

# European Biofuels Technology Platform: Stakeholder Plenary Meeting

## Speakers: CVs & Abstracts

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### WELCOME & KEYNOTE ADDRESS

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#### Jose Manuel Silva,

European Commission, Directorate General for Research

*From 1971 until his incorporation into SOIVRE, while an inspector in the Ministry of Economy and Trade, he was a professor at the School of Agricultural Engineers in Madrid and worked in the private sector in export companies as well as on animal food projects. From 1979 until 1982 he was Employed in the Directorate general of Internal Trade and in the Directorate General of Trade Policy at the Ministry of Economy and Trade, Madrid. In 1983 he became a Counsellor in agricultural affairs and member of the delegation for the Spanish accession negotiation at the Secretaria de Estado, Madrid. Since 1986 he has worked for the Directorate of Agriculture in various capacities. In 1999 he was made Director General for Agriculture and Rural Development, and in January 2006 became Director General for Research.*



#### Key Points

- The European Union is strongly dependent on fossil fuels to satisfy its transport needs
  - Security of supply and sustainable fuel production are at the core of our energy and transport policies
  - Biofuels are currently the only viable short-to-medium term alternative to fossil fuels
  - Research is a key element to address the challenges inherent to an increased level of biofuel production and use, in particular their performance in terms of greenhouse gas reduction throughout the entire production chain
  - These challenges are not only technical but have also a social dimension, for example the emerging discussion on possible competition between fuels and food which brings about links between our energy policy and our agricultural policy
  - The 7th FP energy and environment themes put strong emphasis on biofuel related research, including biorefineries and, in particular, second generation biofuels
  - Second generation biofuels play also a major role in the Strategic Energy Technology Plan and the coming Energy Package
  - European Industrial Initiatives aim at strengthening industrial energy research. The Bio-energy Europe Initiative focuses on second generation biofuels within the context of an overall bio-energy use strategy.
  - The Biofuels Technology Platform provides valuable input to and guidance for our research priorities through its Strategic Research Agenda and Vision Report and it will surely continue to play a major role in our new initiatives
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### POLITICAL FRAMEWORK

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#### Chair: Luis Cabra

Repsol YPF, Chairman BiofuelsTP Steering Committee

*Currently Director of Technology & Engineering in Repsol YPF, being responsible for worldwide R&D, technology support and engineering activities in the company (oil & gas sector). Luis has a B.Sc. (1979) and Ph. D. (1983) in Chemical Engineering from Complutense University, Madrid. He also holds a MBA degree from Insead-Euroforum, Madrid (1993) and advanced management studies in IMD, Lausanne (2003). He began in Repsol YPF as a process engineer in La Coruña oil refinery (1984-86) and subsequently the Madrid Headquarters (1987-1988). He occupied several managerial positions in Process and Engineering Areas (1989-1995) before being designated Director, Investment and Development, Refining Europe (1996 to 2002) and later on Director of Technology, Repsol YPF Group (since 2002). Since December 2006, he has been Director of Technology & Engineering, Repsol YPF Group. He enjoys teaching and is currently collaborating as associate professor and lecturer at University and post-graduate Institutions. He is author of numerous papers and conferences in the field of Oil Refining and R&D management. Has represented Repsol YPF at Oil Industry Associations and carried out advisory roles in several institutions: Chairman, Automotive Fuels Group, Europaia (2001-2002); Member, Scientific Council, CONCAWE (1997-2002); Member, Programme Committee, World Petroleum Congress (2006- ) Member, Council, Instituto Catalán de Investigaciones Químicas (2002-2004); Member, Advisory Council, Quality Assessment Agency, Universities of Madrid Region (2004- ); Member, European Research Advisory Board (2004- ). In June 2006, he was made Chairman of the Steering Committee of the European Technology Platform for Biofuels.*



## **Alfonso Gonzalez Finat**

European Commission, Directorate General for Energy and Transport

*Currently Principal Advisor for the European Commission Directorate General for Energy and Transport, he was previously Director, Directorate General for Energy and Transport - New and Renewable Sources of Energy, Energy Efficiency & Innovation. Since 1989 he held various positions within the European Commission as Head of Units. From 1982 to 1988 he was Director of Division and Deputy General Director – National Enterprise for Tourism and Swissair Associates Companies, following a career in Spanish Civil Administration. He graduated as an Ingeniero de Caminos, Canales y Puerto from the Polytechnical - University Madrid in 1970, and holds an M.Sc. from Ohio State University (1972). He also holds qualifications in Executive management from Instituto de Empresa, Madrid and London Business School (1983).*

### **The European Strategy for Implementation of Biofuels for Transport in Europe (including SET-Plan)**

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## **Hilkka Summa**

European Commission, Directorate General for Agriculture and Rural Development

*Dr. Hilkka Summa is a head of unit in the Directorate-General for Agriculture and Rural Development of the European Commission. The responsibilities of her unit cover bioenergy, biomass, forestry and climate change, being in charge of coordination of the agricultural aspects of EU policies related to biofuels and bioenergy. Her responsibilities also include the implementation of the EU Forest Action plan and measures related to forestry and climate change in the EU Rural Development policy. Hilkka Summa works in the European Commission since 1997. Her previous assignments include promotion of agricultural products and evaluation of agricultural policies. Before joining the EU administration she was a civil servant in the Ministry of Finance of the Finnish government.*

### **European Agricultural Policies and the Promotion of Biofuel Technologies**

The mandatory targets of 20% of renewable energy and 10% of transport biofuels by 2020 are bound to increase the demand for agricultural and other biomass during the coming years. Transport biofuels are today mainly produced from conventional agricultural crops primarily cultivated for food and feed, but with technological development we can expect that much more diverse sources of feedstocks will be used in the future. However, with the targeted increase in the use of renewable energy in general, biofuels will be competing for their feedstocks not only with food and feed production but also with other energy uses of biomass.

