

European Biofuels Technology Platform: Second Stakeholder Plenary Meeting

Speakers: CVs & Abstracts

WELCOME & KEYNOTE ADDRESS

Véronique Hervouet

Chair of Steering Committee (SC), European Biofuels Technology Platform

Véronique Hervouet is a graduate engineer from Ecole Centrale de Lyon (France), Master of Science in Materials Science & Engineering from Cornell University (USA). She has 22 years of experience in the oil & gas industry within Elf & Total (Exploration & Production, Refining & Marketing, Petrochemicals, Chemicals) with responsibilities in the areas of Research & Development, Business and Strategy. Current responsibilities with Total are Vice President, Investments, Total Energy Ventures; Senior Advisor, Bioenergy. She is Chair of the Steering Committee of the European Biofuels Technology Platform and Vice chair of the Evaluation Committee of the Bioenergy Program of the French National Research Agency. .



IMPLEMENTING THE SRA: POLICY AND BIO-RESOURCES CONTEXT

Moderator: Véronique Hervouet

Chair of Steering Committee (SC), European Biofuels Technology Platform

Raffaele Liberali

European Commission, DG Research, Director of Directorate K – Energy

Raffaele Liberali was appointed Director for "Energy" within the Directorate-General "Research" of the European Commission in October 2006. He is in charge of the implementation of the Non-Nuclear Energy priority of the 7th Framework Programme, as well as the definition of political priorities and the coordination with Member States and research/industrial stakeholders in the field of non-nuclear energy technologies. This work is carried out in close cooperation with DG Transport and Energy.



The EU SET Plan and European Industrial Initiatives

The recent adoption of the Renewable Energies Directive by Council and the European Parliament sets the framework conditions for the bio-industry to contribute to the goal of 20% renewables in the EU energy mix.

Bringing the necessary technologies to the market beyond a business as usual scenario is essential to reach this goal. The European Industrial Initiatives (EII) within the SET Plan are a central instrument to shift into a higher gear for fast technology deployment. Industry is called upon to develop its roadmap in this framework, and the bio-industry has started proactively to work on this. The Bio-energy initiative will consider Biofuel as well as other opportunities of converting biomass to energy. As the name says, the European Initiatives are initiatives set-up and steered by industry, so the Commission counts on the commitment and imagination of the sector. It is hoped that the European Industrial Initiative on Bio-Energy can make rapid progress during 2009. The Commission is fully committed to making this initiative a success.

Bruno Schmitz

European Commission, DG Research, Head of Unit K3 - New and renewable energy sources

Bruno Schmitz is Head of Unit in the Directorate General for Research of the European Commission. Since October 2006, he is responsible for the "New and Renewable Energy Sources" Unit, which aims at promoting and supporting research on a mix of renewable energy technologies (solar, wind, biomass, ocean, geothermal) to address the pressing challenges of security of supply and climate change, whilst increasing the competitiveness of Europe's industries. He holds a MS degree in bioengineering from the Free University of Brussels and started his career as researcher in the Belgian national programme on energy. He joined the European Commission in 1984, where he started as Project Officer responsible for the "Development of Natural Resources" Sub-Programme of the FAST (Forecasting and Assessment in the field of Science and Technology) Programme. In 1989, he created the SAST (Strategic Analysis in Science and Technology) Unit. He then held various positions in DG Research. Notably, between 1996 and 1999, he was appointed advisor to the Director General, whilst being also Deputy Director of the "Environment-Water" Task Force and Secretary of the European Science and Technology Assembly (ESTA). Prior to his current appointment he was Head of the "Research Training Networks" Unit as part of the FP6 "Human Resources and Mobility" Programme.



Jose Riesgo

European Commission, DG Transport and Energy

Biofuels & Biorefinery research and demonstration activities of the European Commission: update on recent developments and renewable energy sources

The ELLs will be complemented by other instruments within the SET Plan – such as the recently launched European Energy Research Alliance which is aimed at stimulating co-operation among research bodies at national or regional level – and by usual Framework Programme activities. The European Commission has a long track record - through the Framework Programmes - of investment in RD&D on biofuel and bioenergy more generally. This will be reported briefly along side the more recent exceptional effort made to support biorefinery developments.

