this challenge by promoting the uptake of gaseous vehicle fuels, namely upgraded biogas (i.e. biomethane) and compressed natural gas (i.e. CNG), as well as the production and upgrading of biogas for vehicle fuel.

Background

Full title of the project:
Promoting the Uptake of Gaseous Vehicle Fuels, Biogas and Natural Gas, in Europe
Acronym of the project: GasHighWay

The European Union has set the target of increasing the share of biofuels and so-called alternative fuels, including natural gas, in traffic to 10 and 20 %, respectively, by 2020.
Study Case: Target Implementation of CNG Vehicles and CNG Filling Station in 88471 Laupheim/Germany
The project started officialy in May 2009 and the Kick-off meeting was in early June 2009. The project is now in preparation with one community and a Biogas Plant operator in the Southern Part of Germany.
It is the fiBioenergie Laupheim GmbH & Co. KGfl near the Town Laupheim, 30km South of Ulm.

Major targets

The main target groups of the project are operators of vehicle fleets, municipal and regional authorities, and existing and potential biogas producers. The project aims at stimulating the spread of best practices and best available technologies in the uptake of gaseous fuels in vehicles, the expansion of the gas filling station network and the production and upgrading of biogas to vehicle fuel as well as its delivery to customers in Europe.

Major results and lessons learned

The Biogas Production of 400m3/h is in operation since early 2008. The Biogas will be than treated to Biomethane and injected into the 16 bar CNG pipe grid. The owner of the local gas company (Erdgas Südwest) is doing the gastreatment with the PSA system on-site. The second Phase of the Project is expecting the permission and the gas out-put will be increased to a Total of 1000m3/h.
The Town of Laupheim has a population of 19 600 with a busy industry and a workforce of 8500 people.

The vehicle population in Laupheim (30.09.2009) is as follows
1. Limousines 10625
2. LDV + HDV 543
3. Busses 23
4. Tractors 563

The nearest CNG filling stations are 25 - 30 km away from Laupheim.

The owners of the Biogas plant are 23 farmers and the community of Burgrieden. They are interested in promoting more environmental friendly solutions for the public-, private-, commercial- and agricultural transport systems.
Erdgas Südwest as the local gas provider is supplying already to its CNG Filling Stations Bioerdgas (Biomethane) with 10% because of the Laupheim Biogas Plant. In their advertisements they mention the additional 10% less CO2 as the most environmental friendly fuel on the market.

Laupheim is not only a industry centre but also a agriculture hub with 114 farms and 523 tractors. Our intention is to promote CNG vehicles to the agriculture field for tractors and field vehicles.

In January 2010 we will discuss our proposal with the fiBioenergie Laupheim GmbH & Co. KGfl and discuss its furth approach.

More Information

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Evaluation

Approach to render CNG sustainable by approaching biogas producers as alternative to making CNG engines more efficient and effective in terms of CO_2-reduction. The project is still in its infancies and needs favourable boundary conditions to develop quicker.

Documents

Laupheim_Altermotive.pdf

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within the ALTERMOTIVE project

No. 50

Bio Bus and cooking oil recycling project in Kilmarnock (UK)

As part of Stagecoach's (one of the largest bus operators in the UK) Bio Bus, a new recycling initiative was launched to East Ayrshire residents - the opportunity to exchange used cooking oil collected from their kitchens, for discounted bus tickets which can then be used on Stagecoach bus services within the Kilmarnock area.

Background and Objectives

In October 2007, the UK™s first bio-bus initiative was launched - a cooperation between Stagecoach, bio-energy specialists Argent Energy and the East Ayrshire council. The Bio-bus scheme was originally planned as a six month project but it is still going strong and is now entering its third year.

The initiative™s target has been to encourage the greater use of public transport, and to reduce the carbon emissions.

Implementation

The project involves running of eight buses in the Scottish town of Kilmarnock on pure bio-diesel, made entirely from by-products from the food industry - used cooking oil and animal fats (tallow). The cooking oil collected from East Ayrshire residents along with used oils collected from restaurants, chip shops and the like, are transported to Motherwell based Argent Energy, the company which produces the biodiesel, used to power the Bio Bus fleet.

The project is unique, thanks to the way it involves the local people. All the households along the routes have been given a container to collect their used cooking oil for recycling, which, once taken to the council™s recycling plant entitles the resident to fimoney-off coupons for bus travel.

Conclusions

Since the initiative was launched, it has cut CO2 emissions from the buses by 80%, saving 1470 tonnes of carbon, and more than 66 tonnes of used cooking oil has been recycled.

The single-deck Bio-buses, running under the slogan "Do your part, be Bio smart!", have MAN engines and Alexander Dennis bodies.

They have been fitted with bespoke dual fuel tanks with a capacity for 184 litres of biodiesel and 40 litres of mineral diesel. From first start up in the morning, the buses run on mineral diesel until the normal engine operating temperature is achieved, a process that takes no more than 10 minutes. The system then automatically switches over to biodiesel, which powers the vehicles all day.

Argent Energy, which operates the UK™s first large-scale biodiesel plant, provides bulk fuel storage at Stagecoach™s Kilmarnock depot and supplies all the biodiesel.

The project was awarded for ‚best process™ at the VIBES (Vision in Business for the Environment) of Scotland presentation ceremony in Edinburgh. This award recognises the development and application of a new production technology that has made an outstanding contribution to sustainable development.

More Information

www.thebiobus.com

Evaluation

Unique solution combining biodiesel usage with bivalent operation. Shows that the integration of users is essential for the success when sophisticated operational regimes (fuel switching) are needed.

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within the ALTERMOTIVE project

No. 51

Passenger bus on hydrogen between towns in province of South Holland

The Dutch bus company Connexxion has been testing a hydrogen bus in the province of South Holland for 2 months in 2008. The bus was carrying passengers between several towns during this period following the normal bus schedule. The test has been succesful but the issue of enlarging the initiative still faces some bottlenecks like production and distribution of hydrogen and the high investment costs.

Background

Within the province of South Holland the bus company Connexxion has been using a hydrogen fuel cell bus successfully for 2 months in 2008. The bus was carrying passengers between several towns in the area. The hydrogen bus was part of the companies policy to reduce emissions and other negative impacts of conventional fuels. The aim of this project was to test hydrogen as a fuel for buses in daily transport and traffic.

Implementation

The bus was introduced together with a campaign ‚Driving on the Taste of Water™ during which the passengers were informed about the technology used in the hydrogen bus through leaflets.
The Van Hool bus was equipped with a hydrogen tank on the roof, batteries and hybrid technology to re-use the energy received from braking. Both technologies worked successfully during the project.
To fuel the bus, a hydrogen fuelling station was built. Some difficulties occurred in the legislation and safety procedures regarding this fuelling station because it did not fit the existing frameworks.

Conclusions

Passengers and personnel reacted positively to the hydrogen bus and the company perceives the project as a success. The technology proved to be successful. The bottle-necks for enlarging the initiative on the short term however are the production and distribution of hydrogen and the high investment costs.

More Information

Company website: www.connexxion.nl
Contact person: Marco Cowan m.cowan@connexxion.nl

Evaluation

Paying a high price to learn that hydrogen is only a good solution in a very few cases. Although user acceptance was high, legal, safety and cost problems were dominating.

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within the ALTERMOTIVE project

No. 52

CNG bus fleet in the city of Athens

ETHEL S.A. was founded in 1994 by Athens Urban Transport Organisation (OASA S.A.) and its mission is the implementation of urban transport services with thermal buses in the Metropolitan area of Athens.

Background

ETHEL S.A operates 2148 buses. Roughly 75% of them are diesel powered, while the rest are CNG powered buses. The propulsion used in the fleet of ETHEL is conventional and the average mileage per vehicle is up to 50,000 Km. The buses are used for public transport purposes in the Metropolitan area of Athens (urban and mixed zones).
The purchase of the initial 416 CNG buses was co-funded by the 2nd and 3rd Community Support Framework and the Programme of Public Investment. In 2010, 200 additional CNG powered buses were added to its fleet, bringing the total number to 614, thus operating one of the biggest CNG powered fleet in Europe.

Major targets

The renovation plan of the ETHEL fleet included the purchase of 416 CNG powered buses during 1998-2005, and additional 200 in 2010. There are also 2 CNG filling points in Athens

Major results and lessons learned

Their use showed noise reduction, while their emissions were lower compared to diesel buses. CNG fuel costs are less compared to diesel (approximately 10%).

More Information

ETHEL S.A. was founded in 1994 by Athens Urban Transport Organisation (OASA S.A.). The company is a Legal Entity of Private Law and belongs to the public sector. The mission of ETHEL is the implementation of urban transport services with internal combustion engine buses in the Metropolitan area of Athens.
ETHEL has 7 bus depots and a total of 6,371 employees.

Evaluation

The renovation plan of the ETHEL fleet started in 1998, and included the purchase of 616 CNG powered buses.

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Last update: 11/2010
within the ALTERMOTIVE project

No. 53

Electrical utility vehicles in the city of Piran / Pirano (Slovenia)

Piran is a town of 4,576 (2002) inhabitants on an 1 km² area on the Adriatic coast. Medevial town with its narrow streets is one of the most popular touristic attractions in Slovenia. The public service of waste collection has to be adjusted to this special function of the town.

Background

According to their 6 years experience with electrical vehicles, they have not noticed any differences between diesel and electrical vehicles as far as acceleration, top speed, gear oil changes or filter changes are concerned. The lifespan and average time of service repair are equal for both kinds of vehicles. The refilling time for diesel vehicles is shorter - electrical vehicles run approximately 4 hours, after that, batteries have to be refilled.

Major targets

Three utility vehicles run on electricity (batteries), all others are diesel propelled. The electric vehicles are used as garbage trucks. The reason for the initiative were severe problems with the noise emission and the size of the conventional vehicles in the medieval town. The electric trucks are more practical in the narrow streets. The implementation was not funded by programs of the European Union or any other project.

Major results and lessons learned

When compared to diesel propelled vehicles, the total of operating costs of vehicles which run on electricity are equal, although the costs of purchase of the latter are around 30.000 Euro higher. The costs of alternative fuels, the taxes and the insurance of the electric vehicles are equal to costs of conventionally propelled vehicles. The batteries are very expensive and have to be exchanged every 2 years, but still the overall cost of the electricity for charging and the battery replacement is the same compared to conventional fuel.

More Information

The main advantage is that these vehicles are very quiet and clean and are therefore very suitable for narrow streets in the small tourist town at the seaside. The main disadvantage of these vehicles is the very limited operational time that gets even shorter with the wearing out of the batteries. The 2 time higher price of these vehicles is also problematic.

The 2010 election resulted in a confirmation of the policy.
The new mayor offered to introduce electric cars to the town.

Evaluation

Political decision to go electric even, if the technology was not competitive. This may have caused the decision to head for biogas.

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within the ALTERMOTIVE project

No. 54

Hybrid propelled taxi fleet in the city of Ljubljana (Slovenia)

Rumeni taxi (Yellow Cab) is based on an innovative business model of taxi service organisation. The main principles are the introduction of advanced technologies and introduction of new standards. Since November 2004 the company offers a ride in the first hybrid taxi in Ljubljana.

Background

Rumeni Taxi is taxi company in Ljubljana, that was founded in 2002 by Vlasta Hojan. At the begining they were only using conventionally propelled vehicles. In 2004 they bought Toyota Prius with Hybrid Synergy Drive.

Major targets

Rumeni Taxi is a private company, which operates 5 passenger cars; 3 of them are hybrid propelled. All vehicles are mostly used in urban area and are making up to 100.000 km yearly.

Major results and lessons learned

Based on their 1,5 years and 360.000 km experience, they can say that hybrid propelled cars are performing very well. The acceleration of vehicles is equal compared to conventionally propelled vehicles (the hybrid propelled vehicles have only 1500 cc engine, but the acceleration is the same as in diesel vehicles with 1900 cc engine).

They noticed no differences in lifespan, oil changes (oil change after 15.000 km), filter changes (filter change after 30.000 km) or average time of mechanic service.

The total operating costs of hybrid vehicles are lower, although the costs of purchase are much higher compared to diesel cars.

There are huge differences regarding the purchase taxes. Hybrid propelled vehicles are tax free and the cost of insurance is 30 percent lower.
Consequently total costs per vehicle (evaluated cost per 10.000) are lower.
They have good experiences with hybrid propulsion that is why they are planning new purchases of alternative propulsion cars.

Evaluation

Operating three generations of hybrid electric vehicles successfully in a taxi fleet, which is may be the best application in an urban environment. Reducing not only fuel costs but also operational cost for servicing and replacing brakes.

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within the ALTERMOTIVE project

No. 55

878 Taxi fleet using Biodiesel from used cooking oil in Graz

The taxi fleet from 878-Cityfunk Graz tested and implemented the use of FAME (Fatty Acid Methyl Ester) for their fleet. They installed a tanking facility at the yard and procured vehicles capable of running with 100% FAME.

Background

Taxi 878 in Graz has 220 cars in its fleet and is thereby the city's biggest taxi company.
The taxi fleet is mainly based on Mercedes vehicles but switching to Skoda Superb being able to use Biodiesel.

Major targets

Today 25% of the vehicles of the fleet are operated on biodiesel with the aim to reach 60%.
The filling station is also open to the public, thus encouraging other companies as well as citizens to use biodiesel.
The emergency back-up engine at the yard also uses bio-diesel.
The large-scale introduction of biodiesel in a taxi company makes it possible to gather information about repair, maintenance and service needs when using biodiesel.

Major results and lessons learned

The implementation was accompanied by a awareness programme. This helped to communicate precautions as for example the need to change the fuel filter after having switched to biodiesel.
The company wants to reduce its environmental impact and works actively for this. All drivers have been introduced to environmental issues as a part of a one day training programme for the entire company (see also Taxi drivers as advocates for biodiesel). An electric car has been tested within the fleet. Before Trendsetter, however, the company had not tested biodiesel. In order to make the shift from diesel to biodiesel easier, a refuelling station for biodiesel was established at Taxi 878 headquarters.

The implementation started successfully focusing a few makes being biodies el compatible.

Unfortunately the situation worsened so there is now only low blending feasible in the very heterogeneous fleet which was also amended by CNG vehicles anticipating may be stricter PM limits for operating at days exceeding the PM limit. Due to all efforts it was very hard to convince the taxi drivers of the new technologies and as a result 878 was not able realize their ambitious efforts 100%. One very important reason for failing is the lacking knowledge of the drivers about shifting from one fuel to the other having led to difficulties, another reason were the absence of B100 compatible cars. A big issue is that there are only few cars able to run on B30 only and B30 is not available on the local market, apart from the fact that taxis are seldom of the brands which offers B30 capability.

More Information

www.878.at

Evaluation

Was part of an integrated sound approach but showed the lacking OEM support for biodiesel but also that it needs a huge effort to convince self employed drivers to use alternative fuels.

Posted: 03/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 56

City of Graz - biodiesel from waste oil for public bus fleet

For ecological reasons and in view of an efficient environmental protection the Grazer Verkehrsbetriebe (GVB) have seen its obligation in analysing, testing and implementing the currently existing possibilities of alternative fuels in its daily use in the line operation for many years.

Background

Since 1997 the GVB purchases only such busses which are "Biodiesel - capable". In 2002 the biodiesel initiative was support by the EU-Programme CIVITAS/ TRENDSETTER. At the beginning of the year 2004 already 83% of the bus fleet was operated with Biodiesel - also thanks to the funding of the EU; at the end of 2004 the 100% threshold was reached.

Major targets

To ensure simple and convenient biodiesel fuelling, a biodiesel fuelling station has been built. This station is open for GVB buses as well as other municipal vehicles.
In order to meet the requirements of emissions for harmful pollutants in a better way and by considering the environmental problems of the City of Graz (particulate matters) tests with emission control systems (catalysts) were carried out. Through the results of the research by the Technical University of Graz, and the company Pankl Racing the particle catalysts have been implemented in the bus fleet successfully. This is in line with the EU-Programme Kapa GS and it increases the attractivity of the city due to less exhausts by the biodiesel driven buses.

Major results and lessons learned

Starting with a Biodiesel pilot project in November 1994 first time two GVB busses were adapted to operate with Biodiesel. After a mileage of about 273,000 km one of the engines was dismounted and checked regarding its wear after usage of FAME; no additional wear in comparison to the use of fossil diesel fuel could be noted. Both the city of Graz and the public transport company have decided to go foward with the project after these tests with a full implementation.
The biodiesel buses have 5 - 7% higher volumetric consumption but the price of Biodiesel is lower. Therefore the Grazer Transport Services have no financial benefit from using biodiesel. The project is driven by ecological aspects, the interest in technical progress, improved air quality and image improvement. Whith this project an important milestone concerning the environmentally performance of public transport could be set.

It is an interesting fact that the effect of a particulate catalyst in connection with the use of Biodiesel is even better compared to the use of fossil Diesel. The emissions in terms of hydrocarbons amount to about 81%, in terms of carbon monoxide to about 89% and for particles (particulate matters) the emissions can be reduced to about 29%.

Using customary diesel during the winter saves a lot of money and on the other hand auxiliary heating with Biodiesel results in a massive smoke generation, which could not be handled until now. In the last years particle removal had been tries out retrofitting particle traps. New studies are planed with state of the art filters but there are no reports until now, how they will work. Unforuntelay no EURO 5 or EEV buses with bio diesel capability are on the market. So GVB is thinking about adding CNG/Biogas fueled buses, but until now there is no decision made. Economic efficiency and adaptation are on the stand at the moment and results should be available until mid 2011.

More Information

The fuel used at the GVB which is generally called Biodiesel is a waste cooking methyl ester (FAME) generated from waste cooking oil or fat after a respective cleaning. A relevant part of this waste cooking oil is collected in a systematic way by 250 restaurants of the City of Graz; also private households have the possibility to bring their waste cooking oil to specifically created containers at collection points.

Evaluation

Successful early but finally long lasting example of using summer quality (low cost) biodiesel in an 80:20 approach securing cost efficiency. Had been awarded a lot of prices. Sadly restricted by the inability to install effective particulate elimination as retrofit with existing buses and the absence of B100 compliant buses on the market fulfilling EUR5/EUR6 and EEV standards.

Posted: 03/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 57

Pure Plant Oil Use in Cork City Council Municipal Fleet (Ireland)

Through the EU funded CIVITAS Miracles Project, Cork City Council established a pilot project to investigate the use of biofuels in their municipal fleet. Various options for converting between 5 - 10% of the fleet were considered. Pure plant oil (PPO) was chosen, and in May 2003 Council employees were provided training by ELSBETT to convert 16 vehicles of the City Council fleet.

Background

The fleet comprises 250 vehicles. They are a range of cars, vans and trucks. They operate in urban and rural environments and their average annual mileage is up to 20,000km.

Major targets

In 2003, 17 vehicles were modified to run on PPO: 11 Fiat Ducatos, 4 Couriers, 1 Isuzu NQR and 1 VW Transporter. The conversion kit was removed from the Isuzu as the vehicle experienced too many maintenance problems around the time following conversion. All the other vehicles continue to use PPO. Three vehicles are now also running on biodiesel.

Major results and lessons learned

Research was carried out to assess the feasibility of using CNG, LPG, electric power, hydrogen, biodiesel, ethanol and pure cold pressed plant oil (PPO). The capital costs associated with establishing a fleet of vehicles running on hydrogen, electricity, or CNG were outside of the limited project budget. PPO was ultimately chosen because the conversions could be carried out within budget. The ELSBETT kit was chosen because it is a single tank kit, which, it was thought, should be more reliable and simpler for the drivers to use than a dual tank system. In the first 6 months there were concerns about extra visible smoke, the rancid exhaust smell and possible power losses. Adjustments were made to the engines and up to 25% diesel was added to the PPO to redress these problems. Significant cold starting delays with the Fiat Ducatos continued to occur up until autumn 2004. It was then discovered that fine mesh gauzes in these fuel tanks were impeding fuel flow. After these tanks and gauzes were thoroughly cleaned out, the Ducatos began to run more smoothly. However problems persisted because the Energy Management system within the engine was registering the new set-up as a fault. To resolve this a parallel system was installed instead to heat the fuel-line. Improvements were also made to the fuel delivery system. Initially the fuel was supplied via an old leaded petrol tank; however although this was cleaned out first it did produce some contamination. Ultimatley the fuel was delivered from an IBC via gravity flow with a pressure relief valve.

More Information

Cork City is the second largest city in the Republic of Ireland, home to 123,000 people, and has the second biggest natural harbour in the world. Cork City Council is the local authority for the city with nearly 1,500 employees, and provides a wide range of services including planning and development, water, waste management, social housing, the Fire Brigade, parks and recreation, and roads and transport.

Evaluation

Pilot project underlining the problems unmodified vehicles have using pure plant oil. Successfully developing a pure plant oil market by creating demand.

Posted: 03/2010

No. 58

PPO (pure plant oil) fueled buses in Hasselt (Belgium)

Since January 2004 one public transport bus in Hasselt is driving on PPO (Pure Plant Oil). Bus-company De Lijn started this pilot test to find out regarding the maintenance and operational characteristics, the effects on the life span of the engine and the feasibility to use PPO in public transport buses. The result was that in twenty months there were no technical problems. Therefore 70 more buses should be converted to drive on PPO before the project was stopped after having 10 of them in operation.

Background and Objectives

At the project start the total fleet of the De Lijn consisted of 3650 busses, 359 trams and 20 trolley buses operating in urban, mixed as well as in rural environments. The propulsion methods and fuels used in the De Lijn fleet - besides the PPO bus in Hasselt - are conventional.

Implementation

In January 2004 De Lijn had one bus converted to drive on PPO. The aim was to test the maintenance and operational characteristics and the feasibility to use PPO in public transport buses.
Changes were needed only on the fuel circuit and not on the engine. The bus has two tanks. The original (large) tank is filled with PPO, the new (smaller) one with conventional diesel. Because the viscosity of PPO is less then diesel it has to be preheated, which is done by cooling-water of the engine.
To warm up the cooling-water, the bus drives on conventional diesel for the first 5 to 10 minutes.
When the engine is warm enough (60s) the fuel has to be switched to PPO. In the first PPO bus this was done by the driver, by using an electric switch activating the PPO fuel pump. But now this switch is made automatic by using a thermostat. At the end of the operational period the fuel has to be switched back to conventional diesel (last 10 kilometres). This still has to be done by the driver.

Conclusions/Lessons Learned

By now the PPO bus has driven 93.000 kilometres and 7 oil analyses were carried out. The result was that in twenty months no technical problems and no negative impacts were detected in the lifespan of the engine.The costs for converting the bus were • 4.800,-. Therefore De Lijn decided to convert 70 more buses to drive on PPO (20 buses in 2006 and 50 buses in 2007). The project came to a halt after operating 10 buses with PPO.

More Information

De Lijn is the public transport company in the region Flanders in Belgium. De Lijn wants to offer public transport of the highest quality. This means reliable, punctual, fast, safe and comfortable connections with high frequencies.
www.delijn.be

Evaluation

One of the few examples showing positive experiences using pure plant oil- at least for some time. Approach taking into consideration well to wheel balances and GWP. Stalled finally not being able to solve the problems being only a user. Involvement of engine producers needed to create an acceptable solution.

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Last update: 11/2010
within the ALTERMOTIVE project

No. 59

Rzeszow - the biggest CNG municipal bus fleet in Poland

Rzeszow - a city in South East of Poland, replaced the outdated municipal transportation buses powered by diesel with modern units fueld by CNG. To allow for comparison of the characteristics of different buses 38 new CNG buses from different manufacturers were bought and two diesel buses were converted to CNG.

Background & Objectives

Rzeszow is capital of the Podkarpackie Region (South East of Poland). Its population is 170 thousands inhabitants. The public transportation system is based exclusively on buses.

Rzeszow suffers from increasing air pollution from motor vehicles. It is particularlydifficult to cope with it, due to dense urban structure and the fact that the city is situated in a valley.
Until recently, the public transportation buses were mostly Jelcz PR110 models, produced in the 1980™s. Those buses were not meeting the environmental standards, largely contributing to deterioration of local environmental situation. For that reason the Municipal Transportation Company, together with local authorities decided to replace those outdated vehicles by modern buses, using CNG.

The project was supported by 4 millions PLN (circa 1 millon Euro) from EkoFundusz (Polish environmental foundation based on the priciple ecoconversion of debts).

Implementation

The project converting the municipal transportation buses from fossil diesel to CNG lasted for several years and ended in December 2007.

The major targets were to reduce local air pollution, due to emissions from motor vehicles, especially in the dense populated city centre and - in the long run - reduction of total direct and indirect costs.

To achieve that 38 new CNG buses were bought, while 2 buses were converted to CNG in the specialised company in Mielec.

At present (2010), this is the biggest modern, environment friendly bus fleet in Poland. The Municipal Transportation Company in Rzeszow, now operates 40 CNG vehicles.
Those are:

- 2 modernised Jelcz 120M
- 11 Jelcz M125M/4
- 9 Solaris Urbino 12
- 10 Jelcz M120M/4
- 8 Jelcz M121M/4

The total cost of the measure was 27.5 million PLN (ca. 7 millions Euro), including 4 millions PLN support from EkoFundusz.

Conclusions

Rzeszow was among the pioneers in Poland in this kind of initiative. At present (2010), this is the biggest modern, environment-friendly bus fleet in Poland.

Rzeszow was also the first beneficiary of the EkoFundusz programme supporting environmental friendly municipal transport.

Evaluation

Use of environmental funds pioneering the set up of a medium sized CNG bus fleet in the new member states.

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Last update: 11/2010
within the ALTERMOTIVE project

No. 60

CNG used in public transport vehicles in Sofia (Bulgaria)

A programme of the Sofia city administration, introducing natural gas with public buses, operated by the municipal transport company

Background & Objectives

Sofia, the capital of Bulgaria, is the biggest civic and industrial centre of the country. The number of the motor vehicles is constantly increasing, which contributes to the high air pollution of the city.
In 1989 the Sofia Municipality started a programme for introducing CNG into the public bus fleet. The programme is carried out by the municipal company Sofia Autotransport EAD, with co-financing by the Bulgarian Ministry of Environment and Water.
The main target of the programme, started by the Municipality, was the reduction of air pollution. Furthermore, the need of increasing the quality of the transport services and improving its efficiency were targeted by the programme.

Implementation

The programme is implemented through a number of projects, including conversion of diesel engines into methane powered ones, purchase of new CNG-fuelled buses, construction of natural gas distribution pipeline and compressor stations.
Currently (2010), 50 buses on diesel-methane and 19 buses on CNG are in operation. Construction of a distribution gas pipeline and of two gas compressor stations was carried out.

Conclusions

The acceptance of the measure has been quite positive. The exploitation of these buses in 2008 reduced the year consumption of conventional fuel by 4.53%.
The future plans of the transport company include increasing of the number of the green buses, however, due to a lack of funds, this process might be delayed.

www.bsrec.bg

Evaluation

Innovative fuel blending, but lacking funding is hindering full deployment.

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Last update: 11/2010
within the ALTERMOTIVE project

No. 61

CNG buses operating in Bourgas (Bulgaria)

Since October 2008 the municipality of the Bulgarian Black Sea city Bourgas is operating the first CNG buses on its public transport network. The buses, produced by the Czech company TEDOM have very low emission levels and meet the EURO 5 requirements.
Besides, their economy is definitely better compared to the conventional engines: the fuel costs, when operating in the city, are about 50 % lower compared to regular buses.
The investment amounted to about 2.5 million Euro.