The impact assessment by the EU Commission concluded that biomass availability would not be a feasibility constraint for achieving the targets. It was estimated that of the maximum amount of biomass needed to fulfil the 20% target some 27% could come from agricultural crops, some 15% could be imported and the rest provided by forestry residues, other woody biomass and wastes. Most regions of the world have more biomass production potential, relative to their expected energy demand, than Europe. Imports are likely to play a part in EU renewable energy in general as well as in the consumption of transport biofuels. The actual evolution of the demand for biomass as well as the share of different sources of feedstocks will depend on technological development (2nd generation biofuels, increase in other than biomass based renewable energy such as wind, solar and geothermal energy sources), price development of agricultural commodities and the strategies and support mechanisms that different EU Member States will adopt to achieve their renewable energy and biofuel targets.

The Common Agricultural Policy currently supports the production of biomass by three mechanisms: a specific energy crop premium (45 €/ha), the possibility to cultivate non-food crops on obligatory set-aside land and through Rural Development Programmes.

In Rural Development policy renewable energy is one of the Community priorities, and a wide range of measures, including biofuels processing, are available for the Member States. Since the 2003 reform, the system of direct aids to agriculture is, with very few remaining exceptions (such as the energy crop scheme), decoupled from production, which means that the production choices of farmers depend on market signals and not on subsidies.

The so-called 'Health Check' of the CAP, launched the Commission's Communication last November, and for which a public consultation is currently open, identifies biofuels as one of the new challenges to which agricultural policy will need to respond in the future. One of the three main objectives is to examine how to confront the new challenges, from climate change to biofuels, water management and the protection of biodiversity. The Commission's Communication acknowledges that more incentives are needed in these areas, and proposes to finance the necessary new measures through reinforced Rural Development policy. This could be done through the reduction of direct payments to farms and transfer of the money into the Rural Development budget (so-called 'modulation'). The increased budget could be oriented so that it contributes to the areas identified as new challenges. The future of the energy crop scheme will also be assessed in this context.

More information: [http://ec.europa.eu/agriculture/healthcheck/index\\_en.htm](http://ec.europa.eu/agriculture/healthcheck/index_en.htm)

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## **Lena Ek**

Member of the European Parliament

### **A View from the European Parliament**

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## THE BIOFUELSTP STRATEGIC RESEARCH AGENDA & DEPLOYMENT STRATEGY (I): GLOBAL VIEW

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### Chair: Anders Røj

Volvo, Vice-Chairman BiofuelsTP Steering Committee

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### Ann Segerborg-Fick

STEM, Coordinator BiofuelsTP Secretariat

Currently a biofuels expert for the Swedish Energy Agency, Ann has 15 years experience in the biofuels sector, commencing in the RTD department of the Swedish Farmers Cooperative. From 1998 to 2001 she was a scientific officer in the European Commission DG RTD, specializing in green materials, bioenergy and biofuels. She helped set-up the EC ManagEnergy Network ([www.mamagenergy.net](http://www.mamagenergy.net)) which facilitates local collaboration on energy issues, including renewables and efficiency, across Europe. She is now responsible for the secretariat of the European Biofuels Technology Platform ([www.biofuelstp.eu](http://www.biofuelstp.eu)).



### The Consultation Process and its Impact on SRA/SDD

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### Luis Cabra

Repsol YPF, Chairman BiofuelsTP Steering Committee

(See C.V. under Political Framework, Chair)

### Presentation of Key Findings and Recommendations

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## THE BIOFUELSTP STRATEGIC RESEARCH AGENDA & DEPLOYMENT STRATEGY (II): RESEARCH, TECHNICAL DEVELOPMENT & DEPLOYMENT PRIORITIES

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### Chair: Veronique Hervouet

Total, Member BiofuelsTP Steering Committee

Veronique Hervouet has 21 years experience in the petroleum industry within Elf & Total (Exploration & Production, Refining & Marketing, Petrochemicals, Chemicals) with responsibilities in the areas of Research & Development, Business and Strategy. She is currently Vice President, Bioenergy in the Corporate Strategy & Risk Assessment Division. She is a Member of the Steering Committee of the European Biofuels Technology Platform, the Evaluation Committee of the French National Bioenergy Research Program, and of the Scientific Committee of the Tuck/ENERBIO foundation. She graduated as an Engineer from Ecole Centrale de Lyon (France), and holds a Master of Science in Materials Science & Engineering from Cornell University (USA).



### Markku Karlsson

UPM-Kymmene, Member BiofuelsTP Steering Committee & Chairman BiofuelsTP Biomass Working Group

Currently Senior Vice President, Technology at UPM-Kymmene Corporation, he graduated with a D.Sc. (Chem.Eng.) from the Åbo Akademi University, Turku, Finland, 1987. From 1999 – 2004 he was Senior Vice President, Corporate Technology, Metso Corporation. Having been a Member of the Board of the Academy of Finland, from 2000-2003, he became Vice Chairman in 2004 until 2006. He is also a Member of the Board of the Finnish Forest Research Institute (Metla), and an advisory committee member for the European Technology platform - Forest Based Sector, as well as an Agenda 2020 Technology Alliance CTO Committee member.

### Biomass Production and Supply

The discussion on future biomass supply implies a complex analysis of the local natural and agroenvironmental conditions, the development of food, feed and fiber demand, development of energy and transport demand and the development of international trade, the latter again being influenced by a number of factors. Small grain cereals (i.e. wheat, barley, triticale, rye, oats, rice) dominate the EU arable land. As a result cereal straws are the main crop residues generated. However its energy potential is limited as much is already used for animal feeding, bedding, etc., while the high ash content is of concern during combustion. Corn is also a significant arable crop currently grown on around 10 million ha in EU27.

