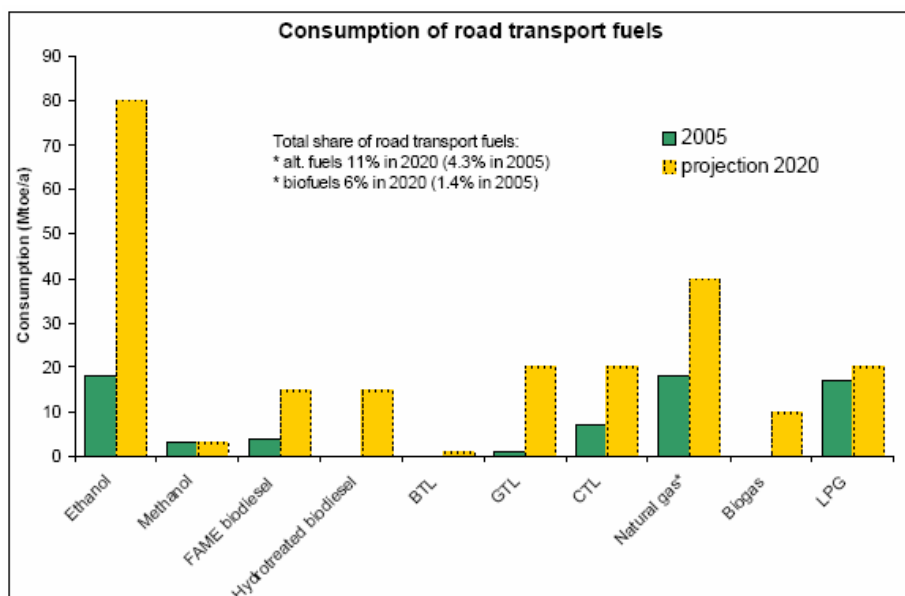




AMFI Newsletter is prepared for the members of the Implementing Agreement on Advanced Motor Fuels of the International Energy Agency (IEA/AMF).

AMFI provides four electronic Newsletters yearly describing recent news on advanced motor fuels, vehicles, energy and environmental issues in general. AMFI Newsletter is available on the website:

www.iea-amf.vtt.fi

Ethanol and natural gas are projected to be the leading alternatives in road transport in 2020. Source: "Status and outlook for biofuels, other alternative fuels and new vehicles (www.vtt.fi/..T2426.pdf).

CONTENTS

GENERAL INTEREST

- ✚ Low-emission-zone in London
- ✚ Biofuels and food crisis
- ✚ Transport ruining European GHG development
- ✚ Bioenergy assessment tool on food security
- ✚ Rotterdam biofuels throughput doubled
- ✚ Sweden to halve the GHG emissions from road freight
- ✚ New fuel economy standards proposed in the U.S.

GASEOUS FUELS (NG, LPG, biogas)

- ✚ DME field test by Volvo
- ✚ Volvo for gas vehicles again?
- ✚ Hythane in India

ALCOHOLS, (BIO)GASOLINE

- ✚ Shell and Virent to develop biogasoline
- ✚ Bioethanol in Italy
- ✚ New factory to produce ethanol from waste in Finland
- ✚ Global ethanol standard

BIODIESEL ESTERS

- ✚ U.S. Biofuel quality survey
- ✚ Biodiesel production slow-down in Europe
- ✚ Biofuels for aeroplanes

SYNTHETIC AND RENEWABLE DIESEL

- ✚ NExBTL plant planned in Rotterdam
- ✚ Status of Helsinki bus biofuel trial

OTHER FUELS AND VEHICLES

- ✚ EU aims at 16 million hydrogen vehicles by 2030

MISCELLANEOUS

- ✚ Swedish Environmental cars: new criteria is planned.
- ✚ Fuel Consumption - miracles

IEA & IEA/AMF News

- ✚ "AMF Outlook" – condensed version
- ✚ Cooperation for transport related Implementing Agreements
- ✚ IEA Open Bulletin interview

PUBLICATIONS

Low-emission-zone in London

The world's largest low-emission-zone, covering 1,577-square kilometres and 7.5 million people, was established in London. Non-compliance vehicles are fined up to £200 per day and risk a further £1,000 fine. Non-compliance vehicles need to be retrofitted with after-treatment devices.