Background and Objectives

Bourgas is not only one of the most important industrial Bulgarian cities, but also a famous tourist centre, situated on the Black Sea coast. During the summer season a large number of tourists from many European countries join the 210,000 local inhabitants and the road traffic intensifies correspondingly. That is why the Bourgas Municipality is taking measures with the aims to increase the role of the public transport and to reduce air pollution. One of them is the operation of new CNG buses.

Implementation

The first delivery of 5 brand new buses took place in October 2008, the second group of 5 vehicles arrived in December of the same year. The buses are produced by the Czech company TEDOM. Their modified diesel engines are specially designed to be operated with CNG with pressure of 220 bar. The tank capacity is 960 mł, which allows to drive 400 km with one single refuelling. The buses have very low emissions and meet the EURO 5 emission standards. The vehicles are very comfortable. They have low-floor tilting platforms and are equipped with air conditioning. The bus length is 12 m, the number of seats is 30 and the total capacity amounts to 90 passengers. On 4th December 2008 the City Mayor and the President of the company *Bourgasbus*, which will operate the buses, officially put the 5 new buses in operation.

Conclusions

The emission levels are comparatively reduced.The content of CO in the exhaust gases vary between 0.01 and 0.08 g/kWh, and those of the NO_x between 1.81 to 3.25 g/kWh.
Besides, the economic efficiency of the buses is definitely better than that of the conventional engines: the fuel costs, on operating in the city, are about 50 % lower compared to regular buses.
The investment amounted to about 2.5 million Euro.
The experience, accumulated not only in Bourgas, but also in Sofia and Plovdiv (where the same CNG buses are operated) has proven that they are very efficient from both environmental and economic point of view. On the other hand, thanks to the modern design and comfort offered to the passengers, these vehicles are already very popular and their implementation is an obvious success.
The municipality will continue to invest into that renewal of the public transport fleet.

For more information

www.burgasbus.piczo.com/?cr=5 burgasbus
burgasbus.info/news.php burgasbus.info

Evaluation

CNG usage in public transport stating good environmental and economical performance.

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Last update: 11/2010
within the ALTERMOTIVE project

No. 62

Recycling cooking oils into biofuels in La Rochelle, France

A used cooking oils treatment plant using raw material collected from restaurant owners has been implemented in La Rochelle in the framework of the *CIVITAS-SUCCESS* project. Operational since April 2008, it offers an original solution to recycle locally a polluting waste into a 2nd generation biofuel.

Background

Currently in *La Rochelle*, half of the cooking oil is thrown away with household refuse in the waste water network or in waste reception centres.
The objectives of the project were:

- to design and implement a used cooking oil treatment plant using raw material collected from restaurant owners in La Rochelle and surroundings
- to organize the collection and recycling process of the cooking oil

Major targets

Recycling method

Priority has been given to an experimentation avoiding the addition of fossil or potentially dangerous products. The process is divided into two phases:

- Decantation: A first 15 days decantation inside the oil drum is required to obtain a good-quality raw material. The recyclable part is transferred into a decantation tank (another 15 days at least)
- Filtration: The oil is filtered and stored in another tank

From the restaurants to the tanks

Restaurant owners in La Rochelle are provided with storage tanks. The biofuel is dedicated to feed part of the Urban Community fleet. The blending is 30% biofuel and 70% diesel. No specific equipment or adaptation of the engine is necessary.

An economical and ecological solution

This solution turns out to be both economical and ecological for the restaurants owners. In France it is forbidden to dispose oil with household waste or in the waste water network and have the obligation to bring it to a specialized company. The average cost for this service amounts to approx. 0.30•/litre. With it's initiative to recycle oil for free, the local authority reaches a balance between incentive and enforcement of the law.

Promoting an eco-friendly approach

The restaurants participating in this operation are awarded by a good behaviour certificate. The restaurant owners have been informed about this approach and the way to take part during information meetings.

Major results and lessons learned

Legal barriers

During the implementation of this project, the main barrier has been the French legislation on biofuel, and especially on cooking oil. A custom statement published in August 2007 forbids the use of cooking oil as a fuel. After a first refusal from the Regional Customs Office in October 2007, the Urban Community finally received the authorization to use their cooking oil for part of its fleet in January 2009. The French legislation on biofuel is currently changing and gives good hopes to the development of alternative fuels not only in La Rochelle, but in France generally.

Results

- 40 agreements have been signed with the restaurant owners
- 3,500 litres have been collected between April and December 2008
- The Urban Community received the authorization from the French Government to use the cooking oils as a biofuels for its fleet in January 2009

This experimentation represents an important first step. Indeed, by anticipating the French legislation on biofuels, La Rochelle has the ambition to develop the use of cooking oil as a fuel and eventually extend it to the transport of passengers.

Evaluation

Successful trial to overcome administrative hurdles using less taxed biofuels. Environmental performance (air quality) of the solution not investigated.

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Last update: 11/2010
within the ALTERMOTIVE project

No. 63

Electric vehicles for companies in Stavanger, Norway

Stavanger has participated in the EU project ELCIDIS in implementing an electric vehicle distribution system and establishing itself as a leading city in electric transport.

Background

The city of Stavanger is located in the South-West coast of Norway, with a population of around 100,000. Despite, the oil industry being the main employer in the region, the city of Stavanger's transport policy aims at reducing dependence on petrol/diesel vehicles in order to reduce polluting vehicle omissions.
Over the past decade, Stavanger has introduced electric powered buses to its public transport system and implemented the necessary infrastructure for private electric cars. The city has taken part in the EU project - ELCIDIS - in order to implement an electric vehicle city distribution system which has involved a review, of urban-freight in Stavanger and a replacement of goods vehicles with electrically powered vehicles.

Major targets

A review of the transportation needs of 4 companies/organisations was conducted along with a feasibility study of the routes travelled within the city in order to determine whether steep hills would be prohibitive to electrically powered vehicles. 8 electric vehicles were introduced as follows:

- 2 vehicles for energy company Lyse Energi AS
- 4 vehicles for the post service
- 1 vehicle for the municipality
- 1 vehicle for the state road authority

A new charging station was built in the city centre to facilitate use of these vehicles.
The vehicles were built by Citroen and Mercedes, the maximum payload range between 300 and 500 kg. The gross vehicle weight is between 1400 and 3000kg. Top speed is 90km/h and the vehicles have a range of 60 - 80 km.
The batteries were made of nickel cadmium or lead acid.

Major results and lessons learned

In the first year of operation, the distance travelled by the vehicles totalled 54,000km and the companies experienced very few technical problems with their operation e.g. battery breaking down in a vehicle used by Stavanger Kommune. The limited driving range that is often used as an argument against electric vehicles was not found to
be a limiting factor in this project.
Cost analysis showed that the savings per electric vehicle to the organisations was 1,00 EURO per 10km travelled.
The organisations were pleased with their performance and intended to continue running the vehicles beyond the life of the ELCIDIS project.

The charging station constructed for the use of the project is now open for use by all users of electric vehicles in Stavanger. Use of electric vehicles has continued to increase in the city with strong encouragement and incentives from the local government. In 2009 Stavanger will host EVS-24, a global electric transportation forum at which the latest technology in electric transport will be showcased. As part of the event there will be an electric vehicle road race from Oslo-Stavanger which is anticipated to attract much media attention.

Evaluation

Local early approach implementing electric mobility.

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within the ALTERMOTIVE project

No. 64

Electric and Hybrid Waste Collecting Vehicles in Sevilla, Spain

Sevilla is one of the first cities in the world using vehicles with electric propulsion for the collection of urban waste. The use of bimodal waste collecting vehicles (compactors) in the historic centre of Sevilla provides important advantages over conventional collection vehicles. The practical benefits of this technology also include lower emissions and environmental noise at low speeds compared to conventional vehicles.
At present, the good experience of the Environmental Department of Sevilla City Council was confirmed by the purchase of another five compactor vehicles, consolidating this bimodal technology

Background and Objectives

Sevilla is one of the first cities in the world using vehicles with electric propulsion for the collection of urban waste. The Cleaning Service Company LIPASAM, managed by the City Council, added the first five compactor vehicles to its fleet in 1998, for the collection of urban waste in the historic centre of Sevilla. These vehicles, with bimodal technology (hybrid combustion-electric engine), were the first experience at national level in Spain.

The practical benefits of this technology also include lower emissions and environmental noise at low speeds compared to conventional vehicles.

At present, the good experience of the Environmental Department of Sevilla City Council was confirmed by the purchase of another five compactor vehicles, consolidating this bimodal technology.

Implementation

Investment Details
The acquisition of these new bimodal vehicles implied an investment over 1.5 million Euro, although the special characteristics of the initiative and its environmental improvement was partially supported by the EU Cohesion Funds (80%); the rest of the investment was supported by the City Council of Sevilla (20%).

Components Manufacturers' Details
A market research among different manufacturers of electric and compacting components was performed prior the acquisition. It was decided to purchase compacting elements produced by SEMAT, which has an extensive experience on bimodal vehicles. Additionally, SEMAT equipment has been used for conventional cleaning systems for urban waste collection in Sevilla for several years.

SEMAT compacting elements were assembled over chassis produced by RENAULT, specifically Premium 250.18 model for medium size and M.180.13 for small size compactors.

The electric equipment was provided by PONTICELLI, which is a company with extensive background and reliability in such field.

Conclusions

First, the size of these vehicles, smaller than classic compactors, make them suitable for the collection of waste in the historic centre of the city, which presents an intricate street layout. These vehicles do not block traffic and allow access to difficult or inaccessible sites for big tonnage vehicles.

In addition, the use of the bimodal technology presents a big difference in terms of environmental benefits compared with vehicles exclusively fuelled with fossil fuels since hybrid vehicles help to reduce smog-forming pollutants and environmental noise.

The driving range of these on board batteries-operated electric vehicles varies depending on the operation, weight, design features. Batteries can be replenished by plugging them into the recharging station installed at LIPASAM central office.

Vehicles are recharged during the morning and operating with electric engine during the collection service at night. This way the period of electric operation is scheduled for those areas where emissions benefits are most desirable.

Based on the positive results, for 2011 an increase of the number of vehicles will be decided.

More Information

More information on the implementation is available (Spanish only) at www.lipasam.es.

Evaluation

Clever approach utilising expensive zero emission waste collection trucks during the night, bypassing congestion during days - bin manipulation noise has to be tackled too when operating during nights.

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within the ALTERMOTIVE project

No. 65

Results of the Project 1000 Green Cabs for Berlin, Germany

Supported by the German Department of the Environment, the Senate of Berlin and the gas providers GASAG and RuhrGAS the project lasted from October 2000 to 2006. The aim of the project was, to boost the use of CNG vehicles in Berlin. The sponsorship for the procurement focussed on taxi and driving school cars.

Background

With the beginning of the project in 2000 the circumstances for the operation of CNG cars were bad:
-Car purchase was more expensive than today
-Car model variety was very bound
-Poorly conceived technology of the CNG cars
-Low pump station density (only 2 CNG pump stations in whole Berlin!)

All in all the initial ignition provide by the project was needed to put CNG on the way of success. Seeing the environmental benefits, the aim of the project partners was, to show other metropolitan areas that the CNG technology was an economic and practicable way to improve urban air quality.

Major targets

Taxi cars and driving school cars were supported primarily through financial incentives, since their high running performance promised the largest positive economic and environmental effects. One important measure within the project was the subsidisation of the purchase of the cars with up to 3,000• and free tanking up to a value of 1,500• for each purchased car. The conditions to be supported were the following: (1) the car had to meet EURO IV emission standard, (2) the car should be operated in Berlin and (3) the cars had to be equipped with low noise tires. GASAG also promised to keep gas prices always 30% lower than the current diesel price and to open 10 new CNG pump stations. This way it was guaranteed that the purchase and operation of a CNG car was beneficial even without subsiding the purchase of the car.

Major results and lessons learned

-By the end of the project in 2006 almost 1000 cabs and driving school cars ran on CNG
-More than 10% of the taxi fleet runs on CNG in 2008
-All in all 3,000 CNG cars operate in Berlin in 2008, it is the highest density of CNG vehicles in whole Germany
-Utility service companies, several company fleets and many private car users also run their cars on CNG
-13 CNG pump stations offer a satisfying supply
-Public transport provider BVG operates 14 CNG buses
-CNG cars will not be able to be abandoned from the environmental zone in Berlin due to their low emissions
-Bernd Döhrendahl, chairman of the taxi guild of Berlin states that, after minor technical problems in the beginning, most taxi drivers are happy with cost savings and performance of their CNG car.
-CNG cars emit 95 % less PM 10, 80% less Nitrogenoxides and 3 dB(A) less noise, compared to diesel driven cars.
-Every year the 1,000 CNG cars save approximately 1,400 t of CO2 (GASAG figures)

The project phased out in 2006, but the incentives (today about 300 •) from the gas provider still exist and the availability problems for CNG cars were solved. Today about 3,500 natural gas cars for passenger transport are existing. The diversity of the motor car types, which are able to use CNG, is still sparely. Market leader are Fiat and Opel. It would be desirable if automobile manufacturer would generally offer a bigger variety of natural gas-dedicated vehicles in all size ranges - from small cars over middle cars up to big cars.
A new issue or an elongation of the fi1000 Green Cabsfl project not very realistic, because the costs are very high for the gas providers. For achieving the smaller incentives today people are bound to paste up a small sticker on their car with a green logo and a slogan like filch fahre mit Erdgasfl. Such a promotion bounda seems to be very important for the further increase of the number of alternative cars.
During the project it was visible that an area-wide infrastructure of natural gas filling stations is important for the success of the whole project. In 2010 two new natural gas filling stations were built and the overall number of 16 gas filling stations in total reached. Further stations are in planning.
In other transport areas, e. g. in the case of heavy trucks, BSR is using already 50 CNG trucks and plans to purchase 100 new CNG trucks in near future, which can be fuelled partly with biogas produced from waste. At least until 2018 CNG users will experience reduced excise duties.

More Information

The CNG promotion was extended to the region http://www.bb-faehrt-erdgas.de/.

Evaluation

Early successful attempt to shift towards CNG. Has been a blueprint for similar initiatives - effectively incorporating driving schools and taxis.

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within the ALTERMOTIVE project

No. 66

CNG buses in Bratislava, the capital city fo Slovakia

The Public Transport Company Bratislava, a. s., currently operates 162 CNG buses.
Public transport company purchased 22 new CNG buses type SOLARIS URBINO 15 with a length of 15 metres in 2006.

Background

In present time the public transport company operates approximately 450 buses of different types on 62 lines with an operating length of 385,5 km. The number of full low-floor buses is 45 and average age of the vehicles is approximately 12 years. Bus types of Solaris, SOR BN 9.5 (so-called midibus), Ikarus, Tambus, Karosa and Mercedes run on Bratislava roads, which transport 150 million passengers per year.

Today 162 CNG (Compressed Natural Gas) buses run on Bratislavas streets, representing 36% of the total bus fleet. The first CNG buses appeared in 2001, whereupon it related to buses of the type Karosa, which were reconstructed to drive on CNG after their modernisation.
Today the Bratislava transport company operates 140 buses of this type. In addition 22 new barrier-free CNG buses of the type SOLARIS URBINO 15 are operated since 2006.

Major targets

The public transport company plans to operate 300 CNG buses in Bratislava streets in 2010, which would represent 75 % of all buses in passengers transport per day.

Major results and lessons learned

On the base of experience of the Public Transport Company Bratislava by using CNG buses transport costs can be reduced by 33.6%. Fuel costs of CNG powered buses are approximately 8 SKK/km (0.25EUR/km), while diesel powered buses run costs of about 12 SKK/km (0.36EUR/km).
CNG buses do not emit particulate matter and do not smell, generate 60% - 80% less gaseous emissions (including methane) than diesel buses.
They are one-third quieter, run more smoothly without vibrations and have longer operating life. The following comparison of emissions from one bus running on average for 3600 hours/year evidences environmental benefit of using CNG buses.

More Information

More information about the public town transport in the capital city of Slovakia, as well as in other cities you can find at the imhd-websit: http://www.imhd.sk

Evaluation

The measure is new in its dimension targeting a share of 75% CNG buses in the fleet for the new member states.

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within the ALTERMOTIVE project

No. 67

CNG cars used by a pizza delivery service in Dresden, Germany

The store of the pizza delivery service Hallo Pizza in Dresden uses 5 CNG cars (Compressed Natural Gas) since 2006. The experiences show a reduction of the fuel costs by 50% compared to the gasoline cars used before. Furthermore the cars noxious emissions got reduced by a huge amount, which is an advantage for every citizen of Dresden.

Background

Mr. Reik Kretschmer, administrator of the store on street Leipziger Strasse in Dresden, stated that the fuel costs are a big position in the overall costs of his business, especially under consideration of the huge running performance of about 40,000 km per car and year. The fuel of the CNG cars has a tax burden which is, related to the energy content of the fuel, about 70% lower than taxes on gasoline, that's why there were sound hopes to reduce fuel costs by great amounts.

Major targets

The intention for the purchase of bivalent CNG cars was the aim to reduce fuel costs. The headquarter of Hallo Pizza Germany decided to order 100 Fiat Punto Natural Power cars, which were purchased for a special price. 5 of them went into service in Dresden.
In comparison to the Fiat Seicento cars which were used before, the fuel costs could be reduced by almost 50%!

It seems that the plan has been implemented to an extent of 20 vehicles only.

Major results and lessons learned

The only disadvantage recognised is the relatively low range in combination with the CNG filling station density.

Sometimes the range of 250 km is utilized within one tour. Since there is only one filling station within the delivery range of the store, it is often requested to make long detours to refill the cars.

Due to the dynamic market of new drive modes, it is not possible to predict what kind of cars will be purchased when the actual cars run out of service. But under today's circumstances the repeated purchase of CNG cars seems to be most likely.

Another positive effect is that noise emissions are lower than in gasoline mode, which is unfortunately not proofed by concrete figures.

The ecological advantage lies within the combustion of Compressed Natural Gases (CNG), which results in lower emissions of nitrogen oxides, unburnt carbon hydrides, and carbon mono- and di-oxides.

Evaluation

Different fuel characteristics and unstable financial incentives are posing problems for fleet managers, large transitions to alternative fuels are scarce.

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Last update: 11/2010
within the ALTERMOTIVE project

No. 68

Bus powered by CNG in Slupsk, Poland

Urban buses power supplying by compressed natural gas (CNG) is very beneficial - for environment and finances as well.

Background

The opinion about buses in polish cities is relatively bad. It mainly results from rolling stock's condition. It is a huge problem in cities where only buses are mean of public transport. According to Slupsk's transport policy, the city is going to bring environmental-friendly fuels into effect and to the improvement of public transport's image. By the time of 2020 the rolling stock should be change for buses only powered by alternative fuels.

Major targets

Gazownicza (Seaside Gas Company) signed a deal about buses powered by gas putting into practice. The city bought 5 Irisbus Citelis 18 meter buses powered by CNG, whose exploitation started in February 2007. Cost of one powered by CNG bus purchasing is 20% higher and amount to 1,200,000 PLN (about 316,000 EUR). Cost of 1m3 amount to about 1.80 PLN (ca. 0.48 EUR), while cost of one liter of diesel oil amount to 3,95 PLN (ca. 1.05 EUR).
The engine powered by CNG meet with the EURO 5 norm. Noise emission are significantly lower than those of conventional diesel buses. Consumption of CNG and petroleum are in the ratio of about 1.3m3 to 1 l.

The agreement with PSG guarantees as well, that by the time of 2014 the price of 1m3 of gas will not be higher than 50% of 1 l of diesel oil price. It enable to plan finances in long-term perspective. Only government's idea of bringing excise on CNG into effect seems to be a serious threat.

Major results and lessons learned

As a matter of fact CNG is not a renewable, but it ensures great environmental virtues: lower level of noise and air pollution emission and about 25% lower exploitation costs. CNG improves public transport's image as well.

Evaluation

Shows how transition to alternative fuels needs contracting to secure stable fuel price differences allowing a payback of the investment. Positive example of improving PT-image.

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Last update: 06/2010
within the ALTERMOTIVE project

No. 69

B30 usage in public transport buses of RATP Paris (France)

Given the extent to which transport is responsible for greenhouse gas emissions, RATP (Paris) decided to promote public transport which consumes 4.6 times less fuel than a personal car. After an initial pilot phase with NGV, LNG, water-diesel fuel emulsion and Diester fuel, RATP had decided to significantly step up its action, not only by working on energy efficient vehicles but also by turning to biodiesel blends. At the moment (9/2010) 285 of 4,483 buses are operated with B30, a fuel containing 30% biodiesel and 70% fossil diesel.

Background

Before the use of biodiesel, RATP managed:

- 12 electric buses,
- 57 buses running on LPG,
- 90 CNG buses,
- 72 buses running on diester (biodiesel),
- 310 buses running on water-diesel fuel emulsion,
- 437 Euro 3 buses and
- 3017 buses equipped with particle filters.

Major targets

RATP's rail transport accounts for 82% of traffic. Furthermore, RATP's fleet of more than 4,000 buses (which alone accounts for a quarter of French city buses) represents 18% of the km/passengers on their networks and totals 35% of RATP's fuel consumption. This triggered their efforts to reduce greenhouse gas emissions. The RATP therefore declared its target of zero oil by 2025 for public transport.

RATP's commitment to try out alternative fuels is essentially motivated by efforts to generate fuel savings and reduce greenhouse gas emissions.

Implementation

Since 2002, RATP has been trying out Diester (RME - Rapeseed Methyl Esther) for its bus fleet after having obtained a manufacturer warranty for a large part of the fleet to use Diester 30 in the engines. The goal was to equip a third of the buses with Diester 30 (B30) from 2007 on. A test drive with Diester 100 was also be launched in partnership with manufacturers and French biofuel stakeholders.

Major results and lessons learned

After an initial pilot phase with NGV, LNG, water-diesel fuel emulsion and Diester fuel, RATP decided to significantly step up its action, not only by working on energy efficient vehicles, but also by turning to B30.

However certain manufacturers will no give a warranty for B30 operation, and some buses need some modifications. Therefore 285 buses out of the 4,483 in total are now running on B30 and not 1/3 as intended initially. Higher maintenance costs were experienced caused by more frequent exchange of the motor oil and a higher volumetric consumption experienced. A lack of warranties from manufacturer leading to a low number of approved biodiesel compatible buses as well as higher biodiesel fuel and maintenance costs have been experienced. At the same time the diesel used by RATP allows to cut the particulate emissions by reducing sulphur content (from 50 to 10 ppm). Also for the ecological balance of biodiesel the last study of ADEME has pointed to the questions of pesticides, use of soil, type of agriculture and the need to chose between eating or driving.

Evaluation

Wide scale test utilising different alternative fuels and deciding to use biodiesel (blends) in part of the fleet. Availability of B30 capable vehicles, economic disadvantages, exhaust treatment and sustainability of B30 are considered as hurdles.

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within the ALTERMOTIVE project

No. 70

The city of Gdynia, Poland uses CNG buses, meeting the EEV standard

The transport authority in Gdynia Poland introduced 5 CNG buses matching the EEV (Enhanced Environmentally Friendly Vehicle) emission standard in September 2007. The current fleet will be extended with further 15 buses (20 in total) until 2010. A fast-fuelling station will be build up in the bus depot in 2008.

Background

Since September 2007, 5 new buses (EEV -) on natural gas have started operating on the streets of Gdynia city, northern Poland. The buses replace the last old IKARUS buses operated in the city.

Major targets

In September 2007 the transport authority in Gdynia introduced 5 new MAN CNG buses matching the EEV emission standard.
Additionally a fast fuelling station will be build up in the bus depot in 2008.
The new buses will run in the city on bus lines 171, R, 107, 147, 150 and 152.

Technical details of the buses

- Manufacturer: MAN
- Bus type: Lion's City G CNG
- Engine power: 228 kW
- Total passenger capacity: 160

All new vehicles are equipped with air conditioning.

Major results and lessons learned

Due to the high emission standard the new buses are environmentally friendly in terms of PM, NOx and HC exhaust gas emissions.
Additional CNG buses cause very low noise emissions and therefore provide better riding comfort. Noise emissions for a bus passing by are almost halved compared to comparable diesel buses.

Procurement of 5 new vehicles assumed to 1.3 million Zloty. Under operational conditions in Gdynia operation of the natural gas buses is expected to be approximately 30% cheaper compared to conventional diesel buses.
At current fuel price level fuel consumption results in annual fuel cost savings of 60,000 Zloty per bus.
Until 2010 Gdynia Transport Authority plans to introduce 20 such CNG buses in the public transport system of the city.

Evaluation

CNG is usually seen as easiest way to meet EEV-standards but in this as in most cases the sustainability aspect is not covered well.

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within the ALTERMOTIVE project

No. 71

CNG vehicles for parcel delivery used by DHL in Germany

DHL operates 170 EEV (Environmentally Enhanced Vehicles) for parcel delivery in 19 German cities. In Germany about 2.8 Million parcels are delivered by DHL (the logistic brand of Deutsche Post AG) every day. In 2007 it operates 6,500 specific delivery vehicles with optimized box body. Since 2005 CNG delivery vehicles with the highest environmental standard EEV were introduced in cities with high environmental impacts, caused e.g. by road traffic.

Background

Until 2003 all diesel driven vehicles had been improved to the standard EURO III, as usual in the market.
Because it is seen as a duty to reduce the emissions (e.g. nitrogen oxides, noise, PM,...) in high polluted cities, DHL was searching for opportunities for further improvements.

Major targets

After a test with normal MB Sprinter vans, driven by CNG, in Regensburg in 1999, DHL looked for CNG-driven vehicles for parcel delivery with bigger box bodies because the payload of the vans was too low. In 2004 after a tendering for such vehicles Iveco was commissioned to produce the first 50 vehicles of the type Iveco Daily 50 C11 G which were put into operation in Berlin, Bremen, Düsseldorf, Stuttgart, Regensburg and Munich.
The decision for the cities based on valuation of infrastructure, e.g. network of petrol stations offering CNG, overstepping of maximum PM emission and economic advantages. Such advantages are e.g. longer operating permissions in the delivery districts. In some districts exist tight restrictions e.g. strict noise control.
Referring to such advantages the delivery process can be optimized and becomes more economic. Compared to normal vans the bigger box bodies resulted in a rise in payload of about 40%. The number of operating vehicles and of tours decreased. Good experiences consequently led to an extension in operated vehicles to 170 in 2006.
The vehicles are operated in the following 19 locations:
Bremen (12), Hamburg (8), Hannover (8), Berlin (20), Dresden (8), Leipzig (8), Dortmund (6), Düsseldorf (12), Duisburg (8), Essen (6), Bonn (4), Frankfurt am Main (7), Mainz (7), Stuttgart (30), Augsburg (5), Nürnberg (5), München (6), Regensburg (5), Würzburg (5).

Major results and lessons learned

The usage of CNG vehicles results in reductions of about 1.6 t nitrogen oxides and approx. 150 kg PM per year, furthermore significant noise reductions compared to diesel vehicles are observed.
Because of low operational performance (approx. 10 000 km p.a.) and the small number of vehicles, only about 40 % of the extra costs can by compensated by fuel costs savings and user benefits.
Increased weight (5.2 t for CNG vehicles compared with 3.4 t for diesel vehicles) caused by heavy steel gas tanks result in a challenge for the organisation of operation. Vehicles with this weight demand a driver's licence C1 or class 3 and a digital tachograph in addition. Therefore the availability of drivers is limited.