Oilseeds (rapeseed and sunflower) cover almost 8.4 million ha in EU27 while grapevines and olive trees use 3.8 and 2.3 million ha, respectively. In additions to cereal straws agriculture produces other lignocellulosic feedstocks such as mowings from set aside and natural habitats. Currently most residues are used in small to medium scale applications especially in the agro-industrial sector where feedstocks are processed on site and further exploited for either heat or combined heat&power. Using the various streams of residues as raw material for biofuels is not currently at commercial level. As conversion technology is developed, careful assessment of both the feedstock types and their fuel properties as well as development of the logistics and the related infrastructure to handle bulk and heterogeneous material will be required.

Forests represent the largest potential biomass resource, though their use is dependent on the development of 'lignocellulosic conversion technology' and competition for this resource with conventional forest industries as well as with 'wood to energy' systems generating heat and power. The forest industry is well advanced in terms of both the production and handling of biomass as well as to the extent to which

it consumes biomass to cover its energy needs. For instance the European paper and pulp sector covers 50% of the industry's total primary annual energy consumption with biomass-based fuels. As the concept of biomass energy exploitation shifts in new directions and innovative technologies are introduced, forest biomass infrastructures are facing new challenges both in expanding their total yields and in optimizing logistics towards supplying new industries, including biofuels and bio-refineries.

"Energy crops" may be defined as traditional or new species (tree/ plant) specifically bred and cultivated to fit specific energy needs. Previous studies on energy crops have focused to some extent on the raw material issues (productivity, adaptation, inputs and culture practices. Today, the main energy-related crop species include oilseed, sugar, starch and lignocellulosic crops. R&D&D should be targeted to maximisation of yield and crop resistance to biotic and abiotic factors, initiate innovative cropping systems and exploitation of marginal land options.

Current primary focus for biowastes is on their safe disposal, so their energy exploitation is a priori advantageous. One of the most significant problems for the conversion of waste into biofuels is the heterogeneous character of waste, as well as the variability from collection to collection, particularly in the case of municipal solid waste. Therefore the development of separate collection systems, sorting, pre-treatment or even conversion technologies that can deal with an inhomogeneous feedstock flow is thus a necessity for the use of waste as biofuels.

The availability of biomass can be increased by optimising production systems (yields, system efficiency, etc.) and broadening the feedstock types as well as by making better use of existing resources taking into account both demand and supply issues. In setting R&D&D priorities it is stressed that future biomass feedstocks should meet a full range of sustainability criteria irrespective of whether they are grown in Europe or are imported.

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## Harri Turpeinen

Neste Oil, Member BiofuelsTP Steering Committee & Co-Chairman of End Use Working Group

*Harri Turpeinen graduated from the University of Oulu with a degree in organic chemistry. He has worked with Neste Oil as a research engineer, as a marketing manager in the coal business, as a Vice President in charge of the bitumen business and as a Vice President in charge of the oil specialities business group (bitumen, solvents, lubricants and base oils). Between 1997 and July 2007 Harri was responsible for the company's Research and Technology function.*

### Conversion Processes (I): Improved Technologies and Alternative Approaches

To reach the goals of the European Union for biofuels uptake it's necessary to develop technologies that allow biofuels to be competitive with those of fossil fuels while minimizing environmental footprint. It is also a prerequisite that the resulting biofuels industry is capable of utilizing a wide variety of raw materials. The development of biofuels will occur through the following different but complementary pathways:

- Biochemical pathway (e.g. Ethanol)
- Thermochemical pathway (e.g. BTL)
- Production of Biofuels from vegetable oils and fats

By fully developing the above complementary pathways the biofuels industry will be able to utilize a broader range of feedstocks than today. Biofuels production from biomass represents a high-efficiency, more or less carbon neutral conversion chain for renewable energy that will utilise available fuel and land resources.

The improvement of existing and development of new technologies will create the potential to produce significantly larger quantities of biofuels. Future biofuels development options need to encompass all elements of sustainability. It is also important that the issues around GHG reduction and dependence on fossil fuels are considered separately as they are not always interconnected,

#### *Biodiesel production from vegetable oils and fats*

Fats of biological origin are predominantly triglycerides and form the major feedstock for the generation of methylesters in Europe, which are commonly referred to as Biodiesel. Beside that industrially established pathway, the triglycerides have the potential to be transferred into other fossil like fuels or fuel additives.

Future biodiesel processes in Europe will be using a broader range of renewable high-yield non-food oil feedstocks containing triglycerides. New technologies, such as hydrotreating will help to diversify the feedstock used.

Biodiesel plants of the next generation will be less vulnerable via a multifeedstock / multiproduct approach, requiring research and demonstration of appropriate concepts. The variability of feedstocks for biodiesel production and the foreseeable large availability of the by-product glycerine with its potential to substitute fossil oil - based chemistry require new technologies.

New feedstocks in the European biodiesel supply chain requires progresses concerning the cold properties of the products. The development of hydrotreating could help to increase the kind of feedstock useful as raw material.

#### *The biochemical pathway*

The biochemical pathway is defined by the use of biotechnology for producing biofuels and co-products. Technology is available for producing ethanol from sugar and starch but further progresses are required. Some alternative pathways, such as producing biogas have to be considered also.