Calliope Panoutsou

Vice Chair of Working Group 1 on Biomass Availability and Supply, European Biofuels Technology Platform

Dr Calliope Panoutsou is the Vice- 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.



Availability of sustainable biomass feedstocks for biofuels: update on key issues

As biomass remains very high on the EU political and industrial agenda the issue of sustainability is perceived by relevant stakeholders in the field as the key to distinguish 'good' from 'risky' bio-feedstocks and estimate what origin, how much, and at which time horizon they can exploit to cover energy and respective non- energy requirements.

Sustainability is a rich concept because it covers and combines three essential dimensions (economy, environment, social). The practical deployment of this concept is very challenging because of the complex and sometimes conflicting interactions between these three dimensions and across different sectors (agriculture, energy, pulp & paper, transportation, etc.)

The challenges of developing successful and sustainable biomass chains for fuel, energy, industrial products, etc. are well understood in Europe. Strong efforts are deployed by the relevant scientific and industrial actors to tackle issues of security of supply, efficiency in resource production and conversion, logistics, compatibility with existing infrastructure and environmental regulations as well as investigation on innovative production pathways and concepts that could bring a significant contribution to the very ambitious EU objectives.

However, today more than ever, the perception of biomass by certain interest groups and advertised by the media among the wider public is jeopardised by a vivid, on-going debate with discussions mixing up energy production, higher food prices, new opportunities for rural areas and agriculture, third world poverty and food crises, deterioration of biodiversity and landscape, climate change and greenhouse gasses emissions, new technologies, employment and so on.

The stronger debates seem to focus on the upstream and specifically the production of feedstocks for biofuels on agricultural land, in conflict with vital sectors such as food and feed. The risk of using land of high conservation value is also a concern. Key interfacing issues regarding available and sustainable biomass include:

- Terminology & Definitions need to be harmonised and carefully set in order to apply to a range of feedstocks, markets & applications.
- Value of co-products: attention should be paid to the co-products and their value in respective market sectors.
- Any methodology for the calculation of the greenhouse gases should take into account the potential CO₂ savings from optimising the cropping system e.g. crop rotation. This will allow a successful comparison of traditional annual crops (i.e. rapeseed, sunflower, etc.) with perennial ones.
- Dialogue with the involved 'feedstock producers'.

The presentation will address the issue of biomass availability in relation to the new dimensions placed by the current sustainability criteria processes and define the key research areas for the short and long term future.

EBTP's MAIN CONTRIBUTIONS TO IMPLEMENTING THE STRATEGIC RESEARCH AGENDA AND PREPARING DEMONSTRATIONS

Moderator: Anders Røj

Vice-Chair of Steering Committee (SC), European Biofuels Technology Platform

Anders Røj joined Volvo Technology (Sweden) in 1989, where he heads the Fuels and Lubricants group and coordinates corporate fuels activities within the Volvo Group. Anders has more than 25 years of experience in the field of refining and fuel quality, previously working in FCC catalyst development (with EKA/ Katalistiks bv) in 1980-1984, and on performance additives for fuels and lubricants (with Exxon Chemical, Paramins) from 1984 to 1989. For many years, Anders has been heavily engaged in industry activities related to fuels and lubricants, such as ACEA (Fuels & Lubricants, Chairman), EUCAR, CEN (Standardisation) and CEC (Development of performance tests). He served as chairman in the BIOFRAC (Biofuels Research Advisory Council), which led into the creation of an EU Biofuels Research Platform in June 2006; he is presently Vice Chair of this Platform. He has a M.Sc. degree in Chemical Engineering from Åbo Akademi in Turku, Finland (1979), and a Licentiate of Engineering degree in the same discipline from Chalmers University of Technology, Gothenburg, Sweden (1984).



Birger Kerckow

Secretariat of the European Biofuels Technology Platform

Birger Kerckow is an agricultural engineer with a specialization in agricultural economics (University of Göttingen). He has more than 19 years of experience in the field of renewable biological resources, both on national and international level and co-ordinates the European activities of FNR. He is the German representative in the Executive Committee (ExCo) of IEA Bioenergy and ExCo vice chair 2008/2009.