Conclusions

With the implementation of the CNG-driven parcel delivery vehicles in Germany the emissions were reduced in the delivery districts compared with the EURO-III diesel vehicles. Due to higher initial costs and low mileage in parcel delivery operation of CNG vehicles requires additional economic benefits for CNG vehicles to be granted by the cities.

Evaluation

Companies require incentives to switch to cleaner fuels. In this case all negative impacts of a transition to CNG have been experienced but all of them seem to be solvable for a big logistics player with good links into administration.

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within the ALTERMOTIVE project

No. 72

CNG buses in Szeged, Hungary

The operator of the public transport fleet of the city of Szeged operates 41 CNG buses. The procurement of CNG buses started in 1996. The last of the vehicles has been purchased in 2006.

Background

Tisza Volán is a major Hungarian public transport operator that has been offering its services for more than 50 years. It also has ISO 9001 and ISO 14001 certification.
The public bus fleet of Szeged comprises 41 CNG buses in total. Annual mileage per bus varies between 60´000 and 80´000 km. They operate in an urban environment serving as a public transport fleet. Procurement of CNG buses started in 1996 and was continued until 2006.
The buses:

- Bus type: Mercedes Citaro O 530 G
- No. of passengers: 146. 39 seats
- Limit speed: 70 km/h
- Fuel tank capacity: 1330 l CNG at 200 bar

Major targets

The main reasons for using CNG back in 1996 were economic. The prices of natural gas were much lower making CNG a cheap alternative. Despite increases in the prices of natural gas the company decided to keep using CNG buses. Low exhaust gas emissions were of high relevance in this decision process.

Major results and lessons learned

Szeged is situated in the Southern Great Plain of Hungary with even topography. Under this operational conditions the buses have a maximum cruising range of 350 km and an average fuel consumption of 0.76 cubic meters CNG per kilometre (respectively 0.63 kg of CNG per kilometre). The CNG buses have proven to be a reliable and low-emission alternative to diesel buses.
For the usage of the CNG buses in Szeged no restrictions are reported.
The operator of the public transport fleet of the city of Szeged will continue to use CNG buses and additionally is looking to explore the possibilities of bioethanol.

More Information

In Hungary there are no tax exemptions for CNG fuels in place as well as no grants connected with the operation of CNG buses.

Evaluation

One of the few cases where economy for the fleet operator was positive without grants or tax deductions when switching to CNG. Eager to explore other alternative fuels too.

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within the ALTERMOTIVE project

No. 73

Gruppo Torinese Trasporti (GTT) uses electric minibus in Turin (Italy)

The Public transport company of Turin GTT (Gruppo Torinese Trasporti) has adopted a sustainable transport policy and uses now 23 electric buses with inductive charging for inner city transport.

Background

The Gruppo Torinese Trasporti S.p.A is a private company of the Turin City. Its activities focus on local public transport and mobility. In 2005 the group:

- transported 640,000 customers per day;
- employed 5,500 (among them 2,900 are drivers),
- has had 403 millions Euro of turnover.

The GTT bus fleet comprises 1,180 buses. They cover urban and extra urban areas with bus and tram lines. There are approximately 640,000 customers per day, with 56 million of kilometers run every year.

Major targets

The GTT mission is to be leader in mobility sector, which it has achieved due to the competitive services, quality and costs. The environmental policy aims to work in environment respect, according to a more sustainable development of Turin area. In this context, GTT has chosen the sustainable mobility according to the environmental policy and for air quality of the City of Torino.

Description of the Measure

In addition to 223 CNG buses, the company has introduced 23 electric buses which run in the city center path.
The electric buses are 7.48 meters long, have 37 passenger places, 15 seated and 22 standing. The bus can reach the maximum velocity of 70 km/h, and the drivability is as comfortable as the traditional bus, but with less noise. The bus energy consumption is 95 kWh/100km.

Inductive Power Transfer (IPT)
In the center of Turin 2 bus lines are operated now (2010) on IPT. On the 2 lines there are 23 busses in action at the moment. Each line has a length of approximately 7km and the buses are recharged at the terminal stops with an inductive fast charging process. It takes only 7 minutes to recharge to a capacity of 80% (at the depot at the end of the day charging adds the rest to 100%, achieving 200V battery voltage).

Further Technical Details:
Energy Consumption: 1.25kW/km
Lead acid gel batteries: exchange every 4.5 years
10% energy regeneration (braking energy)

Life Cycle Costs
Purchasing an IPT-bus results in cost that are almost double compared to a normal diesel bus, with about 420,000•, plus a charging station (70,000•) and a charging rectifier (10,000•).
Positive aspects apart from the zero emission operation are 20% reduced expenses for maintenance and a 20% longer lifespan of the vehicles.
In total, the lifecycle costs should be almost the same, but with the additional positive environmental effect.

More Information

For more information about this project, please visit www.comune.torino.it

Evaluation

Shows the state of the art in a methane friendly country allowing an easy transit to CNG, big hurdles being absent. Inner-city transport is done successfully using electric vehicles, inductive fast charging allowing efficient operation logistics without lengthy still stand or expensive battery exchange.

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within the ALTERMOTIVE project

No. 74

Logistic food distribution utilising CNG vehicles in Torino (Italy)

The case describes the implementation of 29 CNG vans in a food distribution fleet consisting of 79 vehicles in total. The fleet delivers mainly to collective restaurants in the centre of Turin (Italy). Shift towards CNG vehicles was mainly driven by awareness of the company concerning environmental impact related to its activities and by user benefits due to unrestricted access to the city centres of Torino for CNG vehicles.

Background

Sotral S.p.a. is a company specialized in the distributive logistic services of foods for collective restaurants. The company, aware of the environmental impact related to its activities, has implemented many CNG vehicles in its fleet.
The company has chosen to follow sustainable development as a competitive challenge for its activities, realising synergies among economic, social and environmental components. The company acquired some certifications (ISO 9001 from 1998, ISO 14001 from 2002, Environmental Product Declaration EDP from 2003 and SA 8000 from 2005). Sotral S.p.A. has 18 employees, and the transport services are left to 230 skilled drivers.

Major targets

Sotral S.p.a. aimed at reducing the environmental impact related to its catering activities. It was decided to implement a sustainable policy to reduce its environmental impact in the transport fields like in other fields too. In fact, the company has implemented CNG vehicles in it´s fleet for the delivery of meals from production centres to destination places, mainly located in the city centre.
Today the company fleet consists of 79 vehicles in total and includes 29 CNG vans. Each year about 10,000,000 kg of foods are transported. All vehicles of the fleet together run about 4,000,000 km annually in total.

Major results and lessons learned

The company is very satisfied with the CNG vehicles, from environmental and economical to the technical point of view. In fact, the CNG vehicles compared to diesel ones show big advantages like:

-CNG refuelling costs are lower than those for diesel (comparison based on the following prices: diesel 1.178 Euro/l; CNG 0.815 Euro/m^3; no subsidies for vehicles in companies),
-the access to city centres without any limitation, public contract allocation advantages for a company with alternative fuel propelled vehicles,
-maintenance activities are not much different from traditional vans,
-low costs for CNG specific tank examinations (approx. 200 EUR every 4 to 8 years),
-high availability of authorized garages for CNG specific checking.

In opposition of this there are some disadvantages:
-There is a lower engine durability given (about 140,000 kms),
-Lower weight capacity (due to the volume and weight of the gas storage cylinders),
-and lower perceived performance of the engine. According to the fleet manager the performance is not important when running in city centres.

Evaluation

CNG proved again to be the first option **if** the fuel price is consistent with the environmental performances (kept lower price to conventional alternative) and **if** access to city centres limited to low emission vehicles.

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within the ALTERMOTIVE project

No. 75

Electrical utility vehicle in the city of Celje (Slovenia)

Javne naprave d.o.o. is a company that collects the waste in 12 municipalities in the region of Celje. Their main mission is economic handling with waste and taking care of the environment. They therefore decided to buy a utility vehicle with electrical propulsion.

Background

The company Javne naprave d.o.o. was established in 1996. They are mainly dealing with the establishment of a regional centre for waste handling. This centre will guarantee a modern waste management for the next 30 to 40 years. The company is informing the members of their community about separate waste collection. Their endeavour is to include all the citizens in as many environmental projects as possible.

Major targets

One of the reasons the company decided to introduce the electrical vehicle is that those vehicles are quieter, which is especially convenient for cleaning the pedestrian walks and for cleaning the streets during the night. As one and only restriction of the electrical utility vehicle they see its limited time of operation. One battery lasts for one 8 hour shift and it would be a good idea to buy an extra pack of batteries for such cases since they have to connect the vehicle to electrical supply after 8 hours or 40 kilometres.

Major results and lessons learned

Within their fleet which is composed of 36 vehicles they have one vehicle that is utilised for waste collection from asphalt areas as well as from shrubs. Since they work in shifts, one vehicle is all they need so far. They can use it for 40 kilometres without charging the batteries which is sufficient exactly for one 8 hour shift.
If the vehicle stops somewhere and is left switched on, it does not pollute the environment as it would when using the intenal combustion engines for propulsion.
Another thing is that the cost of this vehicle was around 20,000•, but the charging of its batteries is much cheaper than the fuel costs an internal combustion engine would cause. In spite of the high initial investment the operator still recommends vehicles with electrical propulsion to everyone

Evaluation

Given the actual offer of battery electric utility vehicles on the market, the project was outstanding even if the vehicles were few.

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No. 76

Augsburg an exemplary city for gas powered vehicles

Augsburg's municipal utility (Stadtwerke Augsburg) is aiming to improve its profitability and its public image, whereas ecologic issues play an important role.

Background

During the past years, substantial efforts have been taken on to improve Augsburg's local public transport. Environmental friendly trams and natural gas powered buses have replaced most diesel powered buses (the remaining ones are now powered by biodiesel) and most stopping places are barrier-free to disabled people.

Major targets

In 1995, when Stadtwerke Augsburg was still owned and operated by the City of Augsburg, the city council of Augsburg decided to take the necessary steps for fuelling the bus fleet with natural gas.
The act of purchasing natural gas powered buses is associated to Augsburg's new image as the Bavarian environmental competence centre. Augsburg was a showcase during the project "Exemplary use of gas-powered commercial vehicles". The project aimed on establishing as much as possible gas-powered vehicles in certain cities and municipalities associated to an environmentally sound traffic plan and, thus, on getting good publicity.

To ensure that the natural gas-powered buses can be fuelled as fast as the diesel-powered buses (within 4 minutes), a high-capacity natural gas fueling station for fast fuelling had to be built. Most vehicles are fuelled in the evenings, sometimes several ones at the same time. The compressor capacity of the station has been enhanced several times since 1995 and amounts to 3000m&#322 /h ^= 2200kg/h ^= 10-15buses/hour. This fuelling station is also open to externals (private vehicles and light-duty vehicles).
Another independent compressor station with a capacity of 1500m&#322 /h will be built this year (2007) on the territory of the omnibus depot.
Additionally, fuelling points will be established in the work and bus floor.
Stadtwerke Augsburg Energie-GmbH operates two other natural gas fuelling stations located in the municipal area open to private customers.

The city council also decided to purchase only natural gas-powered vehicles in the case of necessary replacements of buses or other vehicles of the fleet.

Major results and lessons learned

The first generation of the utilized natural gas-powered buses showed low motor power. They also had to be repaired more often then the replaced diesel buses, only due to the new technology, as there occured problems with the fuel supply system,
the starter or the generation of heat. The next generations showed more motor power and are technically as reliable as the diesel powered vehicles.
Natural gas-powered buses are used on all bus routes, there are no restrictions, e.g., regarding their height.
The fuelling time: 3 minutes for diesel and 4 to 5 minutes for natural gas powered buses.
To sum up, the experiences with the natural gas technology have been positive.

The aim is to convert the whole bus fleet to natural gas powered vehicles until 2008 and the other vehicles of the municipal utility until 2010.

More Information

Further information on the environment-declaration you will find here: www.stawa.de (only available in German).

Evaluation

An early example switching to CNG, enumerating all technical problems fleets had to overcome at that time.

Posted: 04/2010

No. 77

Alternative Fuel Usage in the Municipal Transport Company (EMT) of Valencia S.A.U.

The MUNICIPAL TRANSPORT COMPANY OF VALENCIA is committed to accept the environmental legislation and regulations that affect to its activity and geographic location. In addition, it will continue making an effort to reduce, to avoid or to suppress the diverse types of present contamination, based on

Background

In big cities like Valencia daily a big amount of cooking oil accurs, remaining partly unused and causing several problems.
Cooking oil is a waste material that can be used in different ways, but collection schemes and recovery options are not sufficiently developed in most regions. Former recycling of cooking oil mainly comprised the usage for animal feed, but is banned due to recent legislative developments. Since cooking oil can be recycled into environmentally friendly fuels this option was followed up in Valencia.

Major targets

The activities in Valencia mainly comprised three steps, setting up an adequate collection system for waste vegetable oil, conditioning and transformation of the collected oil to biodiesel (FAME), test and usage of the produced alternative fuel in urban city buses.

The collection system

The project established a collection system in Valencia. Tree points were established in Valencia to collect domestic waste oils (on average around 100 litres/month were collected). In commercial establishments different sizes of containers are used (from 20 to 60 litres). By the end of the project 800 establishments were involved and about 800,000 litres of used cooking oil had been collected. The system of collecting used vegetable oil from the catering and restaurant trade and the food services industry by areas, covering the entire city of Valencia.

Production of biodiesel

The oil collected are then processed and undergo a chemical treatment at a transformation plant for the purpose of producing biodieself fuel. The process chain includes storage, transport to an external plant, conditioning (cleaning, filtering etc.) and transformation (transesterification).
During the project 322,654 litres of eco-diesel were produced and used in the urban bus fleet of Valencia.

Urban bus fleet uses biodiesel

The fleet of the Municipal Transport Company of Valencia comprises in total 480 vehicles. From March to July 2004 15 to 120 buses and from August until October 2004 264 buses (55% of EMT's fleet) were involved in the project. A diesel/biodiesel mixture with a percentage mainly between 5% (B5) and 30% (B30) biodiesel was used. A amount of 1,778,140 litres eco-diesel/diesel mix have been used and the buses covered 3,228,783 km on this fuel in total.

Major results and lessons learned

Experience concerning cooking oil-based fuel

Reduction of air pollutants:

- CO: minus 15%
- CO2: B30 minus 8%, B70 minus 13%
- NOx: no significant changes
- THC (unburned Hydrocarbons): B30 minus 20%, B70 minus 56%
- Particles (Opacity) B30 minus 22%, B70 minus 56%

More Information

More Information concerning the project is available at:
http://www.ecobus.net/index_e.html
http://ec.europa.eu/environment/life/project/Projects/index.cfm

Evaluation

One of the early attempts introducing biodiesel in public transport.

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No. 78

An E85 bioethanol cluster in Somerset County, United Kingdom

Somerset County in South West England is developing as the leading UK region in the E85 bio-ethanol market. The partners involved include: Morrisons, a supermarket chain, Green Spirit Fuels, Ford, Somerset County Council who have worked to promote bio-ethanol since 2004; and Avon & Somerset constabulary.

Background

Morrisons, the UK's fourth largest supermarket chain, has 13 E85 pumps in England, most of which are in East and SW England. The supermarket chain has pledged to open one new E85 fuel pump at every new store they open. Morrisons was the 2006 winner of the *Greenfleet Awards* alternative fuel supplier of the year. *Green Spirit Fuels* was founded by grain trader Wessex Grain to produce bio-ethanol. It is constructing the country's first production plant in Somerset. Another plant in the North-West is also set to come on-line in 2008.

There are 4 fleets involved in the study. Forty flexi-fuel vehicles were delivered in March 2006: 15 to Somerset Police , 10 to Somerset County Council, 10 to Wessex Water and 5 to Wessex Grain. And in September 2006 Ford delivered a flexifuel vehicle to the Environment Agency's Bridgewater office. All organisations use their cars in the local Somerset area where five filling stations sell bio-ethanol.

Major targets

Results have been achieved in Somerset because of the combined efforts of the various parties. This has both been coincidence and design. One contributory factor was the European-funded project, bio-ethanol for Sustainable Transport (BEST), to which several of the organisations described were partners. The project was coordinated by Somerset County Council. EU financial support was given through

BEST and project partners also provided some funding. The work and investments within BEST gaining European support is estimated to be 18 million Euros.

The project is an essential partnership for the County Council in their efforts to tackle the affects of climate change for Somerset residents.

The South West Region, including Somerset also has a target to cut CO_2 emissions by 20 percent by 2010 and the Council hopes that the FFV, along with its nationally recognised excellence in waste and sustainable development, will help the County Council contribute to the region's effort to meet this target.

Major results and lessons learned

The E85 bio-ethanol market in the UK is currently very limited. The UK government currently allows a fuel duty rebate of 20 pence (about 0.30 Euros) per litre on bioethanol and a GBP 10 (about 15 Euro) reduction in Vehicle Excise Duty (VED) for environmentally friendly cars like E85 vehicles. But flexi-fuel vehicles require about 25% more fuel per kilometre to run on bio-ethanol and there were no further subsidies.

The CO_2 emissions performance is good. Independent analysis of total CO_2 released by a Ford Focus FFV by Imperial College, London, put the car's emissions at under 100 grammes per kilometre, while Ford's 1.8-litre emits 169g CO_2/km when running on petrol.

The experience with the vehicles has been good so far, with no problems reported with any of the vehicles.

Evaluation

Not surprisingly reporting no problems using flexible fuel vehicles- since this is common in Brazil. (Sadly only few policy lessons to be deducted)

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within the ALTERMOTIVE project

No. 79

Green gas in Gothenburg (Sweden)

The natural gas used as vehicle fuel in Gothenburg is blended with renewable biogas. This has led to the concept "Green gas ", which by the city's definition means that even though the renewable biogas is blended with natural gas customers may choose if they want 100% green gas. If so, the customers pay a small additional charge, like a green gas certificate, leading to that fuel station owners are obligated to supply at least the amount of renewable biogas as certificate sold. Now the amount of renewable fuels increases each year, currently by upgraded biogas from anaerobic digestion of biological municipal waste, e.g., sewage sludge but in a near-term future also from biomethane from gasification of solid biomass.

Background

The City of Gothenburg is a pioneer in operating buses and taxis on gas. In the mid eighties Gothenburg installed a natural gas grid and a few years later started to operate the city bus fleet and the municipal fleet on this. Through ambitious campaigns, information and incentives like free parking and a priority taxi line, also taxis and some private companies have changed to gas vehicles. In parallel a regional collaborative project, Biogas Väst, was established with the overall aim of stimulating market development within biogas production, distribution and the development of the gas-powered vehicle market. In the project some 30 organizations, municipal authorities and companies are involved. In spring 2007, Göteborg Energy opened the world's largest biogas upgrading facility, the Gasendal plant in Gothenburg. The plant receives biogas from Gryaab, a local wastewater treatment plant, and upgrades it to natural gas quality, with a capacity of around 60 GWh/yr.

The green gas concept contains upgraded biogas blended with natural gas to be used as feedstock, combined heat and power production and vehicle fuel. In future there will also be a contribution of biomethane from thermal gasification of solid wood. A commercial scale (100 MW) is planned to be built in two steps where the first gasifier (20 MW) is planned to be built 2012.

Major targets

The initial target for the green gas concept was to enable biogas to be offered at all connected filling stations for vehicles. The targets are now moving towards working for an increased production and use of biogas, focusing on the production of synthetic natural gas (biomethane) via gasification of solid biomass.

Gothenburg Biomass Gasification Project, GoBiGas, is the name of the large biomethane investment. The project is run by two energy utility companies Göteborg Energi and E.ON. GoBiGas was granted financial aid at 222 million SEK in September from the Swedish Energy Agency, as one of three selected projects, provided acceptance from the European Commission. In the choice of technology and plant design the project aims to get as high efficiency as possible. The goal is to reach 65 percent of the biomass into biomethane, and by using surplus heat for district heating the overall energy efficiency will be over 90 percent. The gasification plant is scheduled to be built in two stages, the first stage (about 20 MWgas) to be operational in late 2012. The second stage (about 80 MWgas) is scheduled to be put into service 2016.

Targets for the Gothenburg region are that 80 gas fuel stations should be established by 2012, that 20 000 vehicles operating on gas and that the production and use of biogas should be 300 GWh/yr. If meeting these targets the CO2 reduction will be reduced by 88 000 ton/yr.

Major results and lessons learned

In Sweden, political decisions and incentives as well as national goals have been significant for the development of the biogas field. They have all raised awareness and increased the public's understanding of the environmental benefits of gas.
The main buyers of "Green gas certificates" were shown to be public transport and municipal fleets. Also some environmentally concerned companies and private citizens while very few taxis did.

However, soon more "green gas" was sold than could be supplied, leading to that an upgrading facility was built to increase the available amount of biogas with sufficiently high methane content. Further, since the biogas produced from municipal waste is a limited resource, Gothenburg is now planning for the production of biomethane from solid wood.

Major results, within the Swedish biogas use, are that in 2009 more than 23 000 vehicles were operating on gas and there were 104 biogas filling stations in Sweden.

Lessons learned regarding costs are that the investment costs for production and distribution of biogas are relatively high. A fuel station for biogas costs approximately 300,000 € and CNG/biogas vehicles were 10 -15 % more expensive than conventional vehicles. However, total costs for biogas operated fleets depend to a large extend on the national fuel taxes. Biogas can be very competitive compared to gasoline and diesel if it is exempted from fuel taxes.

Other lessons learned are that different stakeholders, such as public authorities (city) and private companies (fuel producer/fuel distributor), should be involved during the implementation phase. A strong political support was also essential in the starting phase.

More Information

Slides presenting the concept of "green gas Gothenburg"
GoBiGas
Biogas Väst

Evaluation

Good example for the attempt greening CNG amid the conclusion that this is only a small step accounting for the huge amount of energy used in transport.

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No. 80

Biogas as fuel for transport in Linköping (Sweden)

Biogas (biomethane) made from wastewater or solid biological material is a very clean commercially available vehicle fuel. There are almost no hazardous emissions at all and very little greenhouse gas emissions. Using biogas is a way to reduce the vehicle emissions and simultaneously reducing municipal waste problem. Biogas is especially well suited for city fleets as it is normally available in all cities from the water treatment plants. Svensk Biogas AB in Linköping is a successful example of the biogas concept having 13 filling stations and 7 more to be opened. In addition to the public transport company's 67 buses one train and more than 500 cars are fueled by biogas in Linköping.

Background

The initial impulse for the use of biogas for transport was the local air quality problem at one of the bus nodes in Linköping. After rejecting trams as being too expensive, the city decided for a gaseous solution. The public energy and waste company Tekniska Verken came up with the idea to utilise biogas produced from municipal waste water. As pioneers in biogas driving, the city decided to initiate a pilot project including 5 buses that were operated and evaluated during a couple of years.
This pilot project also lead to that a separate biogas production plant was built in order to control the input and thus increase the output rate. In the mid 90's a new company "Linköpings Biogas" was founded, which name later was changed to "Svensk Biogas". The company included Tekniska Verken as producer and the Farmer's organisation and a butchery company as supplier of feedstock. The aim was to produce biogas to operate the municipal buses. Svensk biogas AB is both the biogas producer in Linköping and the company who is in charge of the public filling stations. A production plant was ready in 1996 and, the first public filling station opened in 2001, mainly to operate Tekniska Verken's company cars, the municipal bus fleet and a few taxis. The production and use of biogas is continuously increased every year.

Major targets

The major target, for an increased production and use of biogas, is to spread the biogas concept to other cities. Main target groups are (1) public transport authorities, e.g., bus fleets (2) local or regional authority fleets, (3) other large captive fleet owners that use a depot, for example waste trucks and the postal services, and (4) private companies when there is an available infrastructure. Biogas is especially well suitable for city fleets as biogas is normally available in all cities, from the water treatment plants. Starting by introducing a biogas bus fleets has the advantage that bus fleets often are large and can be fuelled over night at one single depot. Svensk Biogas will continue to open up new plants in neighbouring cities. Their ambition is to substitute almost 50 % of the oil used in transport in the region. Svensk biogas is also continuously working with measures to improve their biogas production.

Major results and lessons learned

Major results within the biogas production is that the output rate of biogas production has more than doubled from 72 m3/ton feedstock to 155 m3/ton since the 90's and further improvements are expected. An increasing part of the feedstock is crops grown on set-aside land, according to the rules within the Common Agriculture Policy.

Major results within the biogas use is that there are now 13 filling stations, 67 buses and more than 500 cars that operate on biogas in Linköping. Since 2006 the world's first biogas driven train, has also been running between Västervik and Linköping.

Lessons learned regarding costs are that the investment costs for production and distribution of biogas are relatively high. The cost for distribution is, however, considerably lower if the biogas can be introduced in an existing natural gas grid. Low operational costs and cheap raw material means that the payback time, in Sweden, is about 10-15 years.
If biogas already is produced, but flared away, investments are reduced to upgrading the biogas and setting up fuel stations. A fuel station for biogas costs approximately 300,000 €. The investment costs for fuel stations can be reduced if the biogas is used by a captive fleet kept at a depot, and all the vehicles can be fuelled at one fuel station. CNG/biogas vehicles are 10 -15 % more expensive than conventional vehicles. Total costs for biogas operated fleets depend to a large extend on the national fuel taxes. Biogas can be very competitive compared to gasoline and diesel if it is exempted from fuel taxes.

Other lessons learned are that different stakeholders, such as public authorities (city) and private companies (fuel producer/fuel distributor), should be involved during the implementation phase. Including feedstock providers as partners in the biogas production company was beneficial during the starting phase in Linköping. A strong political support was also essential in the starting phase to be able to invest in a technology that was very little known at that time. For example Linköping city included biogas vehicles as a part of the public procurement for transport services.

One undesirable secondary effect has showed to be that when the demand for biogas exceeds the production capacity, leading to a lack of biogas at the fuel stations, it reduces the confidence and acceptance for the biogas concept.

More Information

NICHES is a Coordination Action funded by the European Commission under the Sixth Framework Programme for R&D, Priority 6.2 Sustainable Surface Transport. Read more about the NICHES project at their website: www.niches-transport.org especially their folder "Biogas in Captive Fleets" which can be downloaded here.
Read more about Linköping biogas concept at Svensk Biogas AB. Folder, "Biogas for a sustainable future".

Evaluation

Interesting case including rail transport as consumer of bio-methane, which otherwise is used with public transport buses. Is a forerunner in promoting bio-methane tackling and solving the weak performance of natural gas in terms of reduction of CO2 emissions.

Posted: 04/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 81

ECTOS - hydrogen buses in Reykjavik, Iceland

ECTOS was a European funded hydrogen bus and infrastructure project. The goal was to test 3 fuel cell buses in commercial service in Reykjavik, Iceland. An on-site hydrogen production refuelling station was opened in Reykjavik in mid of 2003 to dispense hydrogen to a fleet of 3 DaimlerChrysler fuel cell Citaros. The project was very successful and the original time frame of two years in operation was extended to become 3 years as the ECTOS team became partner in the follow up project of CUTE - the so-called HyFLEET:CUTE. The buses have now been for 3 years in commercial service but the operation will stop in January 2007. The goal in Iceland is to follow up this project by introducing hydrogen passenger vehicles following the closing of the bus operation.