Extensive R&D input and process technology development is required to:

- Enhance and improve technologies to biofuels currently utilizing traditional agricultural substrates
- Develop alternative pathways enabling biofuels production from a broader range of feedstock
- Develop of biochemically derived processes to other biofuels that will create additional flexibility around blending options

Alternative process designs

- Study and develop alternative gasification systems
- Study alternative system integrations

## Ricardo Arjona

Abengoa Bioenergy, Co-Chairman of BiofuelsTP Conversion Working Group

### Conversion Processes (II): Lignocellulosic Biomass & Biorefinery

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## Stefan Keppeler

Daimler AG, Chair of BiofuelsTP End Use Working Group

*Responsible for all activities within Daimler research regarding alternative fuels for internal combustion engines. Focus of the activities is the analysis of engine-fuel interaction for alternative fuels. He graduated in 1990 with a Dipl.-Ing. from the Technical University in Aachen (Mechanical Engineering, Internal Combustion Engines), and in 1997 was awarded a Phd by the Technical University in Aachen, with a thesis on Common Rail Injection System for DI Diesel Engines. In 1996 he became Manager, Diesel Engine Development, FEV Engine Technology, Auburn Hills, Michigan (USA). In 2000 he moved to FEV Motorentechnik GmbH, Aachen, as Programme Manager, before becoming a Senior Manager, Fuels for Combustion Engines, DC Research. Since August 2006 he has been Senior Manager, Fuels and Services, Daimler Group Research and Advanced Engineering Powertrain.*



### End-use: Engine/Fuel Performance

Future increase of biofuel shares in road transportation fuels driven by European legislation requires intensive progress to be made in biofuel development and introduction. An indicative target of 5.75% exists for 2010, the SET plan initiative proposes a mandatory target of 10% in 2020 and the BIOFRAC report expresses a vision of 25% biofuel share in the year 2030. At the same time vehicle emission standards will become more stringent in the future (Euro V, Euro VI and further) which requires great efforts in the development of compatible vehicle technology. For reaching these targets the identification of R&D needs with respect to the distribution of biofuels (blended or neat) and their end use in vehicles is essential.

Compatibility with existing fuel supply and distribution chains is prerequisite for a fast and easy introduction of biofuels into the market. Distribution systems are expected to be more sensitive to current biofuels than to later generation fuels as the quality of future biofuels should improve. The chemistry of today's bio-components for fuels, like biodiesel and ethanol, increases the potential for materials incompatibilities as well as contamination in manufacturing and transport especially when blended with higher concentrations. However, since sensitivities of biodiesel on diesel fuel distribution systems and potential technical solutions are mostly known R&D demand will focus more on gasoline application when blending with high ethanol concentrations. Future biofuels produced using thermochemical and catalytic systems like BTL or through hydrogenation of vegetable oils are expected to have less impact on distribution systems.

With respect to the end use of biofuels in vehicles a comprehensive knowledge about their performance in existing and future vehicle technologies will be required for making an informed choice of promising biofuels used as neat fuel or blended with existing fossil fuels. Important evaluation criteria are:

- Safe and reliable vehicle operation of future engine technology even with high blending ratios
- Compatibility with existing vehicle fleets even in high blending ratios
- Compliance with future emission standards

In order to select the most suitable biofuels for application R&D efforts to understand future fuel requirements are essential. This has to be based on a fundamental understanding of fuel property impacts on engine/vehicle performance. Furthermore a consistent fuel specification and harmonized introduction to the EU market as a whole is required for a fast and efficient deployment of biofuels and to ensure compatibility with the complete vehicle fleet. In addition it may be necessary to develop advanced vehicle and engine technologies for dedicated biofuels/blends (e.g. E85, BTL) or for specific applications or demands of the market.

Beside technical issues covering distribution and end use criteria like the overall CO<sub>2</sub> efficiency (well-to-wheel), the substitution potential and also economic and commercial feasibility are of great importance for an overall evaluation.

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## BIOFUELS SUSTAINABILITY AS ADDRESSED BY THE SRA/SDD

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### Chair: Olivier Appert

IFP - Institut Français du Pétrole, Vice-Chairman BiofuelsTP Steering Committee

*On April 2003, Mr. Appert was appointed Chairman and CEO of the French Institute of Petroleum (IFP). Before, he worked as Director of the International Energy Agency's Long-Term Cooperation and Policy Analysis Directorate since 1st October 1999. Prior to that, from 1998 to 1999, he was the Senior Executive Vice-President of ISIS, a technology holding company publicly listed subsidiary of the Institut Français du Pétrole (IFP). From 1994 to 1998 he worked as Executive Vice-President of the IFP in charge of research and development activities. From 1989 to 1994, he headed the oil and gas department of the French Industry Ministry. Mr. Appert also served in the private sector from 1986 to 1989 as Vice-President of the Phillips group for mobile radio activity and strategy. He was Executive Director of the French Industry Minister's cabinet from 1984 to 1986 and was a member of Prime Minister Pierre Mauroy's cabinet from 1981 to 1984. Mr. Appert is a graduate of the l'Ecole Polytechnique and l'Ecole des Mines.*



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### Martin Kaltschmitt

IE Leipzig & TU Hamburg, Chairman BiofuelsTP Sustainability-Working Group

*Prof. Dr.-Ing. Martin Kaltschmitt studied petroleum engineering at Clausthal University of Technology and received his PhD from the University of Stuttgart in the field of renewable sources of energy. Afterwards he headed a research group in the field of renewable sources of energy at Stuttgart University. In 2000 he completed a DFG-research scholarship at King's College in London and also studied at the University of California at Berkeley. He then became managing director of the Institute for Energy and Environment gGmbH, Leipzig. Since 2006, he also holds a chair for environmental technology and energy economics at Hamburg University of Technology. He has written several books, published more than 200 papers and gave numerous presentations in the field of renewables with a special focus on biomass and bioenergy.*



### Marc Londo

Energy Research Centre of the Netherlands - ECN, Co-Chair BiofuelsTP Sustainability Working Group