The emission limits are as follows:

- As of 4 February 2008, Euro III PM limit for lorries over 12 tonnes
- As of 7 July 2008, Euro III PM limit for lorries between 3.5 and 12 tonnes and buses and coaches over 5 tonnes
- As of 4 October 2010, Euro III PM limit for larger vans and minibuses
- As of 3 January 2012, Euro IV PM limit for lorries over 3.5 tonnes and buses and coaches over 5 tonnes

Transport for London (TfL), which is implementing the project, says it will cut healthcare bills by £250 million. Trucking companies complain that this scheme is an expensive way to achieve a "minimal benefit". The biggest pollution from traffic in London comes from cars and the scheme does not apply to them," said Gordon Telling, head of policy for the UK's Freight Transport Association. In Europe, 70 towns and cities in eight countries have or are planning low emission zones.

Source: *The London Low Emission Zone Webpages* (www.tfl.gov.uk). *EurActiv.com*, 4 February 2008 (www.euractiv.com).

Transport ruining European GHG development

In Europe, other sectors but transport have succeeded to cut GHG emissions. If the emissions of the transport sector had followed the other sectors, the total EU-27 GHG emissions would have been reduced by 14% instead of 7.9 % during the period 1990–2005. An increase in transport volumes has offset EU policies on improving vehicle technology and fuel quality. To limit transport demand, measures and policy instruments must go into sectors such as households, industry and service.

When policies on transport are considered, the following issues are concerned:

- Growing doubt about the adverse effects of 1st generation biofuels cautions in promoting them further. Biomass in electricity and heat production gives greater reductions in GHG emissions at lower cost. 2nd generation biofuels seems a better option for GHG reductions with lesser adverse effects. However, better knowledge of biomass utilisation impacts and sustainability criteria are needed.
- Passenger transport continues to increase, particularly in aviation and private cars. Air freight also grew, but slightly slower than the overall freight transport. Freight transport is growing faster than the economy. Better internalisation of external costs can help reduce market distortions and emission growth. The share of rail transport has decreased even though it produces less GHG per transport unit than road transport. Transportation of people and goods by water is one of the lowest polluting modes (except for sulphur related emissions).
- Cycling and walking have an important role to play in sustainable transport systems. The integration of land use and transport planning can be instrumental in managing the demand for transport in Europe's towns and cities.

Source: "Climate for a transport change". EEA Report 1/2007. © EEA, Copenhagen, 2008. (reports.eea.europa.eu).

Biofuels and food crisis

The prices of wheat, rice and maize have nearly doubled in the past year, and prices of other feedstock have been rising. This has led to political instability and deepening poverty in many regions. Food Aid Programs are in trouble as more funding is needed to cover the planned quantities.

The food crisis did not come as a surprise. The buffer stocks of major feedstock have gradually decreased.

The main cause for the food crisis is the world population growth. The major growth of food consumption takes place in emerging economies, especially in China and India. Prosperity has led to an increasing consumption of food per capita, especially meat and processed food. In addition, climatic issues such as flooding, and desertification in China and sub-Saharan Africa, are decreasing the global food production.

The transport sector is one factor behind rising food prices. The transport sector is using increasing volumes of biofuels, which are produced from edible feedstock or competing of land usage with the food industry.

Source: Reuters, news in April 2008. (www.reuters.com).

Bioenergy assessment tool on food security

FAO, Utrecht University's Copernicus Institute and Darmstadt's Oeko-Institut have developed a modelling tool to study the effects of the bioenergy industry in respect of risks for food security. This tool evaluates technical biomass potential, biomass production costs, the economic bioenergy potential, macro-economic consequences, national and household-level impact and consequences on food security. Existing mathematical modelling tools are used, such as Quicksan, which calculates global bioenergy potential to 2050, and FAO's COSIMO, which models the agricultural sector in a large number of developing countries. This tool will be field-tested in three countries – Peru, Thailand and Tanzania – before the analytical framework methodology is made available to the international community at large.