Background

Icelandic New Energy Ltd is a public private partnership which is jointly owned by all key players in Iceland (regarding energy and hydrogen) and DaimlerChrysler, Norsk Hydro and Shell Hydrogen. The goal of the company is to create a hydrogen economy in the future in Iceland.
The Government of Iceland has set forward a very strong energy policy which aims to increase the use of renewable energy as much as possible.
Iceland is in the unique situation to have an abundant source of renewable energy both hydro and geothermal. The governments goal is to use that resources to replace fossil fuels. Currently 72% of all energy usage in Iceland is based on renewable energy, and if hydrogen or electricity can be used instead of fossil fuels in Iceland, the country can become self sufficient with energy all based on renewable sources.

Major targets

In the project there have been 3 fuel cell hydrogen buses in commercial service for 3 years. They have been operated in the capital of Iceland, Reykjavik, in very normal service, both during winter and summer.

The governments policy has been closely followed by foreign companies and a public-private partnership was formed to execute the governments policy regarding establishing a hydrogen society in the near future, i.e. Icelandic New Energy Ltd.

Major results and lessons learned

The experience in general has been extremely positive. The up-time of the buses was far higher that the project team expected and the refuelling was more or less as expected. Of course the project went through technical difficulties specifically with some components of the filling station, the lessons of the project were extremely valuable. The users of the vehicles were also very pleased with the operation. The refuelling time was for example just around 8-10 minutes which is similar to the refuelling time of diesel buses. The cost of the hydrogen technology is still to high as the technology is still going through development, but all partners in the project are eager to continue with using hydrogen instead of fossil fuels when the technology will become more readily available.

More Information

All details can be found at www.ectos.is

Evaluation

Utilising grants to showcase zero emission mobility. Unfortunately hydrogen usage is not sustainable in most circumstances and lacks cost effectiveness.

Posted: 04/2010

No. 82

Electric vehicles in the Municipality of Reggio Emilia, Italy

***Econoleggio* is an innovative project offering zero emission vehicles to business and citizens. It has been launched in 2001 in Reggio Emilia with electric vans promoting the sustainable transport cars through several initiatives. There are 250 electric vehicles in operation in total in the projects.**

Background and objectives

Launched in 2001 by T.I.L. (Integrated Transports and Logistics), a subsidiary company of the Reggio Emilia Local Mobility Agency, the *Econoleggio* project makes the experience, the technical expertise and the reliability gained in 10 years of experimentations and initiatives in the field of E-mobility available to all (public authorities, businesses and citizens of Reggio Emilia). This action awarded Reggio Emilia the title "first electric city in Europe" .
The idea on which the project was based was to convert the public authorities and companies to the usage of electric vehicles.
The main objectives of the project are:

- to promote and diffuse the usage of electrically powered vehicles;
- to provide a rental scheme of electric cars assuring the efficiency of the vehicles and allowing to overcome all the preconceptions linked to the EVs use (actual functioning of the vehicle, high purchasing costs, guarantee on after sale services);
- to follow the regulations of the decree of the Italian minister of environment : by 2003, 50% reduction of the environmental impact of public car fleets;
- to exploit the national incentives for the purchasing of the electric vehicles in order to create an affordable eco-rental service;
- to create a local sustainable mobility system involving public companies, public authorities, businesses and privates.

Implementation

The first two phases of the *Econoleggio* project focussed on replacing internal combustion engines of public fleets. In a first step in January 2001, 46 vehicles (Euro 0-1, traditional thermal engines) of the Council Pharmacies™ fleet have been replaced by 46 electric cars (Piaggio Porter). Those vehicles, owned by TIL which rent out them with an yearly contract, are still used to provide home assistance for the elderly and the disabled.

In a next step in June 2001 further 76 Piaggio Porters have been rented out by TIL to replace 139 combustion engine vehicles which are part of the Reggio Emilia Council fleet.

Major results and lessons learned

Currently, within the *Econoleggio* initiatives, more than 250 electric cars have been rented out by TIL in the territory of the province of Reggio Emilia, leading to a considerable reduction of pollution and noise levels. Data from 31st December 2009 shows that since the introduction in 2001 8,665,036 km have been travelled with electric vehicles (this corresponds to an average annual mileage of 4,500 km per vehicle). This resulted in a decrease of CO_2 emissions equivalent to 866,504 kg and a fuel-saving of 722,086 litres. The success has lead to a third phase of the project (December 2003) where a new initiative has been introduced to gain first experiences in city freight transport and the operation of a public rental system.

More Information

More information can be found on the website of TIL
TIL website Econoleggio

Evaluation

Wonderful example where local initiative compensates for the willingness of the big vehicle manufacturers to develop commercial zero emission vehicles. Also introduces sharing schemes for commercial vehicles reducing investment risks for the users.

Posted: 04/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 83

City of Trento (Italy) - public electrical car fleet

Since end of June 2006 the City of Trento (Italy) and the traffic company *Trentino Mobilitr* provide ten new electrical cars to the public. This innovative fleet is free of charge and follows the idea of a clean urban transport system with zero emissions, low noise exposure and less intrusiveness. Those vehicles are thus optimally adapted for historical and therefore fragile city centres.

Background

The local police releases every day from 10 to 15 permissions to the access of the historical and traffic limited city centre of Trento. This means, that every year about 3,200 new authorizations are decreed. Main objective of the so called Eco Mobiles is to offer an alternative, clean and not contaminating individual mobility service for the city centre. This service is targeting especially citizens who have to carry heavy luggage or parcels across this area or would like to accompany elderly or disable persons. Furthermore, the city administration would like to point out that measures against the problematic traffic situation in the historical centre are undertaken and alternatives to the individual car are possible.

Major targets

The city administration of Trento provides ten new electrical cars that are free of charge. The vehicles can be used by everyone holding a driving license: from the pregnant women to the retailer or everybody else that has to carry heavy objects. The cars are parked in a central city garage. To drive the cars through the city centre, users do not need a special permission from the police. For the way back, the electrical cars can also be used to drive to the hole urban area of Trento. Just registered once, everybody can use the clean transport vehicles. Precondition is to book (reserve) a car at least one hour before by calling a free telephone number.

Two types of electrical cars are provided by the city administration: One is equipped with 4 seats and a small trunk (loading area), the other with two seats and a larger loading area. So, depending on the different needs, appropriate models for the customers use are available. In all, six cars with four seats and four cars with two seats are available.
The maximum speed of the cars is about 40 km/h and the power supply lasts for 50 kilometres (4-seat-model) respectively 70 kilometres (2-seat-model). Charging the batteries completely takes about eight hours.

Major results and lessons learned

The cost amount to 15,900 Euro for the four-seat model and to 14,000 Euro for the two-seat model. The UniCredit Bank, sponsored a part of the cars, contributing 168,000 Euro for the acquisition. Furthermore, the bank make available the complete network of branch banks to promote the service and for booking the cars.

Evaluation

Successful example where a public private partnership created a public car scheme allowing use of battery electric vehicles for everyone. Proved that efficient neighbourhood vehicles are optimally adapted to historic city centres.

Posted: 04/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 84

Electric boat on the lake of Bourget

In a very touristic area, on the greatest French lake in the Alps, a private company decided to offer boat trips with a high quality of comfort (less noise and odours) and a better protection of the environment.
Tourists using this electric boat are very positive about its advantages, even if they do not choose this boat for environmental reasons.

The overall cost of the boat compared with a classical one is about 80 000 •.
A part of this cost is due to the specific conception of the boat. Subsidies from the Region and EDF represented about 15 000 •.
The cost of electricity is about 2 500 •/year, to be compared to a cost of 7 000 •/year with diesel.

Background and Objectives

In a very touristic area, on the greatest French lake in the Alps, a private company decided to offer boat trips with a high quality of comfort (less noise and odours) and a better protection to the environment.

The boat capacity is 60 places (corresponding to the number of people coming in a coach). Its maximum speed is 11 km/h.
It has been specifically built by Debord, a French boat builder.
The boat is used every day between May and October.
The main objective was to diminish the local pollution due to touristic boats, especially for water, in a rich environmental area.
Touristic tours on boats already exist, with a start point on the small river going from the lake to the Rhône.

Implementation

It has the design of a paddle boat, for marketing reasons.
Two 10 kW electric motors are alimented by lead batteries which provide for 7 hours of sailing at a mean speed of 7 km/h. This is enough for the trips for 1 day. A generator has been added for security reasons, but it has never been necessary to use it.
The recharge of batteries is done by night, directly at the loading dock.
The subscription for power supply is a standard low voltage one.

The overall cost of the boat compared with a classical one is about 80 000 •. A part of this cost is due to the specific conception of the boat. Subsidies from the Region and EDF represented about 15 000 •.
Every 7 years, batteries will be renewed, with a cost of 15 000 •.

Conclusions

The electric motorisation induces less water pollution (with oil and lubricants), no local emissions and less noise.
The cost of electricity is about 2 500 • per year, to be compared to a cost of 7 000 • per year with diesel.

No specific problem has been reported.
The captain has been at first surprised by the lack of noise, but only for a short time.
Some small improvements could be done, like a battery charge indicator.
Tourists are not interested a priori by the environmental aspects of the boat. But after the tour, they are all convinced by the benefits of an electrical boat for their comfort (less noise and odours).
The development of electrical boats will need support from local authorities, for the development of tourism.
A change of regulation, by limiting big diesel boats on smaller rivers, could also help to develop electric boats.
A good marketing including, not only media but also the aspect of the boat, is necessary.

More Information

www.chanaz-croisieres.fr

Evaluation

Case profiting from the needs of the tourism business to have an undisturbed environment and the maturity of electric propulsion systems for boating.

Posted: 05/2010
Last update: 06/2010
within the ALTERMOTIVE project

No. 85

B30 (blend of 30% fatty acid methyl esters and 70% Diesel) in the truck fleet of Greater Lyon city administration (France)

One of the biggest French local authorities, the Greater Lyon decided to replace Diesel used by its 170 out of 230 trucks (for waste collection and street cleaning) by B30, which is comprising of 30 % FAME.

Background and Objectives

Because of legal constraints the replacement of Diesel by B30 was possible only because Greater Lyon uses it in their own fleet and they have their own stationary fuel tanks.
2 million litres B30 are used each year, and no problem has been reported for these vehicles which comprise a range of vehicles from Euro II to Euro V emission standards.

The use of B30 (also called Diester in France) is reserved for fleets (either public or private) that have their own fuel logistics (fuel tanks). This implies that the vehicles have allays to come back to the same places, where they can be refuelled.

The main objective of the projects was to reduce local and global pollution.

Implementation

The Greater Lyon owns two tanks in two different places within the agglomeration (80 m^3 and 20 m^3).

The consumption level allowed the delivery of the fuel (a delivery of 25 m^3 is done every week, with complementary deliveries of 25 m^3 every three weeks). This frequent delivery would not have been possible for small quantities.

The UGAP (a public command association of local authorities on national level) tendered for the fuel delivery on behalf of local authorities, including the Greater Lyon.

Conclusions

No modification has been necessary (only a cleaning of the tanks). Truck manufacturers agreed the use of B30 in their vehicles, except one (B30 has been used anyway in their trucks without any problem).

The oil filters have been changed in the beginning of the experiment. With the last generation of trucks, pre-filters for fuel decantation have been installed.

There is a reduction of the CO emission by 12-15 % and of 15-20 % for particles (PM). For greenhouse gases, the CO_2 equivalents are reduced by 20 % avoiding 1,000 tons CO_2 per year.

The environmental objections of the use of B30 are far lower than for ethanol.

The consumption of B30 is quite the same than Diesel (+ 1 %).

A reported side-effect was an decrease of fuel theft in the vehicles.

The cost of B30 per litre is about 2 % higher than diesel. This transfers into costs of about 40 • per ton of CO_2 saved.

It has been important having the tendering done by UGAP, which avoided that the local authority would have been charged with it.

More Information

www.grandlyon.com/Le-Plan-Climat.3139.0.html (in French)

Evaluation

The implementation of B30 has been very positive: it needed only small investments, and there were no changes for the drivers.

Posted: 05/2010
Last update: 01/2011
within the ALTERMOTIVE project

No. 86

Local pure plant oil for trucks in Marmande (France)

The group of cities of val de Garonne around Marmande started to use plant oil (30 % mixed with diesel) in its own vehicles (trucks and vans), in order to support local fuel production and reduce greenhouse gases emission. No modifications of the vehicles have been necessary. It has implemented its fuel supply chain with a tender to choose a producer of plant oil. The objectives of the project were to use a fuel that emits less greenhouse gases.

Background and Objectives

The neighbouring city of Villeneuve sur Lot started to use plant oil in its own vehicles even before it was fully legal. Their experience showed it was possible and led to a change in the regulations, allowing local authorities to use plant oil in their own vehicles.

The objectives of the project were to use a fuel that emits less greenhouse gases, produced locally in order to avoid transportation of the fuel over long distances and to be able to control the environmental effects of production. It was also a way to support local agriculture and it was intended to diminish the fuel costs.

Implementation

In this regard, assistance has been conduced by an external consultant (IFHVP), specialised in the use of pure plant oil.
The use of 100 % plant oil has been studied and it is found that its use would be difficult when the motor has not reached its optimal temperature. So the pure plant oil (30 %) is mixed with diesel (70 %) directly in the tank of the vehicle.
No modification of the motors has been necessary.

6 trucks and 4 vans use this fuel (500 l of PPO by month). A specific tank has been implemented within the technical services building.
The pure plant oil is produced locally, from sunflower seeds, by a farmer. The pressed seeds are used for animal feeding.
A specific convention has been signed between the local authority, the State and the customs, which indicates how control and declarations have to be done.

Conclusions

Technical Results on Vehicles

- no engine broken,
- no power loss,
- less pollution,
- good behaviour of vehicle

Other Results

- Sunflower needs smaller amounts of water and pesticides than corn, usually grown in the region.
- No significant change in consumption has been seen.
- Combustion analysis showed smaller emissions of CO, CO2, NOx.
- Since 2009, the cost of pure plant oil is a little above diesel. Due to a diminution of the excise taxes, the cost of pure plant oil will increase in the next years.
- It has not been difficult to find farmers to produce, but they have some difficulty to cope with consumption variations.
- Some elected people opposed the idea of usage of food products as fuels, and others opposed the higher costs.
- The use of pure plant oil needs a strong will and support from deciders, shared with mechanics and users.
- A technical assistance by experts is very useful.

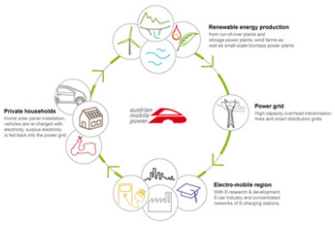
Evaluation

Unique example where the focus lays on the local fuel production. In rural areas emissions are of second importance - durability of engines is to be checked.

Posted: 05/2010
Last update: 01/2011
within the ALTERMOTIVE project

No. 87

Austrian Mobile Power



Within the Austrian Mobile Power platform major Austrian and international companies are joining forces to realize the ambitious goal to have at least 100,000 electric vehicles on the road in Austria by 2020.

Background

Austrian mobile power (AMP) was launched in July 2009 as a joint platform of Magna International, the Siemens AG and Verbund AG, together with KTM, AVL and the Austrian Institute of Technology (AIT). The platform is meanwhile organized as a twelve-member association (Jan. 2010). Newcomers are Wien Energie and Energie Steiermark, as well as REWE, Infineon, The Mobility House and Raiffeisen-Leasing. Further key players, such as Salzburg AG and EVN, are already integrated via projects within the open platform.
A central task of the platform is the integration of model regions for electro mobility in Austria. Five model regions (mobile power regions) were submitted to the Climate and Energy Fund™s corresponding call for tenders. AMP has already concluded letters of intent with all five.

Major targets

The overall target of the platform is to have at least 100,000 electric vehicles on the Austrian streets until 2020, vehicles which are fuelled with energy coming from renewable sources to an 100% extent.
The newly founded company *Austrian Mobile Power GmbH* is responsible for both the management of the platform and the project management, and works in line with the following principles: The declared goal in the development of an overall system is placing user benefits in the foreground. This primarily means that the technology and infrastructure are subject to a uniform - preferably international - standard. The platform is also committed to optimizing the added value for Austria. Consequently, its members are leading Austrian companies with an international background.
AMP is making an important contribution to achieving the platform members™ ambitious goal by investing EUR 50 Mio. for the introduction of "electro mobility" in Austria by 2020.

The funds will be used to promote the market launch of production-ready electric cars, to make an ample charging infrastructure available for electricity generated from renewable energies, as well as developing customer-oriented mobility services. Furthermore the platform will take a leading position in the conception and establishment of a competitive charging strategy, which allows the customers to fuel up their vehicles at home, at the office or on several open spots. To make this possible a complete infrastructure both in logistics and in billing has to be set up. A key to the success of this concept should be the smart grid. According to calculations the smart grid could safe together with charging infrastructure half a million tons of CO_2 and 225 million litres of crude oil through the use of electrically powered cars.

Major results and lessons learned

The project is in the starting phase (7/2010). The pilot phase began in 2010 with a test fleet of 100 E-vehicles in a metropolitan Mobile Power Region. This will see the associated infrastructure being constructed step-by-step, from an intelligent power grid through to electric charging stations and, ultimately, convenient billing systems, for instance, via mobile telephony.

More Information

AMP Web Site
E-Mail: info@austrian-mobile-power.at

Evaluation

Coalition of stakeholders profiting from shifting to electric power. Has to give evidence that this is more than a lobbying group.

Posted: 07/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 88

Electric car demonstrator in Berlin (Germany) showcasing Minis

Since June 2009 the German Berlin capital sees 50 electric MINI's powered by certified CO2 neutral electricity. The e-vehicles were given to 50 test drivers to collect experience with electric mobility and with the necessary infrastructure. In the project's six main partners are joining forces; Vattenfall providing electric power and charging infrastructure, BMW supporting the introduction of electric Minis, the Technical Universities of Berlin, Chemnitz and Ilmenau for scientific support.

Background & Objectives

The hot project phase was started on the 22nd of June 2009 with the delivery of the 50 electric vehicles to the end customer test drivers. The project is realised in the greater area of the city of Berlin.

The project was initially planned and realized by BMW MINI and Vattenfall. Further partners of the projects are the technical universities of Berlin, Chemnitz and Ilmenau. Financial support is coming from public funds of the German Federal Ministry for the Environment, Nature Conversation & Nuclear Safety.

Implementation

The overall project target is to collect experience with electric mobility and the necessary infrastructure. A special focus within this topic is the practical relevance and the user acceptance. BMW is testing the Mini E with a maximal power of 150 kW and with a maximum speed of 152 km/h. As an additional important - and in electric vehicles usual - feature regenerative braking system is implemented to recover up to 20% of used energy under stop'n go conditions.

The range of the vehicle is theoretically supposed to be 250 km which is unparalleled for electric vehicles. The autonomy in practice is 150 up to 200 km.

There are virtually no CO2 emissions when driving the vehicles and during the power production. For achieving a CO2 free demonstrator the production of the energy for the vehicles is entirely done with certified green energy delivered by the energy provider Vattenfall. The used energy is checked and approved with the ok-power quality mark and TÜV quality assured.

The energy provider is especially interested in the correlation of charging of electric vehicles and the fluctuating availability of wind energy. Due to this reason a smart grid management was developed. An additional vision for Vattenfall is the vehicle to grid concept, to be able to receive back energy from the vehicles. As a result of this design both the energy provision and moving of the vehicles may be regarded as CO2 neutral.

Up to 50 charging points for all types of electric vehicles were installed in Berlin. To start the charging procedure a user card is necessary and charging is done with the help of ordinary household plugs or 3 phase CEE plug connections. At the home of the client´s a special charging box is installed. The advantage of the box is that the charging process is steered to the times of low demand and high amount of wind energy. If there is at a time not enough wind energy available other renewable energy sources are used for recharging.

For the first phase 50 users were receiving the Minis for 6 months and after that the vehicles were passed on to 50 other users.

The casting for the 2nd phase of the project has already been started. The target is to get as much different user behaviour experience as possible. The rental price for the customer is EUR 400 per month and includes also a service and insurance package. Also the cheaper operations cost due to lower energy prices compared to other fuels, makes the Mini E competitive against the conventional model.

Conclusions

The main results of the demonstration project:

- The Wind-to-Vehicle-Application works and is welcomed by the users.
- A large scale field study by the Chemnitz University of technology indicates that after 3 month of use for most of the users (>94%) the range is sufficient for everyday needs. More than 66 % rate the flexibility of the EV (charging is necessary) as high as with a conventional car. The test users expect that they can use the EV for 90% of their trips if trunk space (cargo capability) is not limited by battery.
- The long recharge times, compared to refuelling, do not affect the everyday mobility.
- The clients using the charging boxes at home or work need no public charging station.
- The technology of public charging stations is more expensive and prone to errors.
- Charging cars on public roads is, with the existing technology, complicated and expensive.

More Information

More detailed information about the project is available at the web pages of the two main project partners:
Energy provider Vattenfall (in german only)
BMW Mini (in german only)

Evaluation

Important demonstration right sizing the expectations of private vehicle users- underlining the over fulfilment of mobility needs by today's vehicles.

Posted: 07/2010
Last update: 12/2010
within the ALTERMOTIVE project

No. 89

E- Tour Allgäu (Germany)

The project should discover the possibilities of electric mobility for tourism in the region of Allgäu. On the one hand the behaviour of the tourists will be analyzed on the other hand the offer for electric mobility should be also attractive for inhabitants of the region.

Background

The project has started with the opening of the first electric charging station in the beginning of 2010. The area covered is the whole region of Allgäu which is
Members of the projects are the energy services company in Allgäu namely the Allgäuer Überlandwerk GmbH, the university of Munich, Kempten and Tübingen, John Deere, ABT, Soloplan GmbH, MoveAbout GmbH and Energy4You GmbH.
The project is financially supported with the program fiCO2NeuTrAlpfl by the European union . CO2NeuTrAlp is t appreviation of CO2- neutral transport for the alpine space and supports alternative mobility concepts in the Alps region and has 14 partners in Austria, France, Slovenia and Italy. The test fleet will be integrated in the developed virtual energy supply system. The project partners work on scenarios when the EVs should be charged to optimize the use of regenerative energy. On the contrary the vehicles should provide energy back to the grid in times of peak energy.

Major targets

a. with respect to vehicles: The project starts with 50 electric vehicles in use. A major target is to have a practical experience of the vehicles in real time usage and the real usage of the charging points. In addition to the electric cars an electric bus for public transport and pedelecs for the tourism are planned to be used within the project.
b. in terms of energy used: The energy is coming from the product fiAllg&auml:uStrom Kl!ma and is to an extend of 100% energy fro hydro power. The energy is coming from the hydro power plants in Kempten and Lechbruck and is checked by TÜV South and certified according to the EE02 standard.
c. considering emissions: As it is part of the CO2NeuTrAlp one major goal of the project is to reduce or minimize CO2 emissions within the project region.
d. Infrastructure: The first charging point was installed in Kempten. But the topic infrastructure is not ending with the installation of charging stations: Tariff models are developed and even a concept for mobility in general is on the way of realization.
e. target group: The users of the 1st 50 vehicles are selected carefully and consist of companies, public institutions and private person.

Major results and lessons learned

The project is still up and running. The project is supported by the chancellor of the federal state of Bayern, Mr. Seehofer and he is convinced about the future aspects of electric mobility.

More Information

www.ee-tour.de

Evaluation

Exceptional example where the shift towards electric mobility is accompanied by the attempt to introduce renewables in power production.

Posted: 07/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 90

E- Mobility initiative for Italy

The era of electric mobility starts on www.e-mobilityitaly.it. A campaign will officially get underway on this dedicated website on Tuesday November 24th to select the first 100 Italian drivers, making up a significant cross-section of lifestyles and ‚recharging™ habits, who will drive electric vehicles as of next year thanks to the e-mobility Italy project organised by smart and Enel.

Background

The name of the project is e-mobility Italy. The start of the project is the beginning of December 2008 (start of recruitment online campaign from the 24 th of November 2009 to 31 th of December 2009). The project will be rolled out in the cities of Rome, Milan and Pisa. The project is launched by Daimler and Enel. For Daimler it is the 3rd project of this kind after London and Berlin. In Italy, is the first project of electric mobility with, Enel, the biggest Italian energy producing and energy service provider. Daimler is taking care for the fleet of 100 smart electric drive and ENEL will provide the energy and the recharging infrastructure.

Major targets

a. with respect to vehicles: Daimler will deliver the smart fortwo electric drive with an electric engine of 30 kW. Every car will be equipped with lithium ion batteries and has a mileage range of 135km and a maximum speed of 100km/h.
b. in terms of energy used: For the project only energy is used which is produced without emitting CO2. Additionally, for only 25 euros a month, inclusive of VAT and tax, drivers will be able to fifill upfl wi an unlimited amount of ficleanfl electricity at all of Enel™s rechargi facilities both at home as well as in public places, - precisely half of what they would spend on fuel, based on driving an average of 10,000 km per year. This promotional flat rate includes all costs for installing and connecting the smart box in drivers™ garages or at their place of work and the energy supplied will be certified by the RECS, an international certificate system.
c. considering emissions: Driving an electric smart will be a great contribution to the air quality in the cities. According to calculations every smart saves compared to a conventional vehicle about 1.5kg of CO2 for every 10km.
d. infrastructure: In each car will be an fion board unitfl that wi communicate with the infrastructure to recharge. This unit will help to recharge the battery automatically and collect valuable information about the cars themselves.
e. target group: The test persons will be selected by Enel and Mercedes-Benz Italy and currently the number of the testing fleet will be 100 vehicles. Acceptance of application will be subject to careful evaluation of applications by the two companies according to the following main criteria: logistical requirements related to installation techniques of recharging points, residence in Rome, Milan and Pisa.

Major results and lessons learned

The project is still up and running.

More Information

www.e-mobilityitaly.it
www.smart.com
www.enel.it

Evaluation

Industry driven approach to introduce electric mobility.

Posted: 07/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 91

Rotterdam - Project Power Surge (The Netherlands)

Project Power Surge - new impulse for electric vehicles in Rotterdam Creating the right conditions is the objective of the municipal project called Power Surge, a powerful and ambitious project to accelerate the introduction of electric vehicles in the street scape of Rotterdam. This is the City of Rotterdam´s way to boost electric driving.

Background & Objectives

The project started in 2009. The whole city area of Rotterdam will be the field for the project. The project was initiated by the city of Rotterdam. It is part in a huge initiative to reduce CO2 emissions in Rotterdam: Rotterdam Climate Initiative (RCI). The city of Rotterdam is joined in the RCI by the port of Rotterdam, Deltalinqs, which is the association of all the logistical and industrial companies in the Rotterdam port and industrial area and the DCMR Environmental Protection Agency which is the regional environmental agency of the local and regional authorities of the larger Port of Rotterdam. The project is also working together with other Dutch and European cities and national government.

Implementation

Within 5 years 1,000 electric vehicles should drive around Rotterdam. By 2025 the number should have gone up to 200.00 which will be 15% of all electric vehicles in the Netherlands. Some electric vehicles have been already introduced. Street sweepers and scooters of Roteb (department of cleansing and disinfection Rotterdam) is using electrified street sweepers and scooters. Segways are used by the police, electric minibuses and shuttle buses were taking over part of public transport.