*Dr. Marc Londo works as a senior scientific researcher at the unit Policy Studies of ECN, the Energy research Centre of the Netherlands. His main field of interest is biomass energy, with a project portfolio focusing on application in fuels, electricity as well as heat. He is project leader of REFUEL and Elobio, two projects under Intelligent Energy Europe in which respectively an EU road map for biofuels and more market-sensitive biofuel policies are developed. Other activities focus on global potentials for sustainable biomass for energy. He also led the ECN supportive work for the 2006 Biofuels Directive review Impact Assessment. He holds a Ph D in biomass and land use issues and graduated in environmental chemistry.*



## Sustainability of Biofuels - Research and Development needs to exploit potential improvements

Sustainability issues are dominating the ongoing discussion about the pros and cons of biofuels. Within this context lots of articles have been published in recent months indicating that there are or might be several sustainability issues at stake in the biofuels dossier (e.g. greenhouse gas emissions from FAME, monocultures of maize, water use, land use change and deforestation impacts). Therefore a significant improvement of the environmental, economic and social performance of biofuels is urgently needed if biofuels are to contribute significantly to European and world wide energy supply in a sustainable – and thus widely acceptable – way.

With this background, the goal of this presentation is to discuss the areas where sustainability aspects for biofuels have to be taken into consideration. Therefore the overall provision chain for liquid and gaseous biofuels is presented as well as selected parts of the overall chain where such aspects should be addressed in particular. For these areas R&D needs are identified and discussed which support the development of more sustainable biofuel provision chains. Within these R&D-needs a distinction is made between the areas "Biofuels and resource competition", "Biomass production and logistics", "Conversion to gaseous and liquid biofuels", "End-use" as well as "Overall chain" and "Policy measures". Within these areas sub areas are identified which should be tackled urgently to improve the sustainability of biofuels on a European as well as on a world wide level. These R&D-necessities are presented and discussed in order to improve the sustainability of the various biofuel provision chains.

## Imke Lübbecke

WWF Europe - World Wildlife Fund Europe

*Since September 2007, Imke Luebbecke has worked within the WWF European Policy Office in Brussels. She was previously Bioenergy Officer for the WWF in Berlin, and Officer for Agriculture and Rural Development in Frankfurt am Main. Prior to joining the WWF, she was an Agriculture Policy Officer for the German Farmers' Union. She graduated in Agricultural Sciences from the Georg-August Universitaet Goettingen, Germany, and holds a M. Agr. Sc. in Agricultural and Environmental Sciences.*



### How to Make Biofuels Sustainable – An NGO Perspective

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## Ariane de Dominicis

European Commission, Directorate General for Environment

*Ariane de Dominicis coordinates biofuels policies at the European Commission, DG Environment. Before joining the European Commission, she worked at the Climate Task Force of Caisse des Dépôts (Paris, France), where she conducted research on carbon markets, and worked together with the French public authorities on carbon finance and climate-related policies. She also worked on a clean development mechanism forestry project in South America. Ariane holds an engineering degree, a Master in environmental economics and a Master in political sciences.*

### Biofuels Sustainability in EU Policy

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## Loek Boonekamp

OECD - Organisation for Economic Co-operation and Development

*Loek Boonekamp started his career in 1972 with the Dutch Ministry for Agriculture. In 1977, he accepted a position as economist at the OECD where, in 1998, he became Head of the Agri-food Trade and Markets Division in the OECD's Directorate for Trade and Agriculture. In this function he is responsible for a broad programme of work in the field of food and agricultural commodities, covering medium term projections, market and policy issues, trade policy reform, changes in the food economy and, most recently, the market and trade impacts of increased production of bio fuels.*



### Biofuels for Transport – Opportunity or Threat?

Biofuel production that relies on starch-based and oil-based crops as the primary feedstock is not economically viable in OECD countries under current market conditions. The economic viability of biofuel production depends on a number of factors, including which crops are used and where and how they are grown. The technology associated with the production of biofuel (for example, the use of ligno-cellulosic feedstock) is evolving at an increasing pace. Research and development efforts on "second generation" feedstock are promising and could improve the economics of biofuel production in OECD countries.

The rapid growth in biofuel in OECD countries is largely due to government policies that subsidise production of cereal and oilseed feedstock and investment in bio-refineries, require mandatory blending shares with oil products, and impose restrictions on imports from other countries. Tax subsidies alone currently amount to USD 15 billion, according to research presented to the OECD. Such high public support has created, or at least contributed to, incentives for significant private investment.

OECD governments support biofuel production and consumption for a variety of reasons, but the goals most frequently cited are: reduced greenhouse gas emissions (GHG); enhanced energy security through oil substitution; and, positive impacts on incomes for farmers (arising from increased demand for feedstock), with positive spill-over effects to the rural economy.

The actual benefits to date from increased biofuel production are uncertain and may be much smaller than anticipated. It is not clear if greenhouse gas emissions from biofuel production and consumption, measured on a life-cycle basis, are significantly lower than from fossil fuels. The amount of agricultural land that would be required to replace a modest amount of fossil energy is a limiting factor in enhancing energy security. And there are important knock-on effects: diverting crops from food uses has been a factor in the recent rise in global commodity prices.

Rather than production subsidies and border protection, alternative policy approaches would achieve these goals more effectively. For example, incentives to reduce greenhouse gas emissions, to reduce energy demand, and to improve energy efficiency offer great promise to improve both environmental performance and energy security; focusing more effort on research and development would accelerate realisation of the potential of "second generation" biofuel.

The OECD, in a joint effort with the IEA, is undertaking detailed analysis of these issues with the objective of informing future policy decisions. A report will be available for the OECD Ministerial Council meeting in June 2008.