Mapping activities of the EBTP: databases of main ongoing biofuels related R&D projects, pilot & demonstration plants and public biofuels debates

Following the launch of the Strategic Research Agenda and Strategy Deployment Document (SRA/SDD) in January 2008, a key activity of the TP was to obtain a better overview of ongoing biofuels R&D projects as well as biofuels pilot and demonstration plants. In addition, the lively debate on the impact of biofuels on climate change and the world food situation led to a number of publications which impact also the framework for biofuels R&D. To this end, the EBTP secretariat created three databases:

- A searchable online database, on R&D projects funded by the European Commission, EU Member States and third countries, which is open to all registered stakeholders.
- A focused, Excel database to gather timescales and technical details of 2nd generation biofuels pilot and demonstration plants; so far used only internally by the TP.
- An internal Excel database on organisations taking part in the public debate on biofuels and relevant publications; the focus is on the scientific references for claims made, and their relation to technology development aims identified in the Strategic Research Agenda.

Information gaps were identified specifically for nationally funded projects and activities. This will be reduced in the future with the help of biofuels stakeholders, but also complementary projects and activities such as IEA Bioenergy Task 39, Biofuel Cities and BIOMAP.

Markku Karlsson

Vice Chair of the Steering Committee (SC), Chair of Working Group 1 on Biomass, and Co-chair of Working Group 6 on Prioritisation, European Biofuels Technology Platform

Markku Karlsson is the Senior Vice President, Technology for UPM-Kymmene Corporation, Finland. From 1999-2004 he was Senior Vice President, Corporate Technology, Metso Corporation. From 2004-2006 he was Vice Chairman of the Academy of Finland, and a member of the board from 2000-2003. He is also a member of the board of the Finnish Forest Research Institute (Metla), a member of the Steering Committee of the European Biofuels Technology Platform, the Advisory committee for the Forest Based Sector Technology Platform, and the CTO Committee of the Agenda 2020 Technology Alliance. He received a D.Sc. (Chem.Eng.) from Åbo Akademi University, Turku, Finland in 1987.



The identification of Bioenergy value chains of potential relevance to EII-B

The European climate and energy policy is supported by strong Directives for reducing greenhouse gas emissions and increasing green electricity and transportation fuels production in member states. EU has set ambitious targets for CO₂ reduction and renewable energy utilization to affect climate change. In order to reach the targets, industry has to develop their operations. Climate mitigation challenges companies to reduce energy consumption and increase the use of bioenergy to reach lower CO₂ emissions.

EU climate change policies are supported through European technology platforms, for example EFTP and EBFTP by introducing measures and instruments such as the SET Plan and EII-B. Instruments are developed for speed-up of demonstration and dissemination of new technologies. Technologies have to be in use in 2016 in order to reach the targets for 2020.

An approach for identifying the bioenergy value chains of potential relevance to EII-B has been made. In this approach, critical and core technologies for value chains are identified as well as scope and costs for possible demonstrations are determined. In addition, sustainability issues for the value chains have been considered. The paper describes value chains from all most important branches - forest industry (eg. black liquor and extractives based biofuels and biofuels produced from recycled fiber), palm oil/vegetable oils at large oil refineries, sugar cane based biofuels, straw/energy crops/food industry residues. Also future options of algae and aqua biomass are reviewed.

To reach the ambitious targets for bioenergy utilization, reliable value chains with large enough volumes have to be identified. As forest industry's core competences are process integration and handling large raw material stream logistics, biofuels and bioenergy form a good opportunity to the forest sector.