The initiative will improve the air quality and reduce also traffic noise. Furthermore the electric transport will contribute significantly to reach Rotterdam´s goal to reduce CO2 emissions by 50% in 2025 compared with 1990. The city of Rotterdam is committed to creating the right conditions to support the introduction of electric vehicles with the installation of charging points.

Examples of possible locations include bike sheds and car parks. By linking the possession of an electric vehicle with the installation of a charging station it is ensured that the points are only installed in places where they are needed.
Target group are all kind of private persons, companies and organizations which are interested in electric transportation. The project explicitly wants to attract additional for the further development of electric transport. Innovative projects are encouraged and supported with direct involvement of the municipal government.

Funding will be provided for the first 1,000 charging points for the benefit of private individuals, organizations and companies who purchase an electric vehicle. And to make electric driving in Rotterdam even more attractive, 1,000 free parking permits for one year are granted to the first customers.

Conclusions

The project is still running. An update will be provided later on.

More Information

Website Rotterdamelektrisch

Evaluation

Integrated project focusing also on the infrastructure and boundary conditions enabling the shift to electric mobility. Outcome unclear.

Posted: 07/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 92

Electric vehicle deployment in the Edison project (Denmark)

In the EDISON project Danish and international competences will be utilised to develop optimal system solutions for EV system integration, including network issues, market solutions, and optimal interaction between different energy technologies.

Background

E.D.I.S.O.N. is an abbreviation for Electric vehicles in a distributed and integrated market using sustainable energy and open networks. In Denmark there is a political decision on supporting wind power and there are expectations that 50% of used electricity will be coming from renewable energy sources in 10-15 years. As a consequence of this decision there is a big challenge for the power grid to ensure a stable energy supply when 50% of the capacity is based on fluctuating sources. Electric Vehicles could be a solution to support the power system by acting as a storage device and EVs also enlarge the use of renewable energy in transportation.
The project was launched in March 2009. The project demonstration site was decided to be Bornholm, because it gives a good opportunity to show the interaction between wind turbines and EVs in an isolated system. After a successful proof of concept test, a large scale demonstration will be installed by the end of 2011.
The project was initiated by Dansk Energi, the Danish Energy Association, which is a commercial and professional organization for Danish energy companies. Further partners are DTU CET (Center for Electric Technology at the Technical University of Denmark), Risø DTU (National Laboratory for Sustainable Energy at the Technical University of Denmark), DTU Transport (the Institute for Transport at the Technical University of Denmark), IBM, Siemens, Dong Energy (one of the leading energy and utility company in the Northen Europe), Ostkraft Produktion (a Danish energy and energy service provider) and Eurisco (Danish R&D company for hardware and software).

Major targets

The overall purpose of the EDISON project is to gather research institutions and major industry enterprises and to cover all stages from research through concept and technology development to demonstration. The project is organized in 7 working packages. Package 1 should provide a knowledge platform for all partners. With the help of package 2 system architecture design for EV systems should be realized. The objective of WP 3 is to develop software for aggregated control/management of a large number of EVs. With the help of WP 4 the technologies for central fast charging stations and battery swapping stations, including control methods for optimal utilization of the battery capacity in the power system will be assessed. The objective of WP 5 is to develop and test the EV power and communication interface for different architectures. This WP is lead by EURISCO. The WP 6 is divided in two parts: The 1st part is lead by DONG and should test the proof- of- concept of the EV charging control system and the battery models. The 2nd part is lead by Oestkraft and will be conducted with a few EVs and charging stations installed in the distribution grid on Bornholm.
Last but not least, WP 7 is to steer the project and to disseminate the results of the other WPs.

Major results and lessons learned

There are no official results yet.

More Information

www.edison-net.dk

Evaluation

Research attempt having no results for the construction of policies so far-incorporates alos sustainable energy production.

Posted: 07/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 93

Model Region Rhein-Ruhr (Germany)

The region Nordrhein- Westfalen wants to become the biggest European model region in electric mobility and the ambitious goal is to introduce 250.000 into the market up to 2020 and enlarge the market position of regional automotive industry.

Last but not least the model region is part of the electric mobility projects which were launched and supported by the German government.

Background

The project was started in June 2009. The project area is the metropolis region Rhein - Ruhr, which is with 10 Mio. inhabitants on an area of 7.000km¸ the biggest of its kind in Germany. The whole area lies in the federal state of Nordrhein Westfalen, which was a coal and steel producing region in former times and transformed into a region with a strong focus on the metal processing and automotive industry.

The project was originally started by the federal ministry for traffic, construction and city development of Germany. The German government has set a focus on electric mobility within its 2nd program to stimulate the economic growth and provides through the ministry EUR 115 million for 8 model regions until the year 2011.

The coordinator of the project in the region of Rhein & Ruhr is the EnergieAgentur.NRW, an energy consultancy and advisory company with approx. 60 employees. Within the overall project Model Region Rhein-Ruhr, several projects with partners such as Ford, Rhein Energie or RWE and Renault were initiated.

Major targets

The overall targets of the German government are to establish Germany as the leading market for e- mobility with the goal to have 1 million of electric vehicles on the street until 2020. Furthermore it should revive the economy and should contribute to the CO2 goal of Germany and last but not least it should create new traffic concepts and as a consequence increase the living standard.

The overall targets of this particular initiative is to establish the region of Nordrhein- Westfalen as one of the first big model regions for electric mobility and to have up to 250.000 EVs on the roads until 2020. On the economic site it is important to support the local automotive industry and even attract additional players from the automotive sector.

One of the subproject is CologneE-mobil which is a collaboration of Ford Werke GmbH, Rhein Energie, University Duisburg/Essen and the city of Cologne and the focus of the project is to produce and test small transporters and vehicles for city logistics. All in all there will be 15 electric Ford Transit and 10 electric Ford Focus involved in the fleet study. Another project is the testing of 21 hybrid busses within the transport network of Rhein & Ruhr. The 3rd project called E-Mobil NRW is an integrated project which consists of 58 charging points and 50 vehicles (which are used by private and commercial clients) and should test the clearing system for charging energy. A specific project (named fiStromschnellefl)concerning t infrastructure is the fleet testing of RWE and Renault in the region to test the information and communication based integration of electric mobility.

Major results and lessons learned

the project is still running

More Information

www.kraftstoffe-der-zukunft.de
www.energieagentur.nrw.de
www.elektromobilitaet.nrw.de

Evaluation

Large attempt of a region to become leader in electric mobility- no outstanding features mentioned.

Posted: 07/2010
Last update: 08/2010
within the ALTERMOTIVE project

No. 94

PEDELEC rental system deployment in Styria (Austria)

Co-operating with municipalities and utilities (Energie Steiermark) the company *VeloVital* offers a professional bike rental system, which is so far operating in three regions. More than 50 bikes for tourists and residents are operated in the area of "Rebenlandfl, a touristic region around Leutschach i the South of Styria. This project was the first of its kind realized by *VeloVital*. Follow up projects in other regions are "Schilcherland" at Stainz/Reinischkogel and one in the Capital Graz.

Background

The short time rental concept for PEDELECs is operated by partners from tourism but organised by a backbone organisation with the protected brand name *Velovital*. The project was designed and implemented in the year 2010. Official opening of the *Velovital* region fiRebenlandfl was on the 15th of May 2010.The area cover Is the region called fiRebenlandfl, which is a touristic area in t south of Styria, popular for its wineries and its soft and high quality approach in tourism.

The project was started by the founder of *Velovital*, Mr. Philipp Prorok together with the energy region "Rebenland". *Velovital* developed a professional bike rental system and is preparing its roll out in several project regions. The 2 project members are *Velovital* and several hotels and restaurants of the energy region fiRebenlandfl. The project receives support from t *Klima Aktiv* funds which was set up by the Austrian ministries of Environment and Economy.

Major targets

In the first phase of the project 50 high quality e-bikes are leased to the partner companies, mainly hotels and restaurants. In a second step also scooters and electric vehicles will be offered by *Velovital*. All the energy used to recharge the PEDELECs was produced with renewable energies. As a next step the renewable energy will be produced within the region with the help of photovoltaics.

The ambitious target is to reduce emissions caused by tourists in the region. In the long run also the residents of the region will be involved in the project and the reduction of the emissions will be increased.

The infrastructure is mainly in the hand of the partner companies of *Velovital*. The planned enlargement of the project includes also the instalment of several public charging points within the region.

The major target group are tourists of the local partner companies and guests of the region, but also the residents of the region are trying and using the vehicles tough they also have to pay the rental fees.

Major results and lessons learned

The total amount of the project was roughly EUR 150,000. The figures of rented bikes are far beyond the expectations and plan figures of *Velovital*. In the first 10 weeks the number of rented bikes exceeds 1000 and the region also had a significant added value at visits and overnight stays.
For the initial 50 PEDELEC the CO_2 savings account for 43 tons per year.
All in all more than 100 e-bikes are currently in involved in the rental systems of *Velovital*. For 2011 another 150 e-bikes are planned (mainly for Graz) and in 2012 the total amount of e-bikes could be 500.

More Information

Velovital website

Evaluation

Shows positive uptake of a new business model having a private enterprise facilitating implementation of PEDELEC rental in tourism and cities - as add on a wider transition to electric mobility may occur for the sites when offering battery electric scooters as planned.

Posted: 07/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 95

Integrated Electric Mobility Concept in Wachau (Lower Austria)

The project in the Wachau region comprises electric vehicles (e-bikes, e-scooters, and Segways) and a widespread network of public and private charging points which are fed with 100% renewable energy in the UNESCO world heritage region of Wachau.

Background

The project name already reveals one of the big targets of the project, namely the integration of the electric mobility within the public traffic infrastructure. The project was started in spring 2010 and has a projected duration of more than 3 years. The project is situated in the region of Wachau, which is a tourist and wine region at the riverside of the Danube.

The project was started by *ecoplusEVN*, the leasing company *Raiffeisen Leasing* and hotels and restaurants in the area of Wachau. The project was subsidized by the Lower Austrian government with a special fund regarding the purchasing of e-bikes & e-scooters.

Major targets

The project started with bikes, scooters and *Segways* and will be enlarged to e-cars. in terms of energy used: There is a commitment of the project members to make use of renewable energy. One goal of the project is to replace internal combustion-engine vehicles with electric vehicles, and to integrate electric mobility in the public traffic infrastructure with buses, train and boats. The ambitious vision of the involved project members is to eventually establish a zero emission area in the region of Wachau. The complete project area is covered with the help of 5 public charging points and another 15 charging points at partner hotels and restaurants. The technical system of the charging points is a so called open system, which allows energy charging also to people not directly participating in the project.

Major results and lessons learned

Besides the subsidy of the Lower Austrian government the project is financed with the help of leasing models provided by *Raiffeisen Leasing*, which spread the investment costs over the project period and in addition provides service and winter storage of vehicles to the participating companies. The overall project investment is around EUR 400,000 including the vehicles, charging points, project development and promotion. There is also a significant contribution from energy service company EVN, which not only provided all the charging points both public and private for free, but also charging of electric vehicles itself is free for more than 3 years. All in all around 100 vehicles are involved in the first phase of this project. The number of vehicles will further increase during the project period. The project was prominently promoted by the government of Lower Austria: Dr. Petra Bohuslav (Econonmic Affairs, Tourism and Sports), Dr. Stefan Pernkopf (Environmental Affairs, Agriculture and Energy) and last but not least Dr. Erwin Pröll (Governor), who attended several press conferences to create the necessary awareness of the public. The response on the project is very satisfying. Though it is project with a logical seasonal peak between April and September a CO_2 reduction of up to 160 tons per year is realistic.

More Information

Wachau web site
e-mobil web site

Evaluation

Good integration of electric mobility in a special tourism region also interfacing with public transport. Results are awaited.

Posted: 07/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 96

BETTER PLACE infrastructure roll-out in Canberra (Australia)

Better Place Australia announces Canberra as starting point of national roll- out of electric vehicle recharge network.

Background

The project was presented to the public on the 24th of July 2009. The area of the project is the Australian capital Canberra, as there is a high percentage of mobile population either in short or long distances.

The project was developed by Better Place and ActewAGL. Better Place is one leading electric vehicle service provider and its core business is to build up the infrastructure and the intelligent network for the implementation of electric mobility. The 2nd partner is the local utility company ActewAGL which is Australia´s first utility joint venture covering electricity, natural gas, water and wastewater services.

Major targets

ActewAGL will be responsible for sourcing and distributing the renewable energy coming from sun and hydro power. Using 100% renewable energy, supplied by ActewAGL, there will be zero emissions when driving.

The initial roll out will involve an investment by Better Place to establish the infrastructure, services and systems to support the first 100 electric vehicles in Canberra. The investment will cover:
i. Safe and recyclable lithium- ion batteries for the electric vehicles which will exchangeable and will reduce the purchase price of the vehicle.
ii. Charging points in homes, offices, shopping centres and car parks.
iii. Battery Switch Stations, where empty batteries will be replaced with fully charged ones. The plan is to implement them until 2012 and then to expand throughout the country.

Major results and lessons learned

The project is still up and running.

More Information

Web site betterplace

Evaluation

Eagerly waiting on positive news of larger implementations of battery exchange projects- since the chase for the best concept is open and OEMs are dominating in Europe with their approach fighting open standardized solutions.

Posted: 08/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 97

Electric Taxis and battery exchange tested in Tokyo (Japan)

Better Place and Nihon Kotsu, the largest taxi company of Tokio is joining forces for the implementation of 3 electric taxis and 1 battery exchange station in the heart of Tokio.

Background

Project start was planned to be in January 2010. The role out of the project was be in the city area of Tokyo, which has more than 60,000 taxis and with that impressive figure more taxis than any other big city.

The project was initially developed by Better Place, the world leading service provider for electric vehicles. Better Place is joining forces with Nihon Kotsu, which is the largest taxi operator in the city of Tokyo. Last but not least the US battery manufacturer A123Systems and the Japanese automotive group Nissan.

The project is funded by Japanese Ministry of Economy, Trade and Industry´s Natural Resoruces and Energy Agency with the amount of $ 500,000.

Major targets

The project is started with 3 vehicles used in ordinary taxi services and 1 vehicle used for presentation. The cars are supervised with modern techniques and guided to battery switch location whenever it is necessary. The Nissan Leaf is also going to be tested by Nihon Kotsu.

An average taxi in Tokio is producing 29 tons of CO2 a year and although the number of taxis is not very represented in the overall number of cars in Tokio, almost 20% of CO_2 emissions are caused by taxis.
The pilot project showed the complete EV solution of Better Place and included a battery exchange station in the Roppongi Hills area of Central Tokyo. For the start of the project 1 battery exchange station is implemented. If the project is running smoothly during the test runs the charging infrastructure will be enlarged to 50 up to 100 charging points. All in all Better place estimates to have 200 charging points installed in the area of Tokio to be able to serve up to 40,000 taxis (which is 2/3 of the total amount of taxis in Tokio).

The target group of the project are all physical persons who want to run a cab in Tokio.

Major results and lessons learned

The investments for the infrastructure are more than $ 500,000 and mainly covered by the Japanese ministry of Economics. The customers of the taxi are attracted by prices as low as $ 8.

The battery electric vehicles were running without major breakdowns and operational costs are far lower than with vehicles with conventional combustion engines. The necessary time for a battery exchange was very short (even shorter than the refilling of gas!) so several changes every day are possible and realistic. It could be even considered to use the batteries for power storage for grid regulation in the future.
The pilot was finalised withiout a glitch.

More Information

http://www.betterplace.com
http://blogs.edmunds.com

Evaluation

The small pilot demonstrated viability of battery exchange successfully. For captive fleets the solution may be rolled out on a larger basis.

Posted: 08/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 98

BioFuel Region - an initiative to develop an industry based on renewable cellulose-based fuels, Sweden

BioFuel Region is the propelling force in a long-term process where regional co-operation is used to implement the development and introduction of renewable fuels, based on biomass from forests, fields and recycling.

Background

The motivating forces behind *BioFuel Region* are the key problems of climate change and energy supply. As part of the EU's work, these questions were addressed in a directive in May 2003 of the European Parliament that declared that a certain percentage of the fuels for transport should be biofuels. Other directives from EU indicated that the need for biofuels will more than 10-fold in the coming years. Systems and technologies will have to be developed that is more sustainable than what exists at present, not to mention supplying facilities that can produce the enormous amount of biofuels needed in Europe alone. *BioFuel Region* is an initiative taken in 2002 in the counties of Västernorrland and Västerbotten by a number of independent actors and individual social entrepreneurs to develop an entirely new industry based on renewable fuels from cellulose-based raw materials. The knowledge and experience within these counties in the wood rich northern part of Sweden gives the initiative *BioFuel Region* a great advantage of developing such biofuel industry.

Major targets

The vision for BioFuel Region is to be a world-leading region in sustainable transport based on biofuels and bio products from renewable raw materials. Therefore the focus is on being in the forefront of societal change, industrial and regional development, and to increase the availability of renwable raw materials. *BioFuel Region*™s strategy is to promote and lead development by mobilizing, committing and activating as many potential forces as possible in each respective region. Currently *BioFuel Region* consists of about 25 stakeholders that represent municipalities, county councils, county administrations, federal authorities and private enterprises. Many things that are going to be implemented in *BioFuel Region* are activities that the municipalities and the other stakeholders are required to achieve in their normal environmental work. However, through co-operation, exchanges will be greater and the image of the region as a global model will become even clearer and more focused from an international perspective.

Results and lessons learned

It is clear that the initiative has been enormously successful in a short time in its work on mobilising people, organisations, public authorities and companies in the region, and on creating awareness of needs and opportunities to act on them. On the other hand, not all actors have managed to get to grips with what *BioFuel Region* is and what strategy has been chosen to realise its vision. A number of factors for success in building a platform for joint action are identified - the importance of starting with what you have - nothing is created from nothing supporting action-oriented fisocial entrepreneurs opening up processes and not getting bogged down in old structures having communication that attracts both the heart and the brain balancing what drives the actors and one™s own interests relying on the principles of self-organisation administrative support systems and finally, the importance of a well-established regional leadership.

More Information

BioFuel Region
Report:"Formation for Collective Action"

BioFuel Region
Report:"Formation for Collective Action"

Evaluation

Broad region wide approach focusing on biofuels through co-operation between different stakeholders. Will the initiative be able to see the advantages in electricity and hydrogen options?

Posted: 10/2010
Last update: 11/2010
within the ALTERMOTIVE project

No. 99

Portuguese made Electric Buses

The Portuguese company Salvador Caetano is testing 12 meter 100% electric battery buses.

Background

Electric buses with capacity for 70 passengers using only batteries were developed by Salvador Caetano in 2010. This private company is located in the North of Portugal. There were state monetary incentives during the R&D development.

Major targets

The targeted market is bus companies operating short urban routes. It was felt that in the near future there will be a strong market for electric mobility.

Major results and lessons learned

The investment cost is around 4 million Euro. One million was part of a Portuguese state subsidy. The company forecasts the production of 20 vehicles in 2011 and 50 in 2012. Each vehicle will cost 500.000 Euro. All of them will be battery electric vehicles with an autonomy of 100-150 km. The vehicles will use lithium-ion battery (150 KWh) that lasts 1000 cycling charges. Each cycle takes 4 hours from empty to full charge (external energy source - grid).

The electric bus will be tested in real life condition in several cities in Portugal (e.g. Vila Nova de Gaia) and Germany (Offenbach e Wiesbaden).

More Information

http://www.gruposalvadorcaetano.pt/

Posted: 03/2011
Last update: 03/2011
within the ALTERMOTIVE project

No. 100

Fleet of Natural Gas Buses in Porto (Portugal)

Feet of Natural Gas buses bought and operated by the public transport company of Porto, the STCP. To reduce the dependency on fossil fuels and reduce CO_2 emissions the public company STCP has bought 255 Standard (18 t) and articulated (26 t) buses - MAN NL 233 CNG and MAN NL 310 CNG.

Background & Objectives

Forty years were to pass between the appearance of the first American streetcar line between New York and Harlem and their use in Portugal (1832-1872), and it was the city of Oporto (Porto) that first introduced them to Portugal.
In 1878 a line was introduced in the city, using steam traction and, in 1895, the Iberian Peninsula's first electric tramcar line was put into operation here. It was only ten years later (in 1914) that steam traction stopped being used and, during 34 years, the public transport of the population of Oporto and the surrounding municipalities was solely by electric tramcars.

It was in 1948 that buses began to be used in the city and, in 1959, a third type of transport was added to the two existing ones - the trolley-bus - in use till 1997.
In the last years, the environmental awareness become more and more important, that™s why the light rail, tram and the CNG buses were extended.

Implementation

STCP is a public transport company owned by the central Portuguese Government and operates in a regime of monopoly for the bus operations in the city of Porto. More then half of its bus fleet operate on Compressed Natural Gas (CNG), 255 Standard (18 t) and articulated (26 t) buses - MAN NL 233 CNG and MAN NL 310 CNG.

CNG is a substitute for gasoline (petrol) or diesel fuel. It is considered to be an environmentally "clean" alternative to those fuels. It is made by compressing methane (CH4) extracted from natural gas. It is stored and distributed in hard containers, usually cylinders.
It has been found to be one of the most environmentally friendly fuels.

The Portuguese National Plan to fight Climate Change already in 2006 recommended that STCP should increase its fleet of Natural Gas buses. In 2010 STCP largely exceaded the recommendation reaching 54% of natural gas buses.

Conclusions

The bus operator STCP bought the natural gas buses without any type of financial incentive. In 2009 it was consumed 9,875,031 m3 of Natural Gas (68,35 m^3/100 km compared to 52.27 l/100km diesel buses).

The usage of Natural gas helps to reduce polluting emissions. The CO_2 reduction it can be influenced by the fuel consumption. For a litre of diesel the buses produce 2,628 grams of CO_2 and for a cubic meter of NG they produce 1,967 grams of CO_2. For each 100 kilometres covered, CNG achieves a reduction of polluting emissions of between 82% and 98%. Besides this the engines of the CNG buses emit lower noise (compared to diesel engines).

We begin to operate the CNG buses in 2000 and the acceptability of the drivers and the passengers were very good.

More Information

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Evaluation

Private initiative not relying on funds switching to CNG.
Sustainability issues however were not covered.

Posted: 10/2010
Last update: 01/2011
within the ALTERMOTIVE project

No. 101

Waste collection trucks fuelled with rapeseed-based biodiesel (RME) in Gothenburg (Sweden)

Renova has approximately 160 heavy vehicles for different waste transportations in the region of Gothenburg and has decided that by 2012 all of the vehicles should be in the top environment class, Euro 5. Currently about 50 waste collection trucks are fuelled with 100% rapeseed-based biodiesel (RME), all of them Euro 5 classed.

Background & Objectives

Renova is the largest waste and recycling company in western Sweden, owned by eleven municipalities, and offers waste collection and transport, sorting, processing as well as consultation and training. Every day, more than 1,000 tonnes of waste are converted to heat (for district heating) and power, inside the Sävenäs facility in Gothenburg. This translates into a large number of truck loads.

Carbon dioxide emissions from these trucks can be reduced by investing in vehicles in the top environment class, Euro 5, such as vehicles run on RME, a biodiesel fuel based on local produced rapeseed.

Implementation

The main motivation behind investing in the RME fuelled fleet, apart from contributing to the society™s goal of preventing climate change by reducing carbon dioxide emissions; Renova also sees the investment as a possibility of improving local air quality and the company™s green image.

Another motivation was also to test and develop new technology that can lead to valuable insights for the vehicle industry as well as other users. The main target for the investment was to continue the change of their entire fleet into vehicles that meet the Euro 5 standard, and thereby contribute to a sustainable development in western Sweden.

The goal is that by 2012 Renova™s entire fleet of 160 heavy trucks should be Euro 5 classed.

Conclusions

The RME fuelled waste collection trucks reduces the carbon dioxide emissions by 65% (compared to conventional diesel-fuelled waste collection trucks) due to a LCA study conducted at Lund University. During 2009 the use of RME in the waste collection trucks replaced about 250 cubic meters of fossil diesel.

When the entire life cycle of the fuel has been taken into account the use of RME corresponds to a reduction of almost 500 tonnes fossil carbon dioxide. The total cost of operating the fleet has shown to be marginally higher when changed into RME, where for example the O&M cost has increased by 3%.

The truck drivers have also experienced longer queues at the RME fuelling station. Currently 50 waste collection trucks run on RME and future plans include increasing the number of same vehicles.

More Information

Renova
Folder:"Renova-a partner that does more"

Evaluation

Strong support for using biodiesel in heavy duty vehicles- even in Nordic climates.

Posted: 10/2010
Last update: 10/2010
within the ALTERMOTIVE project

No. 102

BioAlcohol Fuel Foundation (BAFF) a knowledge organisation focusing on bioethanol (Sweden)

Örnsköldsvik (Sweden) BAFF is responsible for projects related to production, distribution and usage of bioethanol and biomethanol as well as knowledge and information of systems change towards sustainable transport systems based on biofuels.

Background

Scientists agree that within the next fifty to sixty years we in the western world should reduce the emissions from fossil energy by sixty to seventy percent. Reducing emissions from the transport sector is especially challenging since the consumption is still on the increase. The number of cars in the world today is 500 million and is expected to cross 1000 million in the year 2015.
In contrast with fossil fuels, biomass based alcohol does not contribute to excessive emissions of carbon dioxide. Bio-ethanol is produced by fermentation of starch and sugar from grain or cellulose. Bio-methanol can be produced when the biomass goes through the process of gasification.
The transition to the usage of bio-alcohols as fuels can be described as a development chain, in which all the links are equally important to obtain a good result. The chain describes the processes from raw material to production, distribution to the vehicles and different kinds of engines. The next link deals with the external effects such as emissions and marginal values. The last link is about how the lawmakers of the society regulate laws, and taxes to make it easier for the transition. BAFF is involved in all parts of the chain.
BAFF was established in 1983 under the initial name “The Swedish Ethanol Development Foundation”. The main aim was to develop production techniques and usage of bio-based ethanol for the transport sector. The organisation identified ethanol as the most rational alternative fuel for transport. Good access to raw material, knowledge to utilise by-products from the cellulose industry and bioenergy, including the knowledge of technical process in the paper pulp and chemical industries were contributing factors to the formation of the organisation. An increasingly international focus inspired the name change in 1999 to the BioAlcohol Fuel Foundation, BAFF. Today, BAFF is a knowledge and information led organisation involved in projects of sustainable transport around the globe. Partners in BAFF are e.g., Chematur Engineering AB, SAAB Automobile AB, Scania-ED95, SEKAB, Skellefteå Kraft AB, Taurus Energy and Örnsköldvik municipality.

Major targets

The major targets for BAFF is to share knowledge and prepare a market breakthrough for bio-ethanol and corresponding vehicles as well as inspire and obtain followers.
BAFF is one of the lead participants in the European BEST (Bio-Ethanol for Sustainable Transport) project, which deals with the introduction and market penetration of bio-ethanol, establishment of infrastructure for supply and fuelling, the introduction and wider use of ethanol cars on the market. During the project more than 10 000 ethanol cars and 160 ethanol buses will be put in operation, in Europe, and E85 as well as E95 fuel stations will be opened. Low blends of ethanol with petrol and diesel will be developed and tested.