Alexander Müller, FAO Assistant Director-General for natural resources and the environment, said that FAO would make every effort to ensure that food security issues are on the table when the "Kyoto II" Protocol is negotiated. Although climate change could reduce yields from the main crops in sub-Saharan Africa by up to 40% in the next 25 years, food security is not part of the negotiations road map adopted at last December's UN Conference in Bali, Mr Müller noted. "The challenge will be huge for sub-Saharan Africa," Mr Müller said. According to experts, however, the development of the bioenergy sector in Africa could help mitigate the effects of climate change there. *Source: FAO unveils new bioenergy assessment tool - Weighs impact on food security, 8 February 2008. (www.fao.org).*

Rotterdam biofuels throughput doubled

Throughput figures for biofuels in the port of Rotterdam doubled in 2007, compared to 2006. 1.2 million tonnes of biodiesel, 1.6 million tonnes of bioethanol and 0.3 million tonnes of ETBE were handled. Rotterdam is the most important link between the global and European biofuel flows. A further expansion and deepening of the market is expected.

For ethanol, the major share, 1.2 million tonnes, involved imports. The growth in ethanol imports originates from its usage as fuel. About 40% of imports came from Brazil. Strong growth from September 2007 onwards took place due to the increased price of feedstocks (wheat) for ethanol production in Europe. The main destinations remained Sweden (40%) and the United Kingdom (15%).

For biodiesel, the ratio of incoming/outgoing trade of the 1.2 million tonnes handled in 2007 was 60/40. The incoming trade is accounted for mainly by B99 (99% biodiesel and less than 1% regular diesel) from the U.S. In the U.S, this blend gets a \$1 per gallon subsidy. The European producers are trying to change this situation via the EU. A solution could be found in restricting the subsidies to the country's own production. The U.S. also imports biodiesel from South America and then re-exports at a profit. Much of the biodiesel was re-exported via Rotterdam, a third of outgoing trade went to the UK. Spain, France and Latvia each received around 50,000 tonnes. *Source: Port of Rotterdam, Press release, 29 February 2008. (www.portofrotterdam.com).*

Sweden to halve the GHG emissions from road freight

The Swedish Road Administration, the oil company Preem, the trucking company Schenker, Volvo Trucks and the Centre for Environment and Sustainability at Chalmers and Göteborg University have joined together in a partnership called "On the Road to Climate Neutral Freight Transportation". The group's target is to cut the climate impact of the average shipment by half already by 2020. The partnership focuses on improving the efficiency of transportation logistics, fuel production efficiency, vehicle efficiency, as well as expanding the use of renewable fuels. *Source: Report "On the Road to Climate Neutral Freight Transportation" (in English), 22 February 2008. (www.vv.se).*

New fuel economy standards proposed in the U.S.

U.S. Department of Transportation (DOT) has proposed that fuel efficiency for passenger vehicles and light trucks should increase by 25% from 2011 to 2015, to an average value of 31.6 miles per gallon. For passenger cars economy would increase to 35.7 miles per gallon and for light trucks to 28.6 miles per gallon by 2015. The proposal would save nearly 55 billion gallons of fuel and reduce CO₂ emissions by 521 million metric tons. The proposed rule allows for automakers to earn credits for exceeding Corporate Average Fuel Economy (CAFÉ) standards. This gives manufacturers flexibility to meet the standards without compromising their economic vitality. *Source: U.S. Department of Transport. 22 April 2008, DOT 56-08 (www.dot.gov)*

In December 2007, President Bush called for an energy plan, including a target for fuel economy of 35 miles per gallon (equivalent to 6.8 litre/100 km) by 2020, which will increase fuel efficiency by 40%. (see AMFI Newsletter 1/2008).