FROM PILOTS TO DEMONSTRATION PLANTS: CASE STUDIES I

Moderator: Kai Sipilä

Chair of Working Group 2 on Conversion, European Biofuels Technology Platform

Prof. Kai Sipilä is Vice President, Strategic Research - energy for VTT Technical Research Centre of Finland. He is a Chair of the EBTP Working Group 2 on conversion technologies, a member of the Scientific Committee of the Forest based industries technology platform, Coordinator of NoE Bioenergy (Network of Excellence EU 6FWP RTD), and Representative of Finland on the Executive Committee of the IEA Biomass Agreement, being made Vice Chairman in 2003. He holds an M.Sc. (Tech) and a Lic. Tech in Chemical Engineering from the Helsinki University of Technology, Finland, and from 1996 -2005 was Research Professor in Biomass Conversion Technologies at VTT.



Matthias Rudloff

Business Development Manager, CHOREN Industries GmbH

Since 2000, Matthias Rudloff has been responsible for project and business development at CHOREN Industries and represents the company on national and international bodies. He has gained comprehensive experience in the energy sector in company strategy, product development, marketing and sales, after starting his career as a project engineer for decentralized energy plants and company energy planning. He graduated from the University of Hanover in 1992, having studied mechanical engineering with special emphasis on power and chemical engineering.



The CHOREN Sigma Plant

The CHOREN Sigma Plant is the world's first large scale BTL-facility in Schwedt, Germany. Synthetic biofuel produced from lignocellulosic biomass via gasification and Fischer-Tropsch synthesis (BTL) is one of the most promising options for 2nd generation biofuels. The mayor challenge on the pathway to large scale production of BTL is the demonstration of the integration of various mature process units under industrial conditions. Questions like constructability, operateability, safety and reliability for the integration of more than 110 process units have to be taken into account. While the process units for Fischer-Tropsch synthesis and product upgrading, gas cleaning and conditioning (scrubber, CO-shift, Rectisol) and most parts of the biomass conditioning (storage, chipping) are industrial technologies, effective large scale biomass drying (esp. waste wood drying) and the upscaled Carbo-V biomass gasification are still in demonstration stage.

CHOREN has already gained multiple experiences in the design and construction of the BTL Beta Pilot plant in Freiberg/Germany (360 barrels per day (bbd)). This experience, enriched by operation experiences expected in the course of year 2009, already was and will further be transferred to the design of the first large scale BTL demonstration plant. This plant with a capacity of 5000 bbd is foreseen linked to the Schwedt oil refinery in North-Eastern Germany located in the middle of a rural area. Project funding and stakeholder commitment to take project risks are on the critical path of the time schedule.

Steven Gust

Senior Associate, Neste Oil

Steven Gust is currently Senior Associate, Renewable Feedstocks & Processes at Neste Oil. Having joined Neste Oil in 1986, he has been involved in various renewable energy projects, including life cycle analyses, and as a fast pyrolysis project leader and pilot plant manager. He is currently responsible for BTL synthesis activities. He received an M.Sc. from Carleton University in Canada 1983, before commencing his career as a researcher in lithium thionyl and lead battery development.



The BTL demonstration project of Neste Oil / Stora Enso

Neste Oil and Stora Enso have formed a 50:50 joint venture company NSE Biofuels to develop a BTL chain. NSE Biofuels is responsible for processing biomass into an upgraded energy carrier while Stora Enso is in charge of feedstock procurement. and Neste Oil for intermediate product upgrading and marketing.

The BTL chain is being demonstrated at the Stora Enso mill in Varkaus, Finland. A 12 MW Foster Wheeler CFB gasifier with a 5 MW slipstream for gas cleaning, conditioning and chemical synthesis testing and development is under construction. The gasifier is currently operational and the gas is currently used in a lime kiln to replace heavy fuel oil. Remaining process steps will be installed during 2009. Gasification and gas cleaning expertise from the technical research centre of Finland (VTT) is also utilized. The goals for the Demo programme are to prove the viability of the chosen concept, gain long term experiences with the gas filtering, tar reforming, shifting, final gas cleaning and chemical synthesis. Based on the results of these experiences and market developments, the concept would be ready for scaling up to commercial sizes in a few years.

Hans Sohlström

Executive Vice President, UPM

Mr Hans Sohlström is Executive Vice President, Corporate Relations and Development of UPM-Kymmene Corporation based in Helsinki, Finland. UPM is one of the world's leading forest industry companies. As a member of the group's executive team and reporting to the CEO he is involved in the development of new businesses (especially biofuels) outside the traditional scope of the forest industry. Hans has worked 20 years for UPM, being based in Finland, Germany and France and with varying senior positions in sales, marketing and general management.