Major results and lessons learned

BAFF has been involved in numerous amounts of projects since the 80’s. Projects within bioalcohol production have for example been, LCA-studies, the CASH project, projects regarding pilot reactor plants in Rundvik and Etek, pre-studies of a full scale plant at Etek, projects for developing a strong acidic method to handle house-hold waste, research in process techniques, by-products of lignin, raw material (including sweet sorghum), cost of imported raw material etc.
BAFF has also financed tests on e.g. straw based ethanol, conversion of cars and heavy vehicles, fleet tests, introducing concepts in Brazil and Mexico as well as tests with blends of ethanol and diesel. Projects within the area of information and knowledge sharing have for example been to organise seminars and conferences in Sweden, Europe and China, production of various informational leaflets, brochures and presentations at conferences and seminars around the world. BAFF publishes monthly News bulletins and runs a Web-site with daily updated news.
Results from the BAFF projects are e.g., that a very first ethanol fuel station was built (1983), introduction of ethanol buses in Sweden (1986), organizing Sweden’s first direct imported 100% ethanol cars (Ford Taurus), procurement of Ford Focus flexifuel cars, introducing a low blend with 10% ethanol with petrol, acceptance to modify cars to run on E85 as well as standardization of ethanol fuels-SEKAB (ED95 and E85).
It is clear that the initiative has been a great success and success factors are e.g., the experience and enthusiasm within the partners, the transfer of knowledge and know-how, the flexifuel cars experience and the access to SEKAB ETEK pilot plant for production of lingo-cellulosic ethanol. Via the BAFF Web-site it has been possible to present arguments which may contribute to reverse myths about ethanol and influence a change of mind-sets.

Evaluation

The strong focus on ethanol in Sweden is unparalleled and should motivate other European countries to fight biofuel bashing by enforcing sustainability rules for the fuel producers.

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Last update: 11/2010
within the ALTERMOTIVE project

No. 103

Biogas use in public transport buses in Lille (France)

Lille has been developing during the last 20 years a policy to enhance the use of public transportation systems. More particularly since 1990 an urban programme has been on-going towards exploiting biogas produced by biomass accumulated at the local sewage treatment plan and now from wastes. Hence a renewable source of energy is exploited giving rise to sustainable development associated to emission free transportation.

Background

The idea to operate buses (public fleet) running on biogas was first initiated in 1990 by the City of Lille and Communauté Urbaine de Lille (Lille Metropolis) : 85 local authorities and 1.1 million inhabitants. The project was supported by the EU DG XVII (THERMIE programme), the Regional Council of North Pas du Calais and the french Agency for the Environment and Energy Management (ADEME).

TRANSPOLE is the Community™s urban bus operator. It has currently 450 buses. The CNG - biogas buses of Lille still constitute by far the most important trial being conducted in France..

Between 1994 and 2004 4 biogas buses were used in Lille. In 2004 it has been decided to build a new plant to sort wastes and simultaneously produce biogas.

Major targets

At the beginning the main objectives of the first project was to construct a pilot unit for the production of biogas in a sewage treatment plant and enhance energy efficiency policy by upgrading biogas from fermenting organic wastes of the sewage sludge treatment plant. The methane, is similar to natural gas that is being distributed by Gaz de France and the project targeted the transformation of normal diesel buses to buses to run on biogas. It was an experimental application that wanted to open the way towards commercial exploitation in a fleet of new buses constructed to run on biogas.
Hence at the all beginning of the project in the 90™s the main issue was really to save energy so that to reduce the cost for the local authorities. As the project grew with the waste plant and became the most important biogas site in Europe the fight against greenhouse gases and the willing of politician people were also important and progressively main points.

The first implementation o

the programme took into consideration the parallel transformation of the bus to run on biogas and the development of the treatment plant to produce biogas (methane) suitable to be used as vehicle fuel. Progressively 150 buses will be transformed and use biogas .Hence 4 Mm3 natural gas will be substituted by biogas each year. The project budget is 3 million • for the biogas plant.

Major results and lessons learned

Whilst the ramp up for the methane buses went relatively quickly reaching 320 from 450 buses in total, implementing the production and feeding of purified digester gas to the natural gas network took more than 10 years. Particularly consent from national bodies had to be achieved allowing bio gas feed in- before contractual issues with the gas grid operator and the natural gas supplier could be settled. The plant produces 4 Mio, mł at a price of 0.35•/m ^{3} (gas under normal conditions) which replaces approx. 4 Mio. litres of fossil diesel. The global warming potential is reduced by 74% replacing either CNG or diesel by bio gas in around 100 buses.

More Information

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Evaluation

Case where overarching aims are valued higher than the ease of use for the fleet operator- delivering a sound and sustainable solution which should serve as blueprint for others.

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within the ALTERMOTIVE project

No. 104

Car sharing in La Rochelle (France) offering battery electric utility vans

Implementation of new electric vehicles which can be shared by inhabitants

Background

La Rochelle, (Communauté agglomération of 147.000 inhabitants and 18 local authorities) on the French Atlantic coast, was one of the first European cities with a traffic policy aimed at reducing environmental pollution. As a part of this policy the municipality has been promoting the use of electric cars, bicycles and public transport.
A delegated management of public services has been favoured for a 12 year period to COMOX (Véolia group).

Major targets

The main objectives of the project were :

- First, to fight against (and to reduce) air pollution,
- to reduce travel costs and save money
- to ease car parking
- to implement new electric vehicles which can be shared by inhabitants

This service remains however a public service.

Major results and lessons learned

This project was 50 vehicles in car sharing but also 6 electric utility vans. The project is an urban mobility system for cities that want to broaden their range of public transit solutions. It provides program members a shared access to electric vehicles, which are available at self service stations. Inaugurated in La Rochelle in 1999, the project has since generated an encouraging response. In one year, more than 250 clients have joined the initiative and now make daily use of the 50 cars that were deployed in La Rochelle.

The cars are parked at 7 recharging stations near high use locations, such as the train station, the bus station and the university.
Incentives have also been implemented for instance special parking places for free.
Refuelling facilities have been developed on site and own vehicle maintenance is assumed by La Rochelle.

Users are generally young and 75% of them are men. The main cust omers are students, enterprises, tourists, people in commercial zones, administrative organisations.

In La Rochelle the trips are enough short so that no problem appears with the autonomy of electric vehicles.
Main characteristics of the project :

100 000 km/year for 50 cars
Average trip 8 kms, median trip time 10 min

Total reduction of greenhouse gas emissions and other pollutants :
CO2 22 t/year
PM10 6 kg/year
NOx 76 kg/year

The acceptance of the public and customers (and also own staff) is very good. Hence, a survey of 130 customers confirmed users positive opinion of the scheme, which received an overall satisfaction rating of 8 on a scale of 10. Members especially appreciated the cars driving comfort, the self service system, the availability of cars at the recharging stations and the competency of the sales staff. All also appreciate to fight against climate change.

Concerning environmental impacts it appears that™s the results are very positive by reducing local pollution (no local air pollution) or noise. The main problem is to find new electric vehicles (vehicles availability) and reduce costs for their procurement.
The main costs of the projects concerned research activities, administration of the project, investment in infrastructure and vehicles and use and maintenance costs (300 000 •/year).

More Information

http://www.yelomobile.fr/

Evaluation

Unique example where behavioural change when using cars was incorporated into the change of the propulsion system, providing a sustainable solution (depending on the primary energy source).

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within the ALTERMOTIVE project

No. 105

Serial Hybrid Busses for a Public Transport scheme in Brescia (Italy)

One very ambitious project in the city Brescia in Italy was creating a new environmental friendly bus line, connecting the out of the centreÂ´s parks with the historical centre. The city of Brescia aimed to use buses which are noiseless, vibration free and very low in emission (particulates per kWh). This way the historical patrimonies could be preserved in the best way.

EPT as pioneer in serial electric bus production using micro turbines is providing the innovative and efficient vehicles ensuring very low emission.

Background & Objectives

Brescia is an industrial city in northern Italy with a medieval centre. Buildings from the Celtic, Roman and medieval time in white marble are characterizing the historical centre. The city government wanted a bus line connecting seven car parks, situated outside the city centre, transporting park and ride clients into the historical centre and heart of the city, which has reduced car access and partly pedestrian areas.

The city of Brescia specified buses which are noiseless, vibration free and very low in emission (regarding grams of PM/kWh). This way the historical patrimonies may be preserved in the best way. Thus the city of Brescia ordered in 2000 four EPT HORUS serial hybrid buses with an electric engine and a micro turbine powered by methane.

Implementation

The concept is based on a pure electric bus by using only electricity for the traction. A second component is the micro turbine which provides the necessary energy for the traction in sophisticated coordination with the batteries.

The bus drives only on the power of its batteries until the charging status reaches the 75% threshold. When this happens the micro turbine engine will instantly switch on automatically and provides two tasks at the same time:
1. A part of the energy out of the micro turbine coupled to an electric generator will be transferred into the electric motor.
2.The other part will charge the batteries at the same time.

At a state of charge of 90% the turbine switches off and the bus will run on electrical energy out of its batteries only.
A battery management system with a sophisticated software co-ordinates and checks all the operations which happen between the batteries the micro turbine and guarantees a full automatic operation by providing the traction with energy.

Technical data for the bus model HORUS

- super-low-floor bus
- length of 8 m, 11 seats and 31 standing places (10.50 m is also possible)
- urban operating range of about 250 -300 km (depending on road condition, inclination etc.)
- acceleration from 0-30 km/h is 9 seconds, from 0-50 km/h in 25 seconds at full load
- maximum speed: 70 km/h.
- maximum incline: up to 19% at a speed of 13 km/h fully loaded

Conclusions

An ideal City-bus for big cities with the possibility to reach the peripheral areas. The performance is comparable to conventional buses if we consider the real traffic conditions the public transport are facing.

The bus system is now noiseless, lowest emissions and vibration free which is very important for the historical buildings in Brescia.

The fuel consumption at a constant speed in a flat urban environment of 30 km/h (without stop and go) is about 0.6 kWh / km.

More Information

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Evaluation

Outstanding attempt to innovate in propulsion technology- reducing energy demand by hybridisation thus taking GWP into account. Hybridisation should be standard with all CNG-projects.

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No. 106

Hybdrid taxis circulating in San Francisco since 2004

Hybrid electric vehicles were introduced in taxi fleets based on a private initiative in 2005. Now nearly 50% of the fleet has been exchanged being hybrid electric or CNG based.

Background & Objectives

In 2002 the government of San Francisco decided a resolution calling for a citywide reduction of greenhouse gas emissions to 20 percent below 1990 levels by 2012.
The taxi fleet consisted of about 800 cabs. Multiplied by an average of 87 tons of carbon dioxide per year, the greenhouse gas emissions averaged 72,000 tons per year.

Implementation

San Francisco aims leading the way in reducing taxi greenhouse gas emissions. The taxi drivers wanted to join that initiative.
Since 1994 San Franciscos taxi policy is developed in a newly formed 7-person Taxi Commission. A member recommended at its very first meeting that clean taxis be placed on the agenda.

Until 2004 the cab company owners didn™t have a practical alternative to the gas-thirsty Crown Vic. But in 2004 Ford was planning to introduce a small hybrid SUV being possible to us as a cab. One year later the first 15 hybrid cabs (Ford Escape Hybrid) were introduced, 10 by the Yellow Cab Company and 5 by the Luxor Cabs. This was the first hybrid taxi fleet in the United States. The cars have now driven around 300,000 km.

The mayor, the city government and the taxi companies co-operated in beating those early success.
Because there were no subsidies then the rental fee rose by USD 7.50, which the driver has to pay per shift to drive hybrid and other low-emission taxis. This is called the *gate*.

Conclusions

In spite of the higher rental fee the number of hybrid cabs increased. The reason for this is the reduction of USD 20-40 per shift on petrol/gasoline when driving such vehicles. This compensates the increased rental cost.

The cause is the improvement in fuel efficiency from 9-10 miles per gallon to 30 mpg in city driving for the hybrid electric vehicle (25 l /100 km to 7.8 l/100 km).
New local and federal incentives and the gate solution increased the share of alternatively fuelled vehicles to approximately 50%.

The auto-mobile industry identifies the market for environment-friendly hybrid taxis. Car manufacturers Ford, Nissan and General Motors have all promised to make a larger number of hybrid cars specially designed for use as taxis.

2/3 of our fleet are now hybrid-electric or CNG, and the GHG emissions have been reduced by 50,000 tons per year.

More Information

http://www.hybridcars.com

Evaluation

Shows how committed insiders may generate well accepted approaches for businesses, resulting in a large share of alternative fuel and alternative propulsion - even in in fleets having a large individual component in decision taking.

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within the ALTERMOTIVE project

No. 107

Bio-methane powered vehicles and filing station in Sheffield

The Sheffield city council is currently trying a variety of eco-friendly alternatives of fuel for its fleet of vehicles.
To reduce the carbon emission of the city by trialling ten vehicles that run on biogas generated from a sewage treatment process.

Background

In April 2010 Sheffield City Council conducted a demonstration running light vans and other council vehicles on bio-methane. The council has signed an agreement to install a temporary filling station, said to be one of the first of its kind in the UK, to demonstrate the environmental benefits of bio-methane powered vehicles. The bio-methane gas filling station and associated delivery equipment was be supplied by Chesterfield Bio-Gas, a division of Chesterfield Special Cylinders Ltd, also based in Sheffield. Bio-methane is generated from organic waste products such as cattle manures, or horticultural and brewing residues and, most significantly for the future, household waste.

Major targets

Besides of implementing methane powered vehicles into the cites fleet, Sheffield city council has appointed Chesterfield Bio Gas to supply a temporary bio-methane gas filling station and associated delivery equipment to allow it to conduct a demonstration running council vehicles on bio-methane. The Sheffield-based company signed the agreement to supply the station, which it claims is "one of the first of its kind in the UK". It was installed at the council's Staniforth road vehicle depot and aims to demonstrate the environmental benefits of bio-methane powered vehicles.
The city used this initial six month project to find out how practical it is to operate low carbon, low emission bio methane fuelled vehicles within the Sheffield City Council fleet as an alternative to petrol and diesel. Over the trial period, the council assessed the environmental benefits in terms of reduced carbon dioxide (CO_2), nitrogen oxide (NO_x) and particulate matter (PM_{10}) against existing vehicles running on diesel. Following the trial a project evaluation will take place to assess the environmental benefits, performance, reliability and cost saving achieved as a result of operating these vehicles. The results of the trial are published in the beginning of 2011.
Chesterfield says that in the longer term, the Council may support the development of plants to digest organic wastes and then capture the raw biogas produced. This could be cleaned and upgraded to bio methane by the Chesterfield Bio-Gas process, before being compressed and dispensed at a similar but permanent vehicle filling station.

The bio-methane trial aims to improve air quality, tackle climate change, reduce emissions from Sheffield City Council operations and services, led by example and demonstrate best practice, and encourage the use of clean vehicles in Sheffield. In addition, the natural gas vehicles are considerably quieter than conventional diesel engines.
The project is being run in partnership with Chesterfield Biogas, Volkswagen and Mercedes, and is jointly funded by the Area Based Grant and the Alternative Fuels Infrastructure Grant Programme.

Major results and lessons learned

Biogas is a gas, produced by the breakdown/decay of organic material such as manure, sewage and municipal solid waste, in the absence of oxygen. Biogas is primarily made up of carbon dioxide and methane. Bio-methane is produced when biogas is cleaned up to remove carbon dioxide and other impurities. Bio-methane produced from organic waste and has the lowest greenhouse gas emissions of any biofuel. By capturing methane from decomposing organic waste, which would otherwise be emitted to the atmosphere, using it as a fuel actually saves greenhouse gas emissions rather than reducing them. Also, by turning it into a valuable fuel, it helps to reduce the amount of organic waste going to landfill. Bio-methane is virtually identical to natural gas and can be used as a substitute for natural gas to fuel natural gas vehicles. Unlike natural gas, Bio-methane is an entirely renewable and clean fuel which can be used as an alternative automotive fuel to petrol and diesel.

More Information

Public transport that is easier for people to use

A City of Opportunity: Corporate Plan 2010-13

www.chesterfieldbiogas.co.uk

Evaluation

Supporting the way of methane towards a low GWP solution by a small scale implementation with potential to grow.

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within the ALTERMOTIVE project

No. 108

China as forerunner for ultralight battery electric vehicles

China tackles air quality problems by forcing deployment of battery electric vehicles - ultralight BEVs having a high utility succeeded without government support.

Background & Objectives

China is rapidly upgrading its infrastructure and addressing global warming as well as air quality problems. It is very visible that traffic is much quieter in China even without using electric power trains, but the mere amount of traffic using combustion engines does create air quality problems. Transition also takes place with regards to the citizens rides - shifting from bicycles to heavier vehicles, therefore a sound policy might be more effective compared to countries having a population driving cars with internal combustion engines since 40 to 60 years.

Implementation

The Chinese government forced the development of electric bikes since 1991. By 2006 there were more than 2.700 official manufacturers of e-bikes. Due to extensive bicycle lanes along busy roads (avoid the rush hour) and licensing fees on scooters with internal combustion engine (Shanghai) the government supported BEVs.

Apart from those two wheeled vehicles having a high utility with regards to cargo and passenger transport, also trikes are seen in the streets-some cargo trike converted individually, some used by parcel delivery services -also mini taxis with roof and electric power train are in use near the tourist centres. So apart from individual transport commercial transport is also electric, at least partly. Neighbourhood vehicles with more seats are used in parks and tourism resorts for passenger transport.

To promote electric cars China drew up a five year plan for EV-development. By 2015 an annual sales target of one million alternative-energy vehicles should be reached, most hybrids and electric vehicles.

The Ministry of Industry and Information Technology will invest more than 100 billion yuan (about 11 billion Euro) during the next 10 years to support so called new-energy cars. Subsidies of up to 60,000 yuan (approximately 6,600 Euro) will be given to buyers of pure electric cars in the five cities chosen for the pilot program (Shanghai, Changchun, Shenzhen, Hangzhou and Hefe), buyers of plug-in hybrid cars will receive up to 50,000 yuan (approximately 5,500 •) in subsidies.

Also on a regional policy level the Guangdong regional body encourages governmental agencies to buy EVs. On a local level Shenzhen will invest 30 Billion Yuan in an EV-base.

Conclusions

In China ultralight battery electric vehicles are very visible on the roads of the cities accounting for approximately one sixth of the vehicles seen (Beijing). In 2008 Chinese bought 21 million electric bikes. That™s 90 % of the electric bikes sold worldwide and more than twice the amount of sold cars in China.

The low price of the battery electric bicycles (about 250 Euro), although their look like mofas and low tech lead acid batteries has driven their popularity.
The lead acid batteries are one weak point, especially the difficulties surrounding the disposal and the short lifespan.

Another problem is the traffic safety. No driver™s license is required, the bikes run up to 20 km/h and have weak brakes.
The service infrastructure for professional repair however is lacking and very little support is visible to establish battery electric cargo trikes.

With regards to larger vehicles there is more policy support but there are only some fleets testing battery electric taxis (Shenzhen 50 taxis) or hybrid electric buses (200 so called new energy buses in China rising to 500).

The low wages create a big hurdle for the acceptance of those expensive cars with the general public. Also it is not known whether the promotion of rural car purchases has elements favouring BEVs.

The case shows how a coincidence of a dedicated policy with a change in vehicle ownership might create favourable conditions for electric vehicles - may be also supported by the absence of stricter product quality and environmental standards allowing very cheap production.

More Info

Electric Vehicle New China - Blog covering Chinese BEV policy and industry

Evaluation

Example for an industrialisation process which introduces latest green technology providing affordable zero emission mobility means.

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within the ALTERMOTIVE project

No. 109

Policies for green cars in Gothenburg (Sweden)

Gothenburg city has developed a range of policies with the purpose of increase the number of environmental friendly cars in Gothenburg. Some of the policies and activities are reduced parking fees for green cars, environmental zones, procurements on vehicles, seminars, information for costumers and climate compensation.

Background & Objectives

Apart from improve local air quality, the main motivation for implementing the policies has been to reduce CO_2 emissions with the larger goal of contributing to the global task of prevent climate change.

By implementing the policies for environmentally friendly cars Gothenburg city hoped to create a market for green vehicles, improved alternative fuel supply and additional refueling facilities. By developing the project they hoped it would be easier for companies, municipalities and the public to choose cleaner cars.

Implementations

Polices that have been implemented are for example reduced parking fees for green cars, environmental zones and procurements on green vehicles. Besides the policies Gothenburg city has also been active in informing and educating companies as well as the general public.

The website www.miljofordon.se was created in order to show that there is a growing demand for cleaner vehicles in Gothenburg. The website presents all available clean vehicles sold in Gothenburg (as well as in entire Sweden). It also contains lists and maps showing all filling stations with alternative fuels.

Conclusions

The CO_2 emissions are reduced by 22% with ethanol and 53% with gas compared to gasoline. The number of environmental friendly cars has increased tremendously during the last five years. For example has the number of ethanol (E85) cars increased from 8,000 to 140,000 between 2003 and 2008 and the number of fuel efficient gasoline cars (cars that emit less than 120 gCO_2/km) has increased from 1,300 to 42,000 during the same period. These numbers are for the entire Sweden but the same pattern is seen in Gothenburg.

The success of implementing the policies might have to do with the fact that policies were jointly marketed and disseminated together with other stakeholders in Gothenburg, e.g., municipal authorities, NGOs, fuel producers and fuel retailers.

Target groups for the marketing campaigns have first and foremost been logistics companies, small private fleets, entrepreneurial fleets and public fleets.

The cost for purchasing gas and hybrid vehicles to Gothenburg city has been approximately 100 Million SEK (about 10 Million Euros). In addition there has also been not well known costs for information campaigns and absent parking fees.

One important lesson is that reduced parking fees for alternative fuelled cars have lead to increased usage and driving of cars. Especially from neighbour cities into Gothenburg (people who likely used public transport before started to bring their eco-friendly cars into the city).

Other drawbacks has been that subsidies has been implemented that only benefit alternative fuels (and not energy efficiency). This has lead to that alternative fuelled cars generally consume more fuel than conventional cars.

In future Gothenburg city will enlarged their policies to encourage increased use of bicycles and electrical driven cars.

More Information

Environmental friendly cars in Gothenburg (Miljöfordon)

Evaluation

Example for a local policy supporting low carbon mobility, but experiencing rebound effects and the fact that high efficiency should be first with regards to alternative fuel policy priorities.

Posted: 11/2010
Last update: 12/2010
within the ALTERMOTIVE project

No. 110

Green municipal fleets in Gothenburg City (Sweden)

Gothenburg city has been active in developing green public fleets such as garbage trucks, buses and other municipal fleets. Currently (2010) there are approximately 800 eco-friendly light-duty passenger vehicles, 100 electrical vehicles, 100 hybrid-diesel vehicles, and 100 other heavy vehicles.

Background

One key factor for increasing the use of environmental friendly vehicles is that the cost for buying and using such vehicle should not be dramatically higher compared to conventional vehicles (at least not after subsidies like reduced parking fees and other policies). Vehicle costs are assumed to decrease with increased number of vehicles purchased. Gothenburg city wants to be a forerunner and has taken a role in changing their municipal fleets towards green fleets.

Major targets

Gothenburg city has set targets for municipal fleets. One target is that 90% of all light trucks (up to 3.5 ton) and light-duty passenger vehicles owned or leased by Gothenburg city should fulfil the definition of a green vehicle. Examples of light-duty passenger vehicles included in the target are taxis, mobility service, and city delivery cars. Another target is that a minimum of 50% of the fuels used in flexifuel and bi-fuel vehicles should be alternative fuels.

Major results and lessons learned

Alternative fuels and vehicle technologies that now are used in the municipal fleets are, e.g., bioethanol, biogas, natural gas, hybrid electrical vehicles, battery electrical vehicles and new trams. The new fleets have worked as a marketing measure for the municipal and Gothenburg city is seen as a forerunner in the area of sustainable development.

Lessons learned from changing almost all municipal vehicles within Gothenburg city is for example that by changing type of vehicles additional measures also had to be done, e.g. developing new on-site refuelling facilities, contract fuel retailers to secure fuel supply, and expand the municipal vehicle maintenance department.

During the process of meeting the 90% target some logistic measures coping with reduced autonomy of the vehicles had to be taken. Since some buses and garbage vehicles had to be fuelled more often additional fuel stations were set up and the routes for heavy vehicles run on gas had to be changed. The total cost for purchase and operate the new fleets has for some of the fleets been equal to earlier conventional fleets but some of the new fleets are much more costly.

Success factors for getting the changes done are for example; dedicated and enthusiastic persons within Gothenburg city, internal competence and knowledge, political goals, funding opportunities, external consulting and staff training activities.

In future Gothenburg city wants to continue the work towards even more environmentally friendly fleets and will focus on electrical and more efficient vehicles.

Evaluation

Brave policy of the administration targeting their own fleets and a share of 90% green vehicles even if operational changes were needed to cope with the vehicle autonomy.

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within the ALTERMOTIVE project

No. 111

National policy: Tax reduction on green vehicles (Sweden)

National policies such as tax reduction policies for environmentally friendly cars, have been implemented in Sweden.

Background & Objectives

The main target, for introducing tax reduction policies for environmentally friendly cars, is to create a market for such vehicles.

Increasing the number of cars with better environmental performances would help Sweden meet their European targets in CO_2 reduction, renewable energy use and energy efficiency measures.

National policies have been introduced in Sweden to encourage the purchase of cars with better environmental performances.

Implementations

There are at least three national tax reduction policies benefiting the use of environmental friendly cars. The current definitions of fienvironmental friendlyfl ar
- CO_2 emissions less than 120 gCO_2/km,
- emissions of particular matter less than 5 mg/km,
- fuel consumption less than 9.2 liters, or 9.7 m^3 gas, per 100 km and
- for electrical vehicles the electricity use must be less than 37 kWh per 100 km.

The three main national tax reduction policies are first a five year exemption from the annual vehicle tax on cars that is defined as environmentally friendly.

The second policy is an exemption from congestion taxes for cars defined as environmentally friendly. The exemption will be valid until July 2012.

The third policy is in Swedish called fireducerat förmånsvärdef which relatively freely can be translated into "reduced taxable value for an individual driving a company car". The Swedish company car system works as if you have a company car and drive it privately on your off-duty-time it is seemed as a benefit (comparable with higher salary) and thus you have to pay tax for using the company car privately. How much tax you pay depends on the fiförmånsvärde (the taxable value) which is individual for each car model and reduced if the car is defined as an environmentally friendly car. To illustrate how much the taxable value is reduced, a Ford Mondeo TDCi 5-doors, 2009, has a fiförmånsvärdefl of 44,600 SEK/yr whi the flexifuel version has a value of 33,600 SEK/yr.

Conclusions

Results seen so far are that the number of environmental cars has increased enormously where 30% of all new sold cars during 2008 fulfilled the definition of being environmentally friendly.

The share of biofuels has increased from 4.9% in 2008 to 5.2% in 2009. The average CO_2 emission has decreased from 201 gCO_2/km in 1999 to 164 gCO_2/km in 2009.