GASEOUS FUELS (NG, LPG, biogas)

DME field test by Volvo

The Swedish Energy Agency has granted AB Volvo around 1.4 million EUR (SEK 12.8 million) for field testing of the 3rd generation DME technology for heavy vehicles. The first trucks of a total of 14 trucks are scheduled to be placed in traffic at the end of 2009. The field test is part of a project comprising demonstration of the entire technology chain, from biomass to fuel in the trucks. AB Volvo, Chemrec, Delphi, ETC, Haldor Topsoe, Preem and Total are partners in the project, which applies for support from the EU's Seventh Framework Program (FP7).



Volvo's DME truck. Photo with courtesy of AB Volvo. (www.volvo.com)

In June 2006, the Swedish Energy Agency granted AB Volvo 6.6 million EUR (SEK 62 M) for the development of 3rd generation DME technology, which now will be tested in the field trials. AB Volvo is also investing major funds in the projects.

Volvo's own studies have shown that DME has a potential to become a highly competitive renewable alternative to today's fossil fuels. DME is characterized by high energy efficiency and very low exhaust emissions. DME is a gaseous fuel, which is handled as a liquid in pressure vessels, similarly to LPG. DME is produced through gasification of biomass or fossil raw materials. DME is used as a propellant gas in spray cans. In a few years, world production of DME has increased by a factor of 10, primarily because China has started developing DME for household energy. Source: Volvo AB Press release, 2 April 2008. (www.volvo.com).

Volvo for gas vehicles again?

Volvo has unveiled the Volvo V50 1.8 "Multifuel" car, which can run on ethanol, gasoline, CNG and biogas. In Sweden, Volvo ended production of gas vehicles in 2006. Volvo's Swiss bureau has led the project, which will introduce V50 and V70 as Multifuel models. This project has been conducted in cooperation with F.+Ch. Mueller AG, which is specialized in conversion of vehicles to use gas. V50 1.8F and V70 2.0F "Multifuel" cars will cost around 3900 EUR (36.500 SEK) more than standard models. The V50 model, which was shown in Genève, has a 1.8 litre engine with two gas tanks of 43 litres providing a driving distance of 250 km with gas. The volume of the E85/gasoline tank is 55 litres. According to Volvo's Press Director Bo Larsen this converted model will not be available in Sweden.

Source: Auto Motor Sport, 10 March 2008 (www.automotorsport.se)

Hythane in India

Five Indian manufacturers, Bajaj Auto, Ashok Leyland, Tata Motors, Mahindra and Mahindra (M&M) and Eicher Motors, develop hydrogen blended compressed natural gas (HCNG) fuelled vehicles. CNG containing hydrogen in ratios from 12% to 30% will be tested in various types of vehicles from three wheelers, cars to passenger buses. Source: NGV Global, 27 March 2008. (www.ngvglobal.com).

In India, the first public hydrogen dispensing station to supply fuel to motor vehicles running on either hydrogen or Hythane® will be supplied and installed by Hythane Company LL in Delhi. The US\$1.0 million hydrogen/Hythane® retail fuel outlet will comprise hydrogen production (5 Nm³ of hydrogen per hour), compression, storage, blending (to make Hythane®) and dispensing equipment. The hydrogen dispensing station is scheduled for completion in the third quarter of 2008. The nation is striving to have at least 20% of all vehicles (estimated at more than one million vehicles) operating on hydrogen-based fuels by 2020. Source: Eden Energy Press Release, 17 January 2008. (www.hythane.com).

ALCOHOLS, (BIO)GASOLINE

Shell and Virent to develop biogasoline

Shell and Virent Energy Systems collaborate to develop biogasoline directly from plant sugars. Unlike ethanol, biogasoline, consisting of hydrocarbons, would enable high blending ratios with gasoline without the need for new engine designs or for new infrastructure. In addition, energy content of biogasoline is higher than that of alcohols. Virent's BioForming(TM) technology converts plant sugars into hydrocarbons, which resemble conventional gasoline. The sugars can originate from conventional feedstock (e.g. wheat, corn and sugarcane), but also from non-food feedstock such as corn stover and switch

grass. The BioForming(TM) technology has advanced rapidly concerning yield, product composition, and cost. Source: *Shell News and Media releases*, 26 March 2008 (www.shell.com).