UPM Biofuels development and pilot projects

Second generation (2G) biofuels fit well to UPM's forest industry operations. UPM is already today one of the World's largest producers of biomass based combined heat and power (CHP). Biofuels production is a natural step towards combined heat, power and fuel (CHPF) production. This is also a natural development towards increased value added to renewable forest resources. UPM is developing three biofuels concepts:

1. Forest residue based 2G biodiesel through gasification and the Fischer-Tropsch synthesis
2. Cellulose waste based 2G bioethanol through acid and enzymatic hydrolysis
3. Forest residue based 2G bio-oil through pyrolysis

Wood should primarily be used for wood products, pulp and paper for maximum added value and benefit. Forest residues and waste, which is not suited for recycling, can be used for heat, power and biofuels production. In order for a biofuel to be sustainable:

1. It needs to contribute to significant CO₂ reduction (well to wheel)
2. It cannot compete with food end-uses
3. Its total value chain (from sources to consumption) needs to be sustainable

Patrik Löwnertz

VP Marketing and Sales, Chemrec

Mr. Patrik Löwnertz became VP Marketing and Sales with Chemrec AB in 2007. Previously, he has worked in process engineering, sales, product and general management primarily within the chemical wood pulp industry area. He graduated in 1981 with a MSc in Chemical Engineering.



Turning Pulp Mills into Biorefineries: The BioDME project and beyond

Chemrec is currently operating a 3 MWt (20 tons black liquor solids per day, tbs/d) development plant, DP-1, in Piteå, Northern Sweden. It is a pressurized, oxygen-blown entrained-flow black liquor gasifier system designed to operate at 30 bar and at 1000-1050°C producing raw syngas. The plant has operated about 8000 hours since it started up in September 2005. The plant utilizes about 1% of the mill's black liquor and the gas is currently flared.

The BioDME project consist of two main parts, (1) Construction and operation of a DME plant producing DME from black liquor and (2) utilization of DME as fuel for heavy duty vehicles.

The production plant includes (besides the existing DP-1 plant) a unit for raw gas cleaning and conditioning and a novel DME producing process. The first unit consists of active carbon filter, a CO-shift unit and an amine wash. The latter unit includes a novel technology by Haldor Topsoe, also a project partner, where methanol is produced in a new reactor concept followed by DME generation and distillation. The plant is planned to be operated over a 30 month period generating 4-5 tons of DME per day (150 days a year). Production is scheduled to start in April 2010.

The second part of the project includes vehicle fleet testing using the DME produced at the plant. Volvo will produce 14 HD trucks which will run at four locations in Sweden. Other partners in the project will work with fuel specification, lubricants and material testing (Total), engine fuel injection system (Delfi), DME storage and distribution (Preem) and laboratory work at the DME production facility (ETC).

Chemrec is currently working on two demonstration projects, one in Sweden and one in the US. These projects will utilize about 25% of the black liquor available at the respective pulp mills and generate methanol and DME in a combined process. First production starts 2012.

FROM PILOTS TO DEMONSTRATION PLANTS: CASE STUDIES II

Moderator: Harri Turpeinen

Chair of Working Group 3 on End-use and Co-chair of Working Group 6 on Prioritisation, European Biofuels Technology Platform

Harri Turpeinen is Vice President for Corporate Stakeholder Relations at Neste Oil. Previously, he has worked with Neste Oil as a research engineer, a marketing manager in the coal business, a Vice President in charge of the bitumen business and a Vice President in charge of the oil specialties business group (bitumen, solvents, lubricants and base oils).

Between 1997 and July 2007 he was responsible for the company's Research and Technology function. He graduated from the University of Oulu with a degree in organic chemistry.