The number of flexifuel ethanol and biogas cars has increased from 250 and 1,500 in year 2000 respectively to 138,000 and 15,000 respectively at the end of year 2008. Cars emitting less than 120 gCO_2 per km have increased from 280 in year 2000 to 42,000 in the end of 2008.

During 2009 the emissions from Swedish road transport decreased by 1% from 19.2 Mt to 19.0 Mt. The underlying figures for the decreased emissions are that more fuel efficient cars reduced the emissions by 0.2 Mt, more fuel efficient trucks reduced the emissions by 0.065 Mt, biofuels reduced the emissions by 0.065 Mt but increased traffic increased the emissions by 0.13 Mt.

The overall positive outcome cannot entirely be connected to the implemented national policies but municipal involvement has had a large influence. Future national policies will focus more on energy efficiency measures.

More Information

Swedish tax agency (Skatteverket). Description of taxes for vehicles and traffic

Swedish EPA (Naturvårdsverket). Results on changes regarding vehicles and emissions

Changes in the number of vehicles 2000-2008

Evaluation

Example for a local policy supporting low carbon mobility, but also that high efficiency should not be second with regards to priorities.

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Last update: 12/2010
within the ALTERMOTIVE project

No. 112

China´s first EV taxi fleet in Shenzhen

In China a car manufacturer and a bus operator teamed implementing a fully electric taxi fleet.

Background & Objectives

Shenzhen is a city with a sub-provincial administrative status in southern China's Guangdong province, situated immediately north of Hong Kong. The local government plans to make Shenzhen a green city by introducing electric vehicles. According to the plan, the city will have 24.000 electric vehicles and 12.000 charging stations by 2012.
The use of electric taxis is part of this plan. The central government is subsidizing the purchase of each taxi with up to 60.000 yuan. The Shenzhen government is drawing subsidy plans to support electric taxis.
Since May 2010 the first batch of EV taxis is on the streets of Shenzhen operated by Pengcheng Electric Vehicle Taxi Co.Ltd., a joint venture between BYD (Chinese car-maker) and the Shenzhen Bus Group.

Implementations

Pengcheng Electric Vehicle Taxi Co. Ltd. is operating 40 BYD E6 electric taxis. The car manufacturer delivered 100 of the electric cars by the end of June 2010. The 5-passenger cars travel with up to 140 km/h and consuming 21,5 kWh of power per 100 km.

China South Grid, the local utility, has two charging stations in Shenzhen, one with six quick chargers and the other with three standard chargers.

Due to the limited charging equipment, most BEV taxis need to return to Pengcheng - the taxi companies - headquarters for charging. That´s why the operator compiled a detailed charging schedule to guarantee a constant flow of running taxis.

The taxi companies scheduling and electrical design does not allow cars to run over 200 km. Under ideal circumstances the mileage of an electric taxi could be more than 300 km. But different reasons limit the range, for instance in summer the electricity consumption of the air condition is about 30 %.

Maintenance and repairs are conducted by one BYD store located in Shenzhen, due the specialized technology of BEVs only BYD has the resources and technicians at the moment to do that. On the other hand this secures that necessary product improvements are flowing back to the producer directly.

Conclusions

Saving money on fuel due the lower prices of electric power compared to gasoline is one of the positive aspects of running a pure electric taxi fleet. 100 km with an electric taxi cost 30 yuan, while the traditional taxi 100 km fuel consumption of 12 liters of gas cost more than 60 yuan.

The companies™ taxis with combustion engines run two shifts a day the average daily mileage is 497 km. That™s more than two times the mileage of a fully charged electric taxi.

Full charging takes about 1.5 to 2 hours using fiquick chargefl a 4.5 hours using normal charge. This demonstrates one of the bigger problems running pure electric taxis, because a car with exhausted battery cannot pick up any customer. That is, why Pengcheng came up with a shift system for the drivers.

The problem is that, due to the limited range and the waiting times, the personal income of an electric taxi driver is lower than that of a traditional taxi driver.

The taxi operators™ average daily fuel consumption is 61.7 liters / day for a taxi with combustion engine. If an electric taxi reach the same mileage as an traditional taxi it can save local emissions of 5,18 tons of carbon dioxide each year.

The much higher total costs are real obstacles in BEV commercialization.

- High vehicle price (about 300.00 yuan, 3-4 times higher than a normal taxi)
- High management costs (limited charging stations)
- Higher maintenance and repair costs (low density of specialists, higher prices for parts)
- High infrastructure costs (lack of public charging stations)

This biggest hurdle - the much higher cost - could be compensated partly by subsidies from central and local governments.

More Information

BYD web site
Bydit contact
Electric Vehicle News China - Blog covering Chinese BEV policy and industry

Evaluation

Joint public industrial initiative showcasing zero emission products. Coping with deficiencies of battery electric mobility.

Posted: 11/2010
Last update: 12/2010
within the ALTERMOTIVE project

No. 113

London buses go hybrid-electric - including the double-decker buses

London's historic and world famous red buses are going green, as the city - like many others around the world - strives to cut air pollution and save fuel by introducing hybrid propulsion systems in the cities bus fleet.

Background

London's bus network is one of the biggest traditional transport systems in the world, which comprises roughly 8,500 individual vehicles run by nine different operating companies. These companies have awarded contracts to provide services by the city's overall transport authority, Transport for London (TfL). Each day, approximate 6.4 million passenger journeys take place on over 700 different routes through the streets of London.

Major targets

At the present 56 buses build an exception to the rest of the bus fleet which runs on diesel engines. This 56 buses running over ten routes, most of them located in the central area of the city are using hybrid propulsion systems in which diesel engines are supplemented by a combination of electric motor, battery and generator. The first vehicles were introduced in 2006.
Despite their small number they represent the future for London´s public transport system. TfL wants to send a signal towards the approaching Olympic Games in 2012. All new buses should appear as hybrid vehicles and further on the whole system should comprise only Hybrids.
The operations director for London Buses - the division of TfL responsible for London's bus services, explains that diesel engines produce three major types of emission: particulates, oxides of nitrogen (NO_x), and carbon dioxide. The first two are limited by European legislation that targets engines in isolation rather than in service, but he says that in the case of particulates. Figures of studies indicate that there is room for improvement. London's buses annually produce 610,000t of CO_2 and consume 240 million litres of diesel. The correlation between CO_2 and diesel is direct proportional, and any reduction in fuel consumption will produce a corresponding CO_2 reduction.
With the introduction of hybrid buses, an official target of a 30 per cent reduction in CO_2 is aimed.

Major results and lessons learned

There are two types of hybrid buses used in London a series and a parallel hybrid. The series hybrid variant has no connection between the diesel engine and the wheels. Instead the diesel engine, which can be smaller than in a pure diesel vehicle, runs at a near constant speed to power a generator. This charges a battery (or supercap), which powers an electric motor driving the wheels. The parallel hybrid variant is able to drive the wheels over the diesel engine directly if necessary.
Those are the options tried in London to be able to decide which technology will fit best for which purpose.
A future target is to have around 300 hybrid buses on the streets of London by 2012. It is however unknown at this point, how long it will take to convert the whole fleet to hybrid propulsion.

More Information

http://www.tfl.gov.uk/tfl/livetravelnews/realtime/buses/default.html
Information video on you tube:
http://www.youtube.com/watch?v=F0Ujji6mrl4&feature=player_embedded

Evaluation

Exploiting the best suited application field for brake energy regeneration, inner city transport. Larger trial to find out best suited technology for buses.

Posted: 11/2010
Last update: 11/2010
within the ALTERMOTIVE project

Pilot Application of Clean Vehicles in the City of Thessaloniki: The "IMMACULATE" Project

The IMMACULATE project aim was to demonstrate the positive effects of the use of clean vehicles in the urban environment of Thessaloniki, It resulted in the demonstration of an innovative approach for the mitigation of air pollution and noise problems through the introduction of a system based on the combination of clean vehicles and advanced transport telematics and management technologies.

Background & Objectives

Thessaloniki has a population of around 1 million people and experiences a great degree of urbanisation. Thessaloniki is Greece's second largest city and a major business and trade centre of the Balkans. In the city there is a large penetration of private cars circulating mostly in the city centre causing thus traffic congestion (and thus high emission levels). The shortage of parking spaces, especially at the city centre, revealed the need to support the transport system with a mobility management scheme.

It was therefore the project's objective to demonstrate possible contribution of clean vehicles for mitigation of air pollution and excessive noise levels in the city by performing pilot tests with a small fleet of clean vehicles.

A crucial factor in the diffusion and acceptance by the general public of such technologies are projects of demonstrative nature and pilot character. With this project it was the first time that clean vehicles are introduced in the city, the "pilot" fleet comprising of 1 natural gas fuelled mini bus, 1 hybrid electric vehicle (the Toyota Prius), 2 battery electric scooters and 2 electrically assisted bicycles.

The project started on September 1st 2002 with the following planned activities:

- Definition of the specific requirements of different user groups and scenarios of use of clean vehicles in the city of Thessaloniki.
- Definitions of the functional specifications of the vehicles and the state of art transport telematic applications as well as mobility management schemes to use.
- Development of a training scheme for drivers leading to an "eco-driving" knowledge.
- Organisation and execution of a pilot application of clean vehicles in the city of Thessaloniki.
- Technological, socio-economic and usability assessment and performance of a risk analysis of the proposed scheme.
- Monitoring and addressing of legal and organizational issues.
- Performance of a cost-benefit and cost-efficiency analysis estimating the benefits.
- Formulation of application guidelines, policy recommendations and projection to other European cities with the contribution of the European Association for Battery, Hybrid and Fuel Cell Electric Vehicles (most commonly known as AVERE).

Implemention

Considering the specificities of the Greek market and the availability of such technologies, the following vehicles / technologies were selected and implemented: a hybrid electric vehicle, the Toyota Prius, 2 electric scooters, 2 electrically assisted bicycles. The hybrid car was used because of the great potential of this technology in replacing the Internal Combustion Engine (ICE) for everyday transportation needs.

The equipment installed in the vehicles is being used for pilot studies in the city of Thessaloniki for the purpose of assessing the clean vehicle technologies, in terms of technical performance, environmental gains, user acceptance and socio-economic value. RFID tag and smart cards were implemented so as to authorise the hybrid vehicle's access to a specifically retained parking place.

Conclusions

Mean values of CO2 emissions for the conventional vehicle were measured from 14.02% for the highway route to 15.26% for the urban route, thus they were not depending much on the driving conditions.
These values were much lower for the hybrid vehicle in all cases, namely 3.84% for urban route, 6.04% for mixed route and 8.67% for highway.

The highest duration of CO2 emissions was noted at the beginning and towards the end of the trip, while there were significant periods of time where the CO2 emissions were reduced to zero: these periods correspond to the pure electric mode in which the thermal engine is not used.

Thus, even though the peak value of the concentration of CO2 emissions was 15,6%, the average value was only 5.45%. Relevant results occur also for the NOx emissions. Therefore, even though the maximum value of the NOx concentration observed was 400ppm, the average value is only 31.87ppm.

Due to delays in the planning for the filling station the natural gas application has been abandoned by the project. The Municipality could not purchase a natural gas vehicle in case there would be no adequate filling station in the area.

The IMMACULATE vehicle fleet, even though small in size, has been used to derive important qualitative and quantitative results (in terms of emissions and fuel consumption gains) of clean vehicles compared to standard vehicles for specific urban conditions.

As a conclusion of the experiences gained by the project, IMMACULATE has produced an "Applications guidelines handbook" on clean vehicles technologies. These guidelines aim at assisting in designing an integrated support and intervention policy, so as to facilitate the wide introduction of clean vehicles into traffic, until they become competitive as far as market rules are concerned.

More Information

link to the project
another link to media coverage of the project

Evaluation

Example of positive driving force of EU-funds even if the size of the demonstrator is somewhat limited.

Posted: 112010
Last update: 12/2010
within the ALTERMOTIVE project

No. 115

Biogas and biodiesel operated waste collection trucks in Kungsbacka (Sweden)

In 2010 Renova, together with the Volvo Truck Center and Kungsbacka municipality, launched eight very energy-efficient waste collection trucks that run on biogas and biodiesel combined. Those are the first vehicles of this kind in Sweden.

Background & Objectives

Since 2009 Renova has been appointed to collect all domestic waste in Kungsbacka municipality. Renova is the largest waste and recycling company in western Sweden, owned by eleven municipalities, and offers waste collection and transport, sorting, processing as well as consultation and training.

Carbon dioxide emissions from waste collection trucks can be reduced by investing in vehicles in the top environment class, Euro 5, such as vehicles run on both biogas and biodiesel. The main motivation behind developing the combined biogas and biodiesel fuelled waste collection trucks is to contribute to the society™s goal of preventing climate change by reducing carbon dioxide emissions.

Other motivations are improving local air quality and the company™s green image as well as to test and develop new technologies. One important target for Renova™s investments is to continue the change, of their entire fleet, into vehicles that meet the Euro 5 standard. The goal is that by 2012 Renova™s entire fleet of 160 heavy trucks should be Euro 5 classed.

Implementation

The new waste collection trucks are conventional diesel waste collection trucks (of the brand Dennis Eagle) with a Volvo D7 engine which have been reconstructed (in collaboration with Volvo and Hard Stuff) so it can be fuelled both with 100% locally produced rapeseed-based biodiesel and with locally produced biogas. The fuel share will be 70% biogas and 30% biodiesel.

The vehicle is unique by its extraordinary energy-efficiency. The new technology combines the advantages of the energy-efficient diesel engine with the advantages of using gaseous fuel. Another interesting improvement is that the vehicle also has a special ergonomic cabin which radically improves the working environment.

Conclusions

It is to a large extent due to the Swedish municipalities™ flgreen procurement, with clear demands on environmental sustainability, that these eight vehicles now can be introduced and used in Kungsbacka.

The fuel consumption, for these trucks, is 25% less than for a conventional gas-fuelled waste collection truck. One of the eight trucks does also have a fiplug-in-technologyfl to be able to opera the compressor and the bin loading with electricity.

Regarding the working environment, the organisation "Feelgood" has given highest marks for the cabin™s ergonomic. Arguments for the judgement are e.g., that the refuse collectors more easily can go in and out of the cabin due to the low footboard (step) on both the right and the left side (refuse collectors may get in and out 200 times during a day).

The vehicle has also been judged more silent than conventional diesel fuelled trucks.

More Information

Renova website
Renova™s press release (in Swedish)

Evaluation

Consequent and successful way of the waste collecting company demonstrating the use of biofuels, even if the application is a niche for vehicle manufacturers.

Posted: 11/2010
Last update: 12/2010
within the ALTERMOTIVE project

No. 116

Cleaner and more efficient B10 and hybrid electric urban buses in Vitoria-Gasteiz

Use of biofuels in the fleet of vehicles belonging to the municipal public transport company (TUVISA): There are 90 Biodiesel (B10) vehicles and 4 hybrid-electric (financed by the European project CIVITAS MODERN = MObility, Development and Energy use ReductioN) in operation.

Background

The project is lead by the *Agencia Energética de Vitoria-Gasteiz*. It was also supported by the Basque Energy Agency that participated in the European project BEST (Bio-ethanol for Sustainable Transport). The purpose of the European BEST project was to introduce bio-ethanol as an everyday fuel. The project as proposed by the Basque Energy Agency was to promote the creation of a network of pumps offering different bio-ethanol blends at petrol stations and encouraging the purchase of flexi-fuel cars that can use the top blend (E-85). As a consequence of the BEST project, two petrol stations offer different bio-ethanol blends in Vitoria-Gasteiz.

Major targets

One of the targets of the Local Strategy for the Prevention of Climate Change of Vitoria-Gasteiz is to reduce transport and traffic emissions, especially those of the public transport fleet. In this sense, the Strategy shares one of the objectives of the Local Air Quality Management Plan 2003-2010, which is to promote biofuels in the city by extending their use to all the vehicles in the municipal and public transport fleets.The Local Energy Plan proposes replacing 12% of the fossil fuels consumed by the municipal transport fleet (300 tons of oil equivalent TOE) with biofuels by 2012.

Major results and lessons learned

The measures to promote bio-fuel in Vitoria-Gasteiz were supported by two European projects: BEST (Bio-ethanol for Sustainable Transport) and CIVITAS MODERN = MObility, Development and Energy use ReductioN).
There are 90 bio-fuel vehicles and 4 hybrid-electric vehicles in operation. Data on consumption and saving is expected in the end of the CIVITAS MODERN project.
There was a good support by local policy makers. In spite of not having hard data it is generally perceived that acceptance was good among services and public.

More Information

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Evaluation

Step into the direction of higher biofuel share. Although not very difficult in the implementation this shows that merely every transport operator may follow on the low blending path. More investments are needed however going hybrid- financial incentives like being present in the U.S.A. are lacking on an European level.

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Last update: 11/2010
within the ALTERMOTIVE project

No. 117

Lisbon waste collectors compactors

In June 2007 a fleet of 14 IVECO, Model Eurotech MP 190 E26P G CNC, were bought by the local authority of Lisbon. Of these vehicles 10 were Natural Gas compactors for waste collection on the street, 3 for organic waste collection and 1 for cleaning waste deposits. During 2009 25more Natural Gas vehicles were added to the fleet - this time 5 were totally new vehicles and 20 were bought without the superstruccture (in these cases an old superstructure from older vehicles was installed).

Background

The acquisition by the local authority of Lisbon waste collection services dates from 2007. Since then 39 Natural Gas vehicles are in operation. The vehicles operate in the area covered by the local authority of Lisbon collecting garbage on the streets. No incentives were received.

Major targets

The acquisitions were decided based on the environmental policies dictated by the local authority (CO_2 and particles reduction), lower maintenance costs and fuel price. Noise reduction was also a factor for the acquisition of these vehicles.

Major results and lessons learned

Each new vehicle costed around 170,000 Euro. The fleet now includes 39 Natural Gas vehicles. The acceptance by the services and the general public was good.

More Information

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Evaluation

Thanks to such projects, CNG may now be seen as state of the art not only with buses but also with refuse trucks. Further effort is needed to reduce the GWP when using methane. Following Lille inserting digester produced methane would be an option.

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Last update: 11/2010
within the ALTERMOTIVE project

No. 118

Electric vehicles (buses) for the cities of Cesena and Forlì fiGreen Transportationfl (Italy

Innovative project concerning the diffusion of electric buses for urban public transport. Electricity will be produced via photovoltaics installed on the roof of the open bus shelter at the depot.

Background

The consortium *Romagna Innovazione* aimed to develop an electric powered fleet of buses to use as public transport in the cities of Cesena and Forlì (Emilia Romagna region).
This continued the development of environmental friendly and sustainable public transport in cities that already has clean means of transport (bicycle is a quite widespread use in the city centre)

Major targets

To install sustainable power generation on the roof of the ATR (Local public Transport company). A photovoltaic infrastructures shall power the electric buses used in the city centres.

Major results and lessons learned

Involved vehicles
18 electric buses (total ATR fleet is 106 for urban and 127 for extra-urban transports). One of the highest rate of electric buses in medium size cities

Reduction of green house gas emissions
In total the estimated reduction of CO_2 emissions is around 121 t /year. This equal to a medium size car travelling for 7,000 km/year.

Economic impact
The economic impact of the project is also relevant: Consumption of the electric buses in Forlì account for 100,000 kwh/year. The energy produced by the photovoltaics installed on the roof of the buses parking is around 120,000 kWh/year.This will cover 67% of the buses consumption (350,000 kWh/year compared to a PV production of 235.000 kWh/year).

Cooperation between Public transport companies and consortium for sustainable transports is a key factor in successful pilot projects. Further the two cities confirm a strong long term involvement to introduce cleaner public transport as this project introduce photovoltaic powered buses that are added to the 25 methane buses that already run along the network.

More Information

ATR Web site (in Italian)
pdf article (in Italian)

Evaluation

Shows that local initiative may create a larger stimulus to implement a technology which would be regarded as immature and too expensive by public transport operators. Also worth to mention that renewable power is put on that very fine attempt to green public transport.

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Last update: 12/2010
within the ALTERMOTIVE project

No. 119

Bonus to citizens acquiring electric vehicles in Modena (Italy)

The city administration of Modena budgeted bonuses to citizens acquiring electric (non hybrid) vehicles

Background

From 2001 to 2009 the city administration budgeted 800.000 Euro to grant 3500 citizens having bought electric vehicles.

Major targets

The main aim is to spread use of electric vehicles in the city centre widely. Due to a higher price tag when ordering an electric propulsion system, a subsidy was set up to overcome that price barrier. An additional budget of 110,000 Euro has been allocated to develop the long term project.

Major results and lessons learned

3,500 bonuses were granted covering 35% of the final cost of the vehicle with a minimum of 361 Euro (electric bicycle) maximum of 5,000 Euro each (electric car). Due to traditional use of bicycle in the urban area and they very high price of battery electric cars, the great majority (98%) of bonuses were granted to buy electric bicycles. This leaded users to avoid car use even for longer distances. In fact the shift from motor scooter to electric bicycle is due also to cheaper fuelling (less than 0.20 euro for 30 km)

Other benefits for citizens subscribing to use electric vehicles were: Free use of limited traffic zones; no parking fees; No insurance and property tax are paid by users of electric vehicles.

More Information

web site City of Modena

Evaluation

PEDELECs/EPACs are now penetrating the private fleets anyhow but this early initiative was very necessary to create no doubt that this transport means is one of the most environmentally friendly. Upcoming initiative should include incentives for (battery) recycling in the funding or focus on sustainable production ingeneral.

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within the ALTERMOTIVE project

No. 120

Electric Mobility E-Moving Project in Milan and Brescia (Italy)

A2A and Renault car company to develop electric car for urban mobility in Milan and Brescia (Italy)

Background

After a memorandum signed in 2009, A2A (electric utility company) and Renault (car manufacturing company) launched the *E-moving* project involving private and public bodies to test 60 electric cars.

Major targets

The main aim is to test use of two zero emissions vehicles:

- Kangoo commercial vehicle and the
- Fluence car for professional/private family use.

A2A will provide charging areas in the Milan and Brescia areas. The objective is to spread the use of electric vehicles widely both for commercial and private use.
270 charging point s will be available (200 in Milan 70 in Brescia). 150 of them will be located in public areas, 120 in private areas. Both fast (20-30 minutes) and standard (6-8 hours) charging systems will be available. The electricity will be produced only by renewables (hydraulic energy)
A flat tariff will be charged to clients for charging.
The autonomy of the vehicle will be 160km (at max.).
The tested vehicles will be offered in a leasing scheme.

Major results and lessons learned

Involved vehicles
60 zero emissions vehicles (20 cars and 40 commercial van) targeted.
Pilot project that will test all aspects related to the technical logistic and economic issues related to sustainable transports.

More Information

web site A2A
website renault
web site City of Milan

Evaluation

Project that adds another e-mobility initiative in Italy and may create a wider trend if successful. Italy has the advantage having producers of all kinds of electric vehicles starting with very small ones reaching to buses which makes implementation easier.

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within the ALTERMOTIVE project

Egypt's Clean Fuels Initiative

Compressed natural gas (CNG) is being produced in Egypt to fuel natural gas vehicles (NGVs). The use of CNG for the transportation sector was introduced since 1995 as a partial solution mitigating heavy pollution problems affecting Cairo, to reduce dependence on gasoline and to benefit Egypt's abundant natural gas.

Background

Egypt sought solutions to Greater Cairo's heavy air pollution and public health concerns. In the frame of its national policy to switch from oil to natural gas, the use of natural gas as a transportation fuel was endorsed as a means to also improve air quality and public health. In addition, this would create a new customer segment for the domestic consumption of Egypt's abundant natural gas reserves.

Major targets

Clean Air Initiatives in Egypt have focused on reversing the deterioration of air quality resulting from rapid population growth, traffic congestion and old vehicles, and industrial production.

Egypt's Petroleum Ministry embraced the use of natural gas as a transportation fuel and in 1992 directed that two pilot projects be initiated to 1) ensure that Egypt's natural gas performed well as a vehicle fuel and 2) to prove that the available CNG fuelling station technology would reliably function to support this potentially new transportation fuel customer segment. After the successful outcome of these two projects, the Egyptian government through the natural gas vehicle program encouraged the private sector to begin commercializing natural gas vehicles (NGVs). A decree from the Petroleum Ministry required all approved CNG companies to carry out two major objectives. The first is to construct and operate CNG fuelling stations, and the second is to construct and operate vehicle conversion centres. As a result, each vehicle conversion also produces a customer for the CNG fuelling station, promoting thus more efficient CNG market development.

Major results and lessons learned

In December 1994 the first company to convert gasoline vehicles to natural gas was formed. About 180 CNG vehicles were introduced during the two pilot projects (150 bi-fuel automobiles and 30 dedicated CNG mid-size buses).

By the end of 2005 there were six operating CNG companies, 93 CNG fuelling stations set up by the government and private CNG marketing companies and 26 vehicle conversion centres in the Greater Cairo area, along the Suez Canal, and north to Port Said and Alexandria. More than 63,000 CNG vehicles are in use, 75 per cent of which were taxis, mainly in Cairo. This represents about 3 per cent of the world's CNG vehicles. The oil ministry is to switch Cairo's entire public transport system to gas, to be followed by Greater Cairo's 120,000 taxis. Egypt now ranks number 8 out of the 49 countries conducting clean fuels' programs based upon the total number of CNG powered vehicles. In addition this new industry has created over 800 jobs that are needed to manage, operate, and maintain these CNG fuelling stations and vehicle conversion centre facilities. A primary key to the NGV industry's success in Egypt is a package of incentives offered by the government, including five-year tax holidays for CNG companies, low-cost conversion charges for car owners and the attractive price differential between CNG and gasoline (CNG costs less than half the gasoline price). In addition, a typical vehicle conversion costs the customer about $1,500), thus owners of high fuel use vehicles, such as taxis, can recover their cost of vehicle conversion in as little as six months from fuel savings alone. This clearly explains why taxis have been the most converted fleet.

In addition, CNG's characteristics include excellent engine starts in temperature extremes due to its 130 octane rating.
Recently, Egypt's CNG industry will implement a new Gas Card system. All customers who have outstanding conversion loan balances, and all new financed conversion customers, will begin paying the gasoline price each time they fuel with the difference being credited against their receivables' balance.

Another exciting development for Egypt's CNG growth was the EEAA/USAID-sponsored Cairo Air Improvement Program (CAIP). This initiative focused on improving Cairo's air quality through reducing harmful emissions from lead smelters and vehicle exhausts. Part of the programme included providing 50 dedicated CNG public-transit buses to the CTA and GCBC. The bus bodies are locally manufactured, the CNG engines are manufactured by Cummins in the United States and the rolling chassis were supplied by a US manufacturer. Key challenges for the government have been to fund the conversion of the some 3,500 public buses operating in Cairo and change the price differential between CNG and diesel, which is heavily subsidized.

A sustainability Plan for CNG Bus Pilot Fleet was issued to assist the Cairo, Egypt Public Transit Sector in addressing sustainability issues regarding their current and future CNG bus fleets.

Based largely on the local end users' experiences, the following sections discuss some of the key barriers to expansion of the CNG transit fleet and possible steps that can be taken to overcome those barriers. This will enable staff to evaluate future proposals and incentive programs involving CNG buses with expanded knowledge and help ensure that future funding efforts are expended towards the most efficient and cost-effective methods of expanding and maintaining CNG bus fleets.