Bioethanol in Italy

The Italian chemical group Mossi & Ghisolfi (M&G) plans to build a 200,000 tons/a bioethanol plant by 2009. In the first phase the plant will use 600,000 tons/a of maize. The plant aims to cover 60% of its feedstock needs with local supplies. M&G targets to convert the plant to produce cellulosic ethanol using fibre sorghum or common cane as feedstock. A demonstration plant of 20,000 tons/a output is expected to be launched by 2012. Source: *Biofuels International News, Italy plans bioethanol plant*, 7 February 2008. (www.biofuels-news.com).

New factory to produce ethanol from waste in Finland

In 2006, the energy company St1 began blending ethanol into gasoline in Finland. The ethanol is produced from food industry waste using a new process, called Etanolix, invented by Antti Pasanen, a researcher at VTT. Waste is converted into an ethanol-water mixture at the sites of food industry, and then concentrated to 99.8% purity to be blended into gasoline as 2-5% blends. Source: *AMFI Newsletter 2/2006*.

The production chain will be complete when a new large concentration plant starts operation in the city of Hamina in June 2008. Capacity of the plant is 44 million litres of ethanol per year, and this is planned to be doubled within one year. The plant will concentrate 85% ethanol, which comes from small Etanolix plants. Ethanol can also be shipped to the Hamina Harbour from all over the world.

Feedstock waste comes from bakeries, potato factories and confectionery factories. The feedstock basis is planned to be extended to new raw materials, such as bio-waste from households, straw and paper. In addition to ethanol and animal feed, the small plants can also produce fertilisers.

About 20 small etanolix stations are to be set up in different parts of Finland, but so far, only one of them is operational in Lappeenranta. St1 plans to set up 15 to 20 small plants in Sweden in a couple of years. In addition, St1 is looking for partners both in Europe and in Asia." Source: *Helsingin Sanomat*, 25.2.2008. (www.hs.fi)

Global ethanol standard

Brazil, the U.S. and the EU have agreed on all items of an international standard for ethanol, except the water content. EU wants to limit the water content to 0.24 %, Brazil to 0.5 % and the US to 1.0 %. An agreement would permit ethanol to be traded globally as a unified commodity.

The U.S., Brazil and the EU recently released a white paper on Internationally Compatible Biofuels Standards that will peruse a unified international standard for biodiesel and ethanol. Nine of 16 standards on ethanol were in alignment, while six could be aligned in the short term. Only six biodiesel standards were found to be aligned, and the committee recommended that the remainder could be aligned through blending biodiesel varieties. The Transatlantic Economic Council (TEC) is expected to propose definitive standards for biofuels trade. Source: *Biofuels Intenational News, Brazil, U.S. and EU approach global ethanol standard*, 15 February 2008. (www.biofuels-news.com)

BIODIESEL ESTERS

U.S. Biofuel quality survey

U.S. DoE's NREL has conducted a survey on the quality of ester type biodiesel (B100), which should meet the ASTM D6751 specification. Oxidation stability, flash point, alcohol content, cloud point, water and sediment, acid value, free and total glycerin, phosphorus, sodium, potassium, magnesium and calcium were tested. The samples collected represented 70% of the U.S. market in 2007. It appeared that 89.6% of the biodiesel was on specification. Large producers and BQ-9000 producers hardly ever failed to meet the specifications. Small and medium producers had significant failure rates, most often regarding the oxidation stability. Source: *Alleman, T. and McCormick, R. Results of the 2007 B100 Quality Survey, NREL/TP-540-42787*, March 2008. (www.nrel.gov)

Editorial comment: Biodiesel quality in the U.S. seems to be improved when compared to the period between November 2005 and July 2006, when a third of the biodiesel samples were out of specification. Source: *AMFI Newsletter 1/2007*.