Nicolaus Dahmen

bioliq® Project Coordinator, Karlsruhe Institute of Technology -KIT

Dr. Nicolaus Dahmen is the bioliq®-project leader in the Division of Chemical-Physical Processing (ITC-CPV) at the Karlsruhe Institute of Technical Chemistry, as well as the division leader for gas production from biomass. From 2003-2005 he was division leader for High pressure process fundamentals, and from 1996-2004 was group leader for CO₂ as a solvent for separations and reactions. Dr. Dahmen is a member of the European Biofuels Technology Platform, Working Group 2 on Conversion. From 1998-2007 he was on the he was Editorial board of the Journal of Supercritical Fluids, and In 2008 he was finalist in Innovationspreis der Deutschen Wirtschaft. After completing a doctorate (Dr. rer. nat.) in the Faculty of Chemistry at Ruhr University Bochum, he carried out post-doc studies at Kernforschungszentrum Karlsruhe, IHCH, later ITC.



Armin Guenther

Air Liquide / Lurgi GmbH

Dr. Armin Günther is Director for Product Management Renewables at Lurgi GmbH, Frankfurt. He was formerly Sales Manager at Lurgi AG for biofuels and responsible for sales technology in this field, in particular for biodiesel, glycerin refining and second generation biofuels (BLT). Previously, as Head of Department for Project Management and Renewable Energies at an engineering company, he was responsible for national and international for projects in the traditional engineering sector as well as for renewable energies and biodiesel. He studied chemistry at the University of Frankfurt, worked for the diploma at the CNR Consiglio Nazionale delle Ricerche in Bologna, graduated with a PhD in Chemistry at the University of Frankfurt and worked at the Center of Environmental Research (Frankfurt).



Combining industrial scale biosynfuel production with economic biomass logistics: The bioliq® process of the Karlsruhe Institute of Technology in co-operation with Air Liquide / Lurgi

The bioliq concept has been designed to overcome the problems met, when low grade biomass should be used to a large extent as required in a BTL process. Biomass such as straw, hay, residual wood etc. usually exhibit low energetic densities, thus limiting collection area and transport distance. On the other hand, the production of synthetic fuels require large scale production facilities in accordance with economy of scale considerations. In the bioliq process, biomass is pre-treated in regionally distributed fast pyrolysis plants. The products, pyrolysis char and liquid condensates, are mixed for form a stable, transportable and pumpable slurry also denoted as biosyncrude. Thus biomass is energetically densified allowing for economic transport also over long distances. The biosyncrude is gasified in a entrained flow gasifier at a pressure slightly above that of the following synthesis. In the bioliq process synthetic fuels via methanol are the products aimed at. Thus, a gasification pressure of 80 bar is required.

On site of KIT, a pilot plant is constructed for process demonstration, for gaining practical experience, and to allow for reliable cost estimates. The fast pyrolysis plant, already completed in 2008, has a biomass feed capacity of 500 kg/h (2 MW(th)). A twin-screw reactor, equipped with a pneumatic heat carrier loop with sand as the heat carrier medium, and a two-stage condensation are the main components. A plant and operation description will be given and first experience of pyrolysis plant operation and biosyncrude preparation will be reported.

In the next stage to be started in 2009, the high pressure entrained flow gasifier, 5 MW(th) will be constructed. The special feature of the oxygen blown slagging reactor is the internal cooling screen, allowing for the conversion of ash rich feeds and fast start up and shut down procedures. A basic design has already been worked out and will be presented in the contribution.

In stage 3 to be planned in detail now, a new high pressure – high temperature gas cleaning and conditioning system will be applied. Afterwards, the purified synthesis gas is converted to Methanol or, in a one stage reactor, to DME. That intermediate is then further converted to synthetic fuels via an MtX process. Possible synthesis routes and options will be shown.

The bioliq process is developed in cooperation with Lurgi GmbH and is substantially supported by the Germany Ministry of Agriculture, Food, and Consumer Protection.

Pierre Porot

Associate Director of the Refining and Petrochemical Business Unit, Institut Français du Pétrole, IFP

Since 2004, Pierre Porot has been Associate Director of the IFP Refining and Petrochemical Business Unit, and worked on the IFP Biomass conversion strategy and projects follow-up. From 2001-2004, he was a Process Engineer in the Process Department, dealing with petroleum heavy ends conversion processes, and also managed a refinery modelling project. From 1997-2001, he worked on general innovation processes within IFP. He graduated as an engineer from "Ecole Centrale de Nantes", before starting his career at IFP in 1989 in the Engine R&D Department.