More Information

- Frank Chapel, Managing Director - Natural Gas Vehicles Company (NGVC) & VNG Project Manager - BP Egypt
- Economic Analysis and Incentives in Environmental Policy and Decision-Making with Respect to Chronic Ambient Air Pollution in Cairo, Micheal A. K. Smith, Ahmed G. Abdel-Rehiam and Dahlia Latayef. (Paper presented at Environment '99 Conference in Cairo, Egypt.)
- EGYPT - CNG For NGVs APS Review Downstream Trends, 2000

Evaluation

Egypt is a good show case for exploiting domestic alternative fuel sources. However industrialisation- in order to create a regional field of strength in alternative fuel usage- is not sufficient. Therefore a holistic approach merging local conditions and opportunities would be needed to achieve a higher penetration in less regulated transport areas as for example with taxis, delivery vans etc..

Posted: 12/2010
Last update: 01/2011
within the ALTERMOTIVE project

No. 122

Natural Gas Vehicles in Grenoble

In 1996, the city of Grenoble, with the help of the local gas supplier GEG, started to implement natural gas powered vehicles. There are now 157 natural gas vehicles, which represent 23 % of the number of vehicles.

Background

Since 1996, local authorities have to purchase 20 % of ficlean vehicles. There was the opportunity to profit from a local natural gas vehicles parts manufacturer and a local gas supplier to install a filling station.
Since few natural gas vehicles were available, gasoline vehicles have been modified to be able to use natural gas adding costs to modify vehicles.
Natural gas represented 30 % of the consumption of the natural gas vehicles in 2008, and the objective is to reach 80 % (70 % has been achieved at the end of 2009).
There are 64 cars, 65 small vans and 28 big vans running on natural gas.

Major targets

The main target was to answer to the new regulation by using local opportunities for natural gas vehicles.

Major results and lessons learned

The CO_2 savings in 2008 were 7 tons. If the ratio of 80 % of use of natural gas is reached, it will lead to a save of 18 tons of CO_2/year
The cost of fuel is 6 •/100 km for NGV, to compare with 10 •/100 km for diesel.
The return time on investment varies from 5 years (for a vehicle using 70 % of NGV and covering 4 000 km/year) to 10 years (for a vehicle using 35 % of NGV and covering 2 000 km/year)

There are still few vehicles directly available with NGV motorisations. It implies costs to modify vehicles.
Some users were at first afraid of natural gas (because of safety concerns).
However vehicles originally produced to run on natural gas are reliable. Their drivers are fully satisfied.
Mechanics have acquired experience and know-how on these vehicles.

Evaluation

The project is not so bad off having a lot of natural gas vehicles on the market - namely from Italy and Germany. It is a good example that public fleets once committing to pursue an alternative solution seldom fail doing so completely. And its is good to see that mechanics may adapt to the new technology because in a lot of cases changes of procedures and skills are hindering the internal acceptance.

Posted: 12/2010
Last update: 01/2011
within the ALTERMOTIVE project

No. 123

World leader in automotive LPG usage - large initiative to introduce CNG buses

Korea leads the pack by running 1.72 million vehicles (2003) on liquefied petrol gas LPG. After detecting deficits in the technological development, recent initiatives try to prolong the success by introducing liquid phase injection technology.

Background

Since 2003 conversion of small and medium-sized diesel vehicles to LPG has been subsidized by The Ministry of Environment Korea. Conversion is funded by the government encouraging the use of LPG cars. Other incentives include exemptions from regular inspections for 3 years and the surcharge for environment improvement.
Furthermore a pilot project was implemented in Seoul (2003/04) installing 135 LPG vehicles including garbage trucks (ranging from 1 ton to 2.5 tons) and 25-person vans.
In a program running till 2012 1,233 garbage trucks were converted targeting 5 to 8-year-old diesel cars owned by transportation companies operating more than 30 vehicles.

Major targets

The conversion of diesel engines to LPG and other special Measures for Metropolitan Air Quality Improvement aim to achieve air quality standard of advanced nations within 10 years.

Major results and lessons learned

The following facts were identified:

- Particulate emissions may be reduced (by 100%) and NO_x (by 60%) when switching from diesel to LPG.
- LPG engines have improved torque in low speed as well as increased power in total.
- The noise level is reduced typically by 8 to 9dB.

The increasing difference towards the advancements of the mainstream engines needed a special program improving LPG technology.
Korea is also focusing on other technologies like CNG but the LPG initiative is a good example how implementation programs have to think also about innovation curves and industrial policies to be successful in terms of being able to use state of the art propulsion technologies.
Due to the high erection cost for CNG fueling station construction the deadline for replacing all diesel-powered city transit buses with compressed natural gas (CNG) buses until 2010 (previous plans mentioned a target of 5,000 CNG buses by 200) had been postponed by the Ministry of Planning and Budget (MPB) showing an over arching strategic least cost approach. On the other hand in a local initiative Busan City replaced 1,069 local buses with CNG buses in 2009 intending to double also the number of refilling stations (from 15 to 30) by 2012.

It cannot be denied that the attraction of zero emission battery electric mobility has now introduced a strong competitor for LPG and CNG. So far there are only 5 buses in operation but Seoul has committing itself to convert 50% of all public transport vehicles to electric propulsion by 2020. Bus driver think that recharging is too frequent for the length of the route and the time it takes to recharge should be improved. Since Korean industry is also active in inductive power supply the underground we may see mitigation from this side too.

More Information

Korean LPG Association
Press article about CNG conversion
Press article about the City of Busan introducing CNG buses
Electric Buses on Mt. Namsam
Electric Buses on Mt. Namsam
On-Line Electric Vehicle

Evaluation

The pace of technologies featured in Korean projects is high. Korea certainly has the industrial strength and the concrete will to move on to clean transport. The initiatives presented here are of regional importance, there are many countries where Korean buses have no high share. It would however be very positive if the initiative would extent to Korean car exporters allowing more usage of biofuels and affordable zero emission vehicles so the whole world my profit from the initiative. It may start with affordable full fledged hybrid electric vehicles capable of operating on E25 or B30.

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within the ALTERMOTIVE project

No. 124

Amsterdam Electric - stimulating electric transport in Amsterdam

The city of Amsterdam stimulates electric transport by building charging points and other measures for companies and residents. The *Amsterdam Electric* initiative started in 2009 and aims for 200 charging points and 200 electric vehicles in 2012. In 2015 10,000 electric vehicles must drive through the city.

Background

Amsterdam Electric is a project of the municipality of Amsterdam together with other partners including electricity provider Nuon and grid operator Alliander. The initiative started in 2009 and aims for 200 charging points and 200 electric vehicles in the city in 2012. Amsterdam™s goals is to be a clean, healthy and liveable city for its current residents and future generations. Electric transport offers the city a way to significantly improve air quality, which is also good for the environment, while stimulating the city™s economy.

Major targets

Aim of *Amsterdam Electric* is to give electric transport a strong stimulus. This is done via the construction of charging stations (200 charging stations between 2009-2012) and implementing measures to make electric transport more attractive for residents and businesses. The city aims to have 200 electric vehicles in 2012; 10,000 electric vehicles in 2015 (or 5% emissions-free kilometres); 40,000 electric vehicles in 2020 (or 20% emission-free kilometres) and 200,000 electric vehicles in 2040 (100% emission-free kilometres) in the city. Although the focus is put on electric vehicles, also other electric transport is stimulated (bikes, scooters, boats, trams, metro and buses).

Major results and lessons learned

The project is not finished yet so no final evaluation has taken place. After the first year the project 200 people use the 100 charging point built and in total 70,000 electric kilometres are driven in the city.

Some of the charging points are only for scooters, but most are for cars (including a free parking space for electric cars). All electricity is 100% green and charging is for free (at least until March 2012). The placement of the public charging points is done in cooperation with electric vehicle owners. This way the points are build on places with best convenience for the users. The municipality also compensates part of the costs of the placement of private charging points. Companies can apply for a subsidy to cover 50% of the extra costs of the electric vehicle. In total 3 million Euro of subsidies is available.

More Information

Amsterdam Electric website

Evaluation

The initiative presented here is supported by the tendency of Amsterdam's citizens using clean transport means like bicycles to a higher degree. Battery electric cars may be a good amending transport solution but transition may be seen as problematic if there is only one car per family and more bicycles. The introduction of electric cars might concentrate more on joint ownership models for those cases.

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No. 125

Mobi.E: The Portuguese Programme for Electric Mobility

The Programme for Electric Mobility in Portugal is an open-access and market-oriented concept, with the goal of attracting private investors, benefiting the users and promoting the fast expansion of electric mobility in Portugal. The Mobi.E model grants universal access to any car and battery manufactures, electricity retailers and Recharging Network Operators. This will be a competitive open system and users may choose the best offer in the market at any time. This will be achieved through a Managing Authority, which will act as a Clearing House.

Background

Mobi.E is an ongoing project covering the whole Portugal. It is a governmental programme to encourage the expansion of electric mobility. The technological consortium involves different entities: INTELI, responsible for the concept and the model development; NOVABASE, which developed the IT platform; EFACEC, which developed the recharging solutions; EDP INOVAÇÃO, the innovation department of EDP, the Portuguese energy utility; CEIIA, responsible for styling and engineering; and SIEMENS, which is in charge of the home recharging. The partnership has signed an agreement with the Renault-Nissan Alliance.

Tax incentives for Electric Vehicles (EV)
The Portuguese tax system provides several incentives for the purchase and use of EV's which are not available to ICE vehicles including Hybrids.

a) Vehicle tax exemption - EV's are fully exempt from Vehicle Tax due upon purchase.
b) Vehicle circulation tax exemption - EV's are fully exempt from the annual Circulation Tax.
c) Personal income tax allowance - Personal Income Tax provides an allowance of EUR 803 upon the purchase of EV's.
d) Company car tax exemption - EV's are fully exempt from the 5%-10% company car tax rates which are part of the Corporation Income Tax.
e) Electric vehicles special tax incentives starting 2010 - The Budget Law for 2010 provides for an increase of the depreciation costs related to the purchase of EV's for the purpose of Corporation Income Tax.

Monetary incentive
The first 5,000 EV's sold until the end of 2012 will receive a direct subsidy of €5,000 on purchase, which may increase an additional €1500 if it replaces an end-of-life vehicle, for the first 5000 vehicles - sold by the end of 2012;. This incentive may only be used by families.

Public procurement
The Portuguese State did also commit to play a pedagogic role and defined that EV's will have a 20% share of the annual renewal of public car fleet, starting in 2011.

Communication and education
An effort is being done in order to communicate the advances of Mobi.E and the advantages of electric mobility - with road shows, conferences, demonstrations.

Major targets

In order to kick-off the electric mobility in Portugal, Mobi.E is implementing a pilot recharging infrastructure. This network comprises 1,300+ normal recharging points (fully recharges a battery in 6 to 8 hours) and 50 fast recharging points (recharges 80% of a battery in 20-30 minutes). The first recharging point was installed in Lisbon in the end of June 2010 and new recharging points are being installed every week. The entire network will be in place before the end of June 2011.

The 1,300+ normal recharging points will be distributed in 25 municipalities all around the country. These 25 municipalities form a Living Lab and each municipality had to design its own Local Plan for Electric Mobility. The 50 fast recharging points will be installed in the main motorways in order to make possible travelling all around the country.
It is estimated approximately 130,000 EV in circulation in Portugal by 2015 and 750,000 by 2020. The scenarios for the reduction on GHG emissions forecast a reduction ranging from 772 kton of CO2e to 3,894 kton of CO2e between 2011 and 2020, depending on the number of EV and the emission factor considered.

Major results and lessons learned

The costs of the first charging points and incentives are covered by the National Budget and EDP, Portuguese energy utility. 25 Local Authorities were involved and did their own Electric Mobility Plans. Given that EVs are still not available in the large scale consumer market the results can only be accessed after 2011.

More Information

Mobi.E Web site
GAMEP
Gabinete para a Mobilidade Eléctrica em Portugal
Rua da Horta Seca, 15
1200-221 Lisboa

E-mail: gamep@meid.gov.pt
Source: Neves, T et al. Mobi.E: Portuguese Programme for Electric Mobility, European Transport Conference, 2010, Glasgow, Scotland, United Kingdom.

Evaluation

The project represents a fine example supporting the roll-out of electric mobility, exploiting mostly financial incentives. There is however some risk that the subsidies may be reduced or cancelled if the demand for electric vehicles increases significantly and state debts too in parallel before reaching the diffusion targets. In markets without own auto-mobile industry it would be easier to set up tougher rules for licensing cars supporting zero emission vehices, but we may only hope that the market is important enough so producers will follow with affordable battery electric cars. Utilisation of solar charging would be interesting to access in the project since Portugal has a good potential. For both problems cars and panels affordable European products are scarce however.

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No. 126

Hydrogen HyMove project in Arnhem, the Netherlands

The HyMove project aims to stimulate the use and development of hydrogen in transport. This is done by bringing hydrogen to people's attention and developing an hydrogen infrastructure in the Arnhem region. During the first phase of the project a hydrogen fuelling station was opened and a hydrogen bus is used as a showpiece. From 2011 onwards more hydrogen vehicles will be used.

Background & Objectives

The initiators of the HyMove project view hydrogen as an energy carrier with large advantages when applied in transport. The emissions of vehicles using hydrogen are low and hydrogen reduces the dependency on oil, coal and nuclear energy because it can be produced from many different energy resources. To realize these advantages, the technology will be tested in practice in the HyMove project.

HyMove started in 2009 and is financed by the province of Gelderland, the Arnhem-Nijmegen Urban region, the municipality of Arnhem and participating companies. Together they contributed 2,6 million euro for the initial phase of the project. The Gelderland Hydrogen Enterprise Foundation has been set up to implement the HyMove project.

Implementation

The objectives of HyMove are to bring hydrogen to people™s attention, to develop a hydrogen infrastructure in Arnhem as well as having vehicles in the region. To realize this the first phase of the project consists of building a hydrogen bus, purchasing a number of hydrogen cars and installing a refueling point in Arnhem. In addition HyMove should increase the reputation of Arnhem as a region that is actively seeking solutions for environmental impact of transport.

Conclusions

The project has started only recently. However many parts of the first phase have been accomplished. The first bus in the HyMove project is a showpiece to ensure visibility of the project in the region. From 2011 on it is used in the normal city bus timetable.

In December 2010 a hydrogen filling station was opened in Arnhem. The licensing procedure was a time-consuming process because no regulations nor procedures were set up yet for hydrogen filling stations. At the beginning of 2010 the Netherlands Standardization Institute published the first guidelines for hydrogen filling stations which were followed in the design and construction of the station.

In 2011 a number of hydrogen vehicles will be used in the HyMove project. Apart from the hydrogen bus, a hydrogen electric truck will take in second hand goods in the region. Also the Arnhem municipality will use a hydrogen electric Fiat Doblo in its carpool. This car was retrofitted to hydrogen by the HAN Automotive university, who also took care of the official certification processes necessary to drive in public roads. The first privately owned car associated with the project will be a converted Subaru Impreza rally-car.

Further investigation takes place about what other cars and buses can be used and tested. Many manufacturers are developing hydrogen cars, but most prototypes are either still very expensive, not available or not approved for use on the roads in the Netherlands (e.g. Toyata Prius with ICE hydrogen). Arnhem region is now seeking out other EU-regions and partners for the second phase of the project, including joint development and deployment of more hydrogen electric vehicles.

More Information

HyMove project

Evaluation

Hydrogen as fuel is so attractive that research projects are prolongued even if the economics are bad and also the CO_2-savings critical if no renewables are included. The project presented may be challenged later whether delivering a business case for hydrogen or pointing to quantum leaps boosting feasibility for hydrogen application.

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within the ALTERMOTIVE project

No. 127

Taxis on green natural gas in the east of the Netherlands

Taxi and driving school *Gebr. Berendsen bv* in Silvolde, a town in the east of the Netherlands, is using two taxis driving 100% on locally produced green gas since November 2010 . The company aims to offer emission free services to its customers who have several sustainability targets. *Gebr Berendsen bv* is one of the first commercial companies in the area to use green CNG as transport fuel and aims to enlarge the number of CO_2 neutral cars in their fleet.

Background

Taxi and driving school *Gebr. Berendsen bv* in Silvolde, a town in the east of the Netherlands offers four different driving trainings and taxi services for individuals and groups. Their fleet consists of 17 vehicles. The company uses only vehicles with a driving range of minimum 500 km. The company prefers green CNG because the fuel is clean, quiet and save and can be used in all vehicles suited for CNG.

Major targets

The taxi and driving school has many customers with sustainability targets. The company likes to react to these targets by offering sustainable services by using CO_2-neutral fuels. Another aim of the company is to contribute to a better climate for next generations. When the first CO_2 neutral cars turn out to be efficient both financially and technically, the company aims to increase the number of cars using alternative fuels.

Major results and lessons learned

Since November 2010 two taxis (Volkswagen Touran) of the company Berendsen are driving on green CNG. The company choose the Touran model because these cars have a large fuel tank, which offers a driving range of 500 km with CNG. Many smaller cars on CNG can only drive 200-300km which is too little for the taxi company. The CNG is produced from local biomass, certificated and cleaned for distribution via a CNG pump in Doetichem. The cars are thus driving CO_2-neutral. The first experiences are good despite some technical breakdowns (more than conventional diesel cars). Berendsen bv interprets these as some start up problems and expects the breakdowns to disappear.

The taxi company is one of the first commercial companies in the region to drive on green CNG, following the example of the municipalities and housing association who started earlier. The company regrets that the reduced road and purchase tax for alternative fuelled cars in the Netherlands do not count for taxi companies. Also no subsidies for taxi companies to test and use alternative fuels exist. This hampers the use of alternative fuels in the sector.

More Information

Company Web Site www.berendsenbv.nl

Evaluation

This small but fie example shows the tremenduous opportunities which alternative fules do offer for SMS transport compynies. Bio-methane allows to use EEVs from major OEMs without any compromise. The case shows that it is possible to circumvent the chicken and egg problem with regards to infrastructure/fuel and vehicle supply. Manufacturers of CNG engines are asked to improve reliability and efficiency of their makes though.

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within the ALTERMOTIVE project

No. 128

More environmentally benign busses in Vienna (Austria)

The city of Vienna improves the environmental quality of its public bus fleet continuously. In 2005 the development of a new generation of LPG-engines was finished. By 2012 the hybridisation of the bus fleet will start.

Background

To continuously improve the energetic efficiency an the environmental benignity is a major and enduring goal of Vienna™s municipal utility WIENER LINIEN. This process started already at the beginning of the 1980s when the local public transport company of Vienna, WIENER LINIEN, started to establish liquefied petroleum gas (LPG) as an alternative-fuel for their busses. Today, in 2011, every bus of the WIENER LINIEN is LPG-powered.
In 2005 the development of a new generation of LPG-engines was finished: Along with the Wiener Linien the vehicle manufacturing company MAN developed an environmentally friendly engine (model number: G 2876 DUH02)

Major targets

Since 2005 these new LPG engines were fitted in the new busses of the Wiener Linien in a consequent way. Since 2007 the development of a further stage of the LPG engine (G 2876 DUH02) was finished. Because of an other fuel injection, the noise of the engine is lower than before and the fuel consumption could get reduced again.

The emissions of these new engine falls more than 50% below the EU-5 standard, which is in force since 2008. It was possible to decrease the fuel consumption and therewith the CO2 emissions by 14% compared to the engine used before (G 2866 DUH05).

Due to a three-way catalytic converter the emissions of NOx are also lower. Furthermore the new engines go below the EEV -Norm (Environmental Enhanced Vehicle) on CO, NMHC and NOx. Only on CO2 the emissions of LPG-engines are above comparable diesel engines.

Major results and lessons learned

Because of the new developed engine the emissions of pollutants and particulates decreased. The use of these engines is a considerably measure against carbon dioxide (CO2) nitrogen oxides (NOx) emissions. These engagements were awarded with the Umweltpreis (Environmental award) of Vienna in 2006. The planned hybridisation starting in 2012 will be a further step in this direction.

Evaluation

Consequent policy exploiting fiscal measures to allow public transport a wide scale implementation of alternative fuel solutions. Further efforts to improve efficiency by introducing hybrid power trains or blending biofuels are appreciated.

Posted: 01/2011

No. 129

Power Surge Programme in Rotterdam, the Netherlands

The *Power Surge* programme aims to stimulate the introduction of electric vehicles in the city of Rotterdam. It has several targets for 2014 including 1,000 free parking places for electric vehicles, 1,000 charging points and making the city of Rotterdam an icon for electric vehicles.

Background

Power Surge (Stroomstoot) is a strong and ambitious programme to stimulate the introduction of electric vehicles in the city of Rotterdam between 2009 and 2014. The programme has four focus points: stimulating electric vehicles in the inner city, more charging points for electric vehicles, free parking for electric cars and room for innovation. The municipality coordinates different projects within this programme.

Major targets

Each of the focus points of the *Power Surge* programme has its own targets. These include making the inner city of Rotterdam an icon for electric transport, financially support the building of 1,000 charging points for private individuals and organizations, create 1,000 free parking places for electric vehicles and support and participate in innovations and experiments related to electric transport. An example of such experiments is a pilot project with 75 electric and plug-in hybrid vehicles. Many different projects contribute to these targets, including free use and testing of electric scooters and bikes, using electric garbage vehicles and an efficient hybrid city bus. The long term aim is to have 200,000 electric vehicles in 2025 in Rotterdam.

Major results and lessons learned

Because the *Power Surge* programme will run until 2014, no final results are available yet. However, some intermediate results can be presented. 10 electric scooters are made available in 2010 for inhabitants of the city to test drive during one week.

15 electric bikes of different brands are made available to companies whose employees want to test them. A food delivery company is using 10 electric scooters as a pilot to test their behaviour when used intensively in company use. In the inner city, 32 segways substitute small passenger cars during surveillance activities. The city also operates a small electric garbage truck, a large hybrid garbage truck and an electric sweeper.

From the different pilots the city already learned that electric vehicles can be used in different specific niches and that the technologies are generally accepted by the users. However, market developments are slower than expected, electric vehicles demand special care and relatively high investment costs are involved. Furthermore, product improvements are still needed.

More Information

Power Surge Website

Evaluation

Broad battery electric vehicle demonstrator including also ultra-light vehicles for distribution, which may be a swifter path into sustainable mobility.

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within the ALTERMOTIVE project

No. 130

Hybrid Bus Implementation in the VRR (Germany)

The traffic association VRR (Rhein-Ruhr) is funding the purchase of 21 hybrid electric buses of its clients with 10.5 million •.

Background

Compared to the U.S.A. Germany is deserted of hybrid electric buses. This certainly has been caused by lacking incentives motivating purchasing by the transport operators. On the other hand hybrid electric propulsion technology is on the market since years and has been maturing with the help of German bus producers. Support of a traffic association for buying clean buses is not new but was not HEV-specific so far.

Major targets

The funding of 10.5 million • by the VRR covers the operation of 21 hybrid electric buses. The main location for their use will be environmental zones. This shows that public bus transport want some improvements for their environmental image, since in Europe engine efficiency is regarded more important than emissions standards especially with regards to particulate matter PM10. This is exactly the other way round in the USA, where hybrid power trains do help to contribute to lower emissions and thus a clean image of ill reputed diesel engines.
In September 2010 the testing of different buses was started within the VRR. The 4 main indicators which were specially monitored are:

- Fuel savings (economic efficiency ,CO_2 emissions)
- Gaseous and particle emissions
- Effectiveness of exhaust gas treatment
- Acceptance of hybrid buses by the drivers, passengers and neighbours
- Impact on local immissions
- Comparative monitoring with two diesel propelled buses (EEV)
- Monitoring of conventional buses: (2 lines in 8 different operating areas)
- Measurement data of all 5 hybrid bus types (2 lines in 4 operating areas)

Results of these tests are going to be published in 2011.

Several suppliers participate in creating a test-bed for further improvements of hybrid electric power trains.

Major results and lessons learned

The project just started and estimates that the fuel savings will account to 20% and more, PM savings up to 90% and NO_x savings up to 39 %.
Apart from all the air pollutant emissions the reduction of noise emissions gained more and more importance in the project. That´s why a noise-action-plan was introduced:

- Cabin noise measurement
- Outside noise measurement (bus stop approaching and leaving noise)
- Drivers and passenger survey (main issue acoustics/comfort)

One condition for gaining a funding for this ambitious project was that a comprehensive accompanying research is made. 15 public and private transport companies and five different bus-producers campaign together in this project.

Lessons learned:
- New technologies have small problems which need to be adjusted over the time.
- Operators and producers collect data to optimize the buses and to expand the fleet further on
- The education and motivation of the drivers is essential
- An evaluation is only possible after the research period

Future steps:
The first step to accelerate the introduction of hybrid buses is reached. Increasing purchase numbers of these buses will lower their prizes over the time and bring more vendors and producers to the market. (e.g.: VDL, VanHool, Irisbus/Iveco, Göppel, –)
The 2nd and 3rd support program of the VRR will fund another 20 Mio. • to the project. More than 50 additional hybrid buses will be purchased over two tenders in 2010 and they will be delivered in 2011. Logical further steps would be to get other transport companies on board to increase the number of companies involved.

More Information

press release in German

Evaluation

Unique attempt of a transport association in Europe to support implemention of new efficient and environmentally friendly propuslion concepts.

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within the ALTERMOTIVE project

No. 131

Industrialisation of fuel cell scooter -field testing (Great Britain)

Mass production approval could be obtained for Europe allowing an implementation of the zero emission scooter running on gaseous hydrogen - following the installation of filling sites in London.

Background

Electric scooters are now entering the mass market with different quality. Depending on the efficiency and durability autonomy differs. To overcome those limitation hydrogen fuelled scooters may step in. However it is a challenge to integrate the fuel cell stack and the hydrogen tank in such a tiny vehicle.
Later this year, Transport for London will start operating five hydrogen fuel cell buses, and the Mayor of London, Boris Johnson, has committed to
working with manufacturers to make all taxis operating in London zero tail-pipe emissions by 2020.

Major targets

The field test of the approved design utilising three units shall give evidence about usability in real world practice. After achieving fitness for mass production a business case for the production is to be validated.
First exhibited at the 41st Tokyo Motor Show in October 2009, the Suzuki Burgman Fuel Cell Scooter, equipped with the latest version of Intelligent Energy™s unique, air-cooled hydrogen fuel cell system, has been participating in a UK public road testing program run by Intelligent Energy and supported by the UK Government™s Technology Strategy Board. The Suzuki Burgman Fuel Cell Scooter design has now met with specified EU performance standards meaning that the vehicle and its components are approved for production and sale within Europe.
Intelligent Energy, Lotus Engineering, LTI Vehicles and TRW Conekt, with funding from the UK Government™s Technology Strategy Board, developed a full performance, zero-emissions Fuel Cell Hybrid London taxi.

Major results and lessons learned

The mass of the Fuel Cell Scooter does surpass the internal combustion version only by 10kg. A 0.5kWh lithium-ion (Li-ion) rechargeable battery helps to keep the fuel cell stack small and allows to work steadily. The drive range of the scooter when travelling at 30km/h is 350km, the maximum speed is 63km/h.
The Fuel Cell Hybrid Taxi unveiled today is not yet commercially available and is presently undergoing track and road-testing prior to wider deployment. The
vehicle will also need to meet the London Public Carriage Office conformity for use as taxi on public roads.

More Information

Motorcycle News
Nikkei Japan news

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