Biodiesel production slow-down in Europe

The European Biodiesel Board (EBB) announced that only 50% of the European capacity of biodiesel production was used in 2007. One reason for this is the U.S. subsidised biodiesel exports, which increased from 20,000 tonnes/month in 2006 to 80,000 tonnes/month in 2007. Lack of support for biofuels in the EU is blamed as well. *Source: Biofuels International News, European biodiesel production growth slows, 15 February 2008. (www.biofuels-news.com).*

Biofuels for aeroplanes

A Boeing 747 from Virgin Airlines used a blend of 20% of coconut and babassu oil and 80% of the normal Jet A aviation fuel in one of its four engines. A short flight from London to Amsterdam did not carry passengers. A little bit earlier an Airbus A380 used a synthetic mix of gas-to-liquid in one of its four engines on a 900 km flight. There are also other initiatives to use biofuels in aeroplanes.

There are a number of problems anticipated with usage of traditional biodiesel in kerosine. *Editorial comment:* Basically, the problems of ester-type biodiesel in aeroplanes are similar to those in ground-transport vehicles, such as poor stability and poor cold properties, and increased NO_x emissions. However, an engine break-down at an altitude of 10 km is more serious than on the ground. *Source: BBC News, Will biofuels power tomorrow's planes? 24 February 2008. (news.bbc.co.uk).*

SYNTHETIC AND RENEWABLE DIESEL

NExBTL plant planned in Rotterdam

Neste Oil is considering building a NExBTL plant in Rotterdam. Planning is in the early phase and "go ahead or not" decisions will be taken later on. Neste Oil's applications for certain environmental permits became public. According to Jarmo Honkamaa from Neste Oil, the Rotterdam plant would be similar to what Neste Oil is planning for Singapore. *Source: Final transcript, NES1V.HE - Full Year 2007 Neste Oil Oyj Earnings Conference Call, 7 February 2008. (www.nesteoil.com).*

Status of Helsinki bus biofuel trial

In September 2007, testing of Neste Oil's new hydrotreated NExBTL renewable diesel started in greater Helsinki. A 25 % blend of NExBTL was introduced at two bus operators in a total of some 50 buses. No problems were observed during the winter period. Now the trial is expanding. Later this spring some 200 buses are expected to operate on a 30 % NExBTL blend.

In March 2008, Helsingin Bussiliikenne (one of the bus operators), joined the trial with four brand new EEV-certified Scania buses. These buses will run on 100 % NExBTL only. Two identical new buses running on conventional diesel will serve as a reference. The testing of 100 % NExBTL will be done in close cooperation with Scania. The aim of the project is to study the decrease in emissions and the long-term effects of pure NExBTL diesel on bus engines. The cooperation between Scania and Neste Oil will help gain maximum benefit from all the positive properties of high-quality biofuel in efforts to improve city air quality.

VTT Technical Research Centre of Finland has carried out emission testing in a chassis dynamometer with Euro II to EEV emission certified diesel buses. The results are very encouraging, as NO_x is reduced some 10 % and particulate emissions 30 – 45 % for all types of vehicles when switching from sulphur-free diesel fuel to 100 % NExBTL. *Sources: Neste Oil Corporation, Press release, 3 April 2008. (www.nesteoil.com). Nylund, Presentation in the Conference "Bioenergy: Challenges and Opportunities", Guimarães, Portugal, 6-9.4.2008.*



Scania city buses join the Helsinki biofuel trial. Photo: VTT Technical Research Centre of Finland.

OTHER FUELS AND VEHICLES

EU aims at 16 million hydrogen vehicles by 2030

The European Union (EU) estimates that 16 million hydrogen-powered vehicles will be traveling European roads by 2030. The infrastructure investments could cost nearly \$90 billion, says the EU's research. Despite substantial technological and

infrastructure barriers, there is an opportunity to take an early lead in the development of a hydrogen economy, the European Commission said. "The right steps have to be taken quickly if Europe is not to count the cost of late market entry." Ministers from the 27 EU member countries are expected to approve a nearly \$1.4 billion industry-led research program into hydrogen fuel cells. The EU and the private sector will each provide half the funds. *Source: AutoObserver, 26 February 2008, (www.autoobserver.com).*

MISCELLANEOUS

Swedish Environmental cars: new criteria is planned.