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## THE CHALLENGE OF IMPLEMENTING THE SRA/SDD

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### **Chair: Birger Kerckow**

FNR – Fachagentur Nachwachsende Rohstoffe e.V., BiofuelsTP Secretariat

*Birger Kerckow is responsible for European co-operation at the Fachagentur Nachwachsende Rohstoffe (FNR), the German Agency for Renewable Resources, and supervises FNR funded projects on economic and sustainability aspects of renewable resources. Before joining FNR in 1997, he was a National Expert to the European Commission, DG Research, and he worked also for the German Federal Ministry of Agriculture and the Federal Research Centre for Agriculture in Braunschweig. He studied agricultural sciences at the University of Goettingen and specialised in agricultural economics.*



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### **Calliope Panoutsou**

Imperial College, Co-Chairman BiofuelsTP Biomass Working Group

*Dr Calliope Panoutsou is the Co-Chair for the Working Group on Biomass availability and supply within the EU Biofuels Technology Platform. She is a Research Fellow in the Centre for Environmental Policy of Imperial College London. She holds a PhD from Aston University and her research work focuses on biomass resources, methodologies for resource assessment, economic appraisal of bioenergy chains, biorefinery, and bioenergy market issues. She has long term research work experience with a variety of energy crops (annuals and perennials) as alternative land uses and with biomass resource assessments with special focus on agriculture. She has coordinated several EU projects involving multi-disciplinary research on bioenergy. She also acts as expert in EU bioenergy, biofuels and agriculture committees.*

### **Biomass Feedstocks – Can Agriculture and Forestry Meet Future Market Demand?**

By 2030, the European Union aims to cover one quarter of its road transport needs by clean and carbon-efficient bio-fuels. A substantial part of that is foreseen to be provided by competitive European industry in both the production and the conversion of raw materials.

At present, the main biofuels being sold (biodiesel and bioethanol) are derived from well-established crops such as rapeseed, cereals or sugar beets. The growth in European biofuel production capacity over the last few years has increased demand and, consequently, within related markets there have been price increases and in certain cases shortages. This has led to concern in terms of competition between the production of crops for food, feed and fibre and crops for fuel. However, improved and new processes for the production of transport biofuels are expected to be able to use a much wider range of agricultural and forestry raw materials in the medium-term future.

Recent studies conclude that land capable of producing crops or forest at an annual incremental rate sufficient to provide biomass to be used as feedstock for biofuels at an economically viable price on a sustainable basis are limited, both in the EU and worldwide. The rise of agricultural commodity and forest product prices in 2006 and 2007 due to a strong world demand has been also attributed to an increasing competition for food, feed, industrial and energy uses.

Therefore, the increasing demand from the biofuels sector will require strategies to improve the energy yield per hectare of existing land used for agricultural and forest products. It will also require consideration of increased use of other land resources. The development of high-yield plants with new properties and qualities suited to biofuel production and making use of the whole crop for energy will reduce the pressure on land and help stabilise markets and prices.

Sustainability is a critical issue in the development of biofuels. Unregulated excursions into unsuitable regions, soil types or eco-systems can result in deforestation, erosion and loss of soil structure with associated loss of biodiversity. Adopting the wrong production chains, end-use strategies and legislative background could give biofuels that emit levels of greenhouse gases comparable to that of the fossil fuels they replaced.

This presentation focuses on the supply of agricultural and forest feedstocks for biofuels and provides evidence based information on the contribution these resources can have to meet the targets for 2030. It further illustrates the comparative advantages and disadvantages of current and future raw materials-to-biofuel chains in relation to sustainable, social and economic terms.

## Alexandre Rojey

IFP - Institut Français du Pétrole, Chairman BiofuelsTP Conversion Working Group

*Alexandre Rojey is Director for Sustainable Development at IFP. He coordinates IFP activities in the area of Sustainable Development: environment protection, use of biofuels and other alternative fuels, production and use of hydrogen, long term energy supply, issues related to global climate change including CO<sub>2</sub> capture and storage. He is also chairman of CEDIGAZ, an international association in the area of natural gas and chairman of the ECRIN Energie Association for the promotion of links between research and industry.*



### 2nd Generation Biofuels R&D – Do We Need a Different Research Infrastructure?

Ambitious goals have been fixed by the EU Commission concerning the penetration of biofuels. Innovative technologies are needed for building up the required infrastructure and for producing biofuels from new biomass resources (i.e. lignocellulosic biomass). The development of these technologies represents a major opportunity for the European industry.

The SET-Plan prepared by the European Commission proposes to launch a Bio-Energy Europe Initiative focused on “next generation” biofuels within the context of an overall bio-energy use energy. The main obstacle in the deployment of innovative conversion processes is the lack of validation at a large scale. This need is specially important for thermochemical and biochemical processes for converting lignocellulosic biomass. Thus, an approach different from the conventional one, decoupling research and development, is required and a whole integrated program from research to industrial deployment appears as needed.

It is necessary to establish an infrastructure linking R&D work to large scale installations, and to operate a program, enabling European companies to achieve successfully the require capacity extrapolations. The best way to build-up the confidence between the different stakeholders, by operating such a program, will be discussed during the presentation, resulting in proposals for a future initiative.