In Sweden, new criteria is planned for environmental cars. These criteria would disqualify 60% of the cars that now are classified as environmental cars. In addition to current requirements, the environmental cars should fulfil certain Euro Ncap safety requirements. *Source: SvD Näringsliv Nyheter, 9 April 2008.*

Fuel Consumption - miracles

In Finland, the motoring magazine Tekniikan Maailma tested equipment and chemicals that are claimed to reduce fuel consumption of vehicles. This study covered fuel consumption, power output, exhaust emissions, usability and other factors. A pulse generator that is installed in between battery posts, F-16 Pulse King, got a score of 4.6 (scale 4-10). The Giga Power magnet, which is installed in the fuel line got a score of 4.6. Oil additives got as poor scores. Scores for X1-R and Xado were 4.5. The equipment and chemicals studied did not have any effect on the on the engine performance. Some products were given credit for easy installation, therefore scores were higher than the minimum of 4.0. *Source: Tekniikan Maailma, 2 April 2008.*

IEA & IEA/AMF News

"AMF Outlook" – condensed version

The condensed version of the "AMF Outlook" is now in public domain. According to the report, gasoline and diesel are projected to remain the dominant automotive fuels until 2030. Vehicle technology and high quality fuels will eventually solve the problem of harmful exhaust emissions. The problem with greenhouse gas emissions, CO₂, still remains, and much attention will be given to increase efficiency. Hybrid technology is one option to reduce fuel consumption. Diesel engines are fuel efficient, but have high emissions compared with advanced gasoline engines. New combustion systems combining the best qualities of gasoline and diesel engines promise low emissions as well as high efficiency. By 2030, alternative fuels could represent a 10–30% share of transport fuels, depending on policies. Ambitious goals for biofuels in transport have been set. Currently the sustainability of biofuels is discussed extensively. Synthetic fuels promise excellent end-use properties, reduced emissions, and if produced from biomass, also reduced CO₂ emissions. The report presents an analysis of technology options to meet the requirements for energy security, climate change, local emissions as well as sustainability. In the short term, energy savings will be the main measure against climate change in transport, fuel switches will have a secondary role.

The study was carried out within Annex XXVIII (AMFI Information Service, www.iea-amf.vtt.fi) of the IEA Advanced Motor Fuels Implementing Agreement and within the EU Bioenergy Network of Excellence (NoE).

Source: Nylund, N.-O., Aakko-Saksa, P. and Sipilä, K. Status and outlook for biofuels, other alternative fuels and new vehicles. VTT 2426. 2008. (<http://www.vtt.fi/inf/pdf/tiedotteet/2008/T2426.pdf>).

ESPOO 2008

VTT RESEARCH NOTES 2426



Nils-Olof Nylund, Päivi Aakko-Saksa & Kai Sipilä

Status and outlook for biofuels,
other alternative fuels and new
vehicles



Cooperation for transport related Implementing Agreements

There is a total of seven Implementing Agreements with activities related to transport, five within the End-Use Working Party (Advanced Fuel Cells, Advanced Motor Fuels, Advanced Materials for Transport, Combustion, Hybrid and Electric Vehicles) and two within the Renewable Energy Working Party (Bioenergy and Hydrogen).

At the end of March 2008, in conjunction with the spring meeting of the IEA End-Use Working Party, six of the seven transport related IAs met at the IEA Headquarters in Paris to discuss exchange of information and enhancing cooperation. All these IAs work for a more sustainable transportation system. It was decided to develop this co-operation further, and to meet on a regular basis. The Transport Contact Group (TCG) will meet once a year. For March 2009 it was decided that the TCG will team up with the IEA Secretariat to make a contribution on sustainable transport at a side event of the Geneva Motor Show.

35th ExCo in Austria
27 - 30 May 2008

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IEA Open Bulletin interview

The IEA OPEN Bulletin recently interviewed Nils-Olof Nylund regarding the AMF Outlook report and cooperation between Implementing Agreements. This interview is available at the following link to the IEA Open Bulletin Issue No. 50: <http://www.iea.org/impagr/cip/pdf/Issue50NylundInterview.pdf>. © OECD/IEA.

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