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## Ebba Tamm

SPI -Swedish Petroleum Institute, Member BiofuelsTP Markets Working Group

*Ebba graduated 1982 from The Royal Institute of Technology in Stockholm, with a degree in chemical engineering. Since 1982, she has held different positions in the oil industry. She has worked in a refinery and held positions as process engineer, production planner and environmental engineer. She transferred to the marketing side and worked as a product development manager. Since 2002, Ebba works with product related and environmental issues at the Swedish Petroleum Institute, which is a national oil industry association.*



### Biofuels and Motor Fuel Quality – Enemies or Allies?

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## Wolfgang Steiger

Volkswagen AG, Member BiofuelsTP Steering Committee

*Wolfgang Steiger is the director of powertrain research for the Volkswagen Group, with expertise in engine development and design, thermodynamics in diesel and gasoline engines as well as exhaust gas after treatment, transmissions, hybrids and fuel cell development. He has produced 100 publications and presentations on these topics and lectures in several Universities including in China. He is a member of the scientific research board of the German Car Manufacturers FVV and of the Mineral oil industry DGMK. He is also engaged as a steering team member of several European organizations such as the: European Biofuels Technology Platform; European Road Transport Advisory Council ERTRAC; Energy Science Center ETH Zürich; Alliance for Synthetic Fuels for Europe. During his career he was involved with Robert Bosch GmbH, Battelle Institute and Adam Opel AG finally being responsible for diesel engine development and test. In 1997 he joined the Volkswagen AG group research department, where he is responsible for powertrain research including diesel and gasoline engines, transmissions, hybrids, batteries, fuel cells, engine electronics & fuels. He graduated from the technical university Darmstadt in mechanical engineering and holds an PhD (Dr.-Ing.) from the same university. In 2005 he was awarded the “Prof. Ferdinand Porsche Prize”*



### Biofuels and future engine requirements – The View of a Car Manufacturer

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## THE BIOFUELS TP SRA/SDD AND OTHER INITIATIVES – COOPERATION & SYNERGIES

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### Chair: Ann Segerborg-Fick

STEM, Coordinator BiofuelsTP Secretariat

*(See C.V. under The BiofuelsTP Strategic Research Agenda & Deployment Strategy (I): Glocal View)*

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### Dirk Carrez

EuropaBio, European Technology Platform for Sustainable Chemistry

*Since September 2004, Dirk Carrez has been Public Policy Director at EuropaBio (The European Association for BioIndustries), where he also coordinates activities of the Industrial Biotech Council and the Biofuels Task Force. Between 1999 and 2004, he was Secretary-general of BelgoBiotech (the Belgian biotech industry association), and also Director Innovation & Product Policy of Fedichem (the Federation of the Belgian Chemical Industries). He has been Responsible Care® and Product Stewardship Manager (Chemicals Sector) at SOLVAY S.A. (1997-1999), Senior Research Assistant at SOLVAY Research & Technology at the Department of Industrial Fermentation (1990-1997), and (Senior) Research Assistant of the National Fund for Scientific Research (FNRS, Belgium) in the Laboratory of Molecular Biology of the Ghent University (1984-1990). Dirk Carrez is also Vice-Chair of BIAC's Biotechnology Committee (Business and Industry Advisory Committee to the OECD). He holds a degree in Chemistry and Agricultural Industries from Ghent University (1984), and a PhD in Agricultural Sciences from the Laboratory of Molecular Biology of Prof. Dr. ir. Walter Fiers, Ghent University (1989).*



### Biofuels and Sustainable Chemistry - Just Meeting in Biorefineries or More Synergies?

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### Ulrich Schurr

Forschungszentrum Jülich, European Technology Platform Plants for the Future

*Since 2001 Prof. Schurr has been head of the Phytosphere Institute (ICG-3) at Research Centre Jülich, which covers 4 research areas; Growth and Metabolism, Transport, Ecosystems and Enabling Technology. He is also a Professor at the Heinrich Heine University Düsseldorf. His main scientific interests include Dynamics of growth and transport as well as their interaction with the spatially and temporally heterogeneous environment. Knowledge about these interactions provides the basis of novel applications in a sustainable bioeconomy of the future - the so-called knowledge-based bioeconomy (KBBE). He is a Member of: Plant Biochemistry and Physiology Section of Faculty 1000; EPSO Board; the Advisory Board of Plant, Cell & Environment; and the Advisory Board of Journal of Experiments Botany.*



### Biofuels and the Contribution of Plant Biotechnology

Plant sciences create the knowledge base for sustainable biomass production and supply. As plants will provide the major resource in a knowledge-based bioeconomy (KBBE), plant science will play a major role in developing the capacity and novel opportunities for a bioeconomy in line with the environmental and economic settings in Europe. European plant science is very well positioned to contribute with its strong expertise to obtain increased quantities of biomass at adequate qualities for the various optional routes of conversion, at economically competitive prices and with acceptable impacts on the environment.

There are numerous fields of action in which knowledge from plant sciences on agriculture and forestry crops needs to be used to deliver to the overarching aim of a sustainable bioenergy economy including the provision of suitable biomass for biofuels. The central topics for biofuel applications are:

- Higher biomass and feedstock production
- Improved availability and processibility of biomass for dedicated conversion routes
- Improved resource use efficiency and low environmental impact of agricultural production on the environment
- Increased diversity of bioenergy plants for dedicated bioenergy crops with favourable characteristics
- Interaction between the diverse stakeholders is required in the future bioeconomy in order to achieve economically, ecologically and socially acceptable solutions.

## Andreas Dorda

BMVIT - Austrian Federal Ministry of Transport, Innovation and Technology,  
Chairman BiofuelsTP Mirror Group



*Since 2006, he has been Managing Director of the Austrian Agency for Alternative Propulsion Systems. Previously he was responsible for the R&D-Program A3 "Austrian Advanced Automotive Technology" funding the development and market introduction of alternative propulsion systems. From 1997-1999 he carried out Technology foresight & assessment studies at the Institute for Prospective Technological Studies of the European Union in Seville in the field of transport technologies and sustainable mobility. And from 1994 to 1997 he was responsible for R&D funding programs for transport technologies as deputy Head of Unit at the Austrian Ministry for Transport, Innovation and Technology. He studied Chemistry at the University of Vienna (Masters 1987, PhD 1992), and completed a Post Doc, at University of California in Berkeley in the field of battery research. He was also Assistant Professor at the Institute for Physical Chemistry at the University of Vienna.*

### SRA and SDD – A View from the EU Member States

For the development and market introduction of biofuels EU member states cooperate closely with the European Commission, R&D institutions, agriculture and the vehicle and fuel industry with the common goal of reducing emissions of greenhouse gases and Europe's dependence on oil imports as well as opening new opportunities for agrarian income and rural development.

Striving for ambitious targets like 20% of motor fuel consumption by new and alternative fuels as well as a 10% biofuel share in 2020 the EU needs to speed up the market introduction of biofuels as only two Member States achieved a market share of more than 2% in 2005. In 2005 80% of the total EU ethanol production was achieved by 4 Member States and in the case of biodiesel by only 3 Member States.

As progress in introducing biofuels and the potentials for producing biofuels differ substantially among Member States, different support instruments might be appropriate at the current stage of development. On the other hand, the industries involved require a long-term predictable policy framework in order to ensure investment security. This can be achieved by setting mandatory targets for the share of biofuels in 2020 on a European basis.

Biofuels still need public support under present conditions becoming competitive compared to fossil fuels only at oil prices above 100 US\$ (depending on feedstock- and biofuel production costs). Member states adopted different policy tools with the following advantages and drawbacks:

- **Feedstock subsidies**
  - + Direct support to farmers
  - + Can be used to influence the sort of crops grown (environmental impact) and to stimulate more environmentally-friendly agricultural practices
  - Loss of revenue for governments
  - Only complementary measure (negligible impact on biodiesel and bioethanol costs)
  - Limited success so far
  - Can draw away crops from food production and increase their price Investment subsidies (Support to biofuel production facilities)
  - + Can be major drive for second generation biofuels
  - + Can steer investment
  - Only complementary to mandate/tax exemptions for 1st generation as limited impact on fuel price
- **Fuel quality standards**
  - + Can be used as a guideline for all stakeholders (fuel producers, distributors and vehicle manufacturers)
  - + Confidence for the end-user
  - There are some limiting restrictions in current fossil standards
- **Tax exemption on biofuels**
  - + Well suited to initiate an 'infant' market – proved to be successful
  - + Easy to implement
  - + Incentive to innovation
  - + Low market risks
  - + Can be differentiated to e.g. account for the environmental efficiency
  - + Suitable to bring pure/high blends into the market
  - Losses in revenues for governments
  - Risk of over- and undercompensation (due to volatility of oil prices)
  - Insufficient to reach high shares of biofuels depending on tax level and oil price
  - Complicated system in tax exemption in EU
- **Obligation to fuel suppliers to achieve a certain biofuel share in their total sales**
  - + Improves likelihood that target will be met (depending on the penalty)
  - + No revenue losses for the government
  - + Efficient polluter pays principle reduces transport demand

- + Predictable framework and higher investment security for biofuel producers
- + Efficient tool to achieve high biofuel shares
- + No overcompensation by subsidies possible
- More difficult to implement (additional costs for producer and consumer)
- Market risks for producers by uncertainty of changing demand by higher prices
- Likely to favour cheaper options (low blends, imports)
- No overachievement of targets makes target setting more crucial
- Fewer incentives for innovation
- Limited experiences so far
- Not suitable for high blends
- Risk of technology lock-in

In the last years many Member States shifted from tax exemption to obligations (or at least to a mixed system) avoiding revenue losses as well as achieving higher biofuel shares.

The SRA and SDD are a valuable guideline for the design and implementation of a national biofuel policy. The EU member states congratulate the authors and suggest some general recommendations:

- R&D is the key to bring biofuel costs down and to multiply the biofuel yield per acreage in order to avoid competition with food production.
- Social acceptance of biofuels is crucial taking ethical considerations and environmental consequences into account. A certification system is needed to guarantee sustainability standards as foreseen in EU directive.
- Not only technical improvements are important but predictable framework conditions and confidence of investors in capital-intensive innovative technologies should be established.
- Implementation of an efficient information system is needed to avoid misinterpretation of data.
- Even if national policies are different due to structural and climatic differences member states are united by the common goal of a sustainable transport and energy system and the targets set on the EU-level for greenhouse gas reduction.

## Hans Harald Jahn

EIB – European Investment Bank

### The BiofuelsTP SRA/SDD – How Can the European Investment Bank Contribute to their Implementation?

## Ralph E.H. Sims,

IEA - International Energy Agency

*Ralph Sims is Professor of Sustainable Energy at Massey University, New Zealand where he began his research career testing biodiesel from animal fats in the early 1970s. He is currently based at the Renewable Energy Unit of the International Energy Agency, Paris. He was the Co-ordinating Lead Author of the "Energy Supply" chapter of the IPCC 4th Assessment Report, is a member of the focus group for the forthcoming IPCC Special Report on Renewable Energy, is a Fellow of the New Zealand Institute of Professional Engineers and a Companion of the Royal Society.*



### Biofuels in the Global Energy Market - The IEA Perspective

Biofuels have become a favourite topic of politicians. The message sometimes given is that in spite of growing greenhouse gas emissions from the transport sector and oil supply security, you can continue to drive your high fuel consumption vehicles in the same way without changing your behaviour and we will simply substitute biofuels for gasoline and diesel. Targets are also being set, often without a prior full analysis of the biomass resources available and the true costs involved. The IEA has recently conducted various analyses of first and second generation biofuels relating to costs, their short and long term potentials, planning barriers, competition for the biomass (e.g. for heat and biomaterials), sustainable biomass production, trade between north and south, and the role that policy drivers should play. The transition from first to second generation biofuels, the development of conversion technologies, and comparisons of life cycle analyses are currently under evaluation. This paper will highlight the key points of the findings.