The FUTUROL project on 2nd generation Ethanol

FUTUROL is a R&D project aiming to launch a complete industrial value chain to produce ligno-cellulosic ethanol. The project duration is 8 years starting from 2008 and the global budget is 74 M€. IAR, the "pôle de compétitivité Industrie Agro Ressources", support it. It is partially funded by OSEO, a french public agency. The main goal is to reach an ethanol production process with a competitive price of ethanol. The global process should be versatile, able to treat different feedstocks from different areas. FUTUROL will thus develop and industrialize technologies to extract and hydrolyse the cellulose from the feedstocks and improve and adapt the fermentation process. FUTUROL will also select the best enzymes and yeasts for the global chain and bring them to the market. The overall energetic and GHG balance will be optimized. The sustainability of the overall value chain (from feedstock supply to ethanol distribution) will be evaluated and will steer the FUTUROL project. The association of R&D centers with industrial companies already present in the first generation ethanol production and covering all the value chain gives to the project its consistency and credibility. The project deals with 3 scales : lab studies (1 kg/d), pilot tests (1t/d) and demo plant (100 t/d). The lab studies are already in process and the pilot plant is under detailed engineering and should start in 2010. The prototype building is expected to begin in 2013 and the start-up should last 1 year.

The research, industrial and financial partners are Champagne Céréales, Confédération Générale des Betteraviers (CGB), Unigrains, Crédit Agricole, Tereos, Total, Office national des forêts (ONF), Institut National de la Recherche Agronomique, INRA, Lesaffre, IFP and Agro Industrie Recherches et développement (ARD). A specific company has been created by the partners to follow up the project and industrialize the process after the demo : Procethol 2G.

Michael Persson

Vice President, Inbicon

Michael Persson is currently Vice president, partnerships and stakeholder relations, Inbicon A/S. Before that Michael has worked 12 years with business development in Danisco Sugar, latest as vice president, with responsibility for sugar activities in Lithuania and for feasibility studies of first generation bio-ethanol factories in conjunction to existing sugar factories in Nakskov and Anklam, Germany, of which the latter is now under construction. Michael has also experience from medical instrumentation (Radiometer A/S) and cleaning equipment for the processing industry (Toftejorg A/S). Michael has a M.Sc. from Technical University of Denmark and an MBA from INSEAD, France.



Demonstration of 2nd Generation Biofuels in Denmark

The international biofuel industry has set its focus on the development of new technologies for producing ethanol from agricultural waste and energy crops. In Denmark, DONG Energy A/S biotech subsidiary Inbicon A/S is constructing a demonstration plant for the conversion of wheat straw to ethanol. The plant will demonstrate the process developed by Inbicon and will be located next to one of DONG Energy's power plants. The construction began in the spring of 2008, and the plant is scheduled for commissioning before the Copenhagen Climate Summit in November 2009. The plant will receive 30,000 tonnes of wheat straw per year and will produce 4.300 tonnes ethanol per year, 8,250 tonnes of dry biofuel and 11,100 tonnes of cattle feed per year. The investment is around €40 mill., of which €10mill. is funded by Danish government grants.

In the 90s, Danish power companies started using biomass for power production, and now several power plants handle 500 tonnes pr. day of wheat straw. Based on the experience with the straw handling, a process was developed for the pretreatment of biomass with the intention of producing ethanol, and in 2002, a R&D project ("Co-production biofuels") partly funded by the European Commission was initiated.

In the course of the R&D project, several technological breakthroughs were achieved, and a pilot plant with a design capacity of 24 tonnes pr. day of wheat straw was inaugurated in 2005. After the completion of the R&D project, the subsidiary Inbicon was formed to focus on and accelerate the commercialization of the technology.

The core technology is the hydrothermal pretreatment and the enzymatic hydrolysis using the high gravity principle, both patented by Inbicon. The hydrothermal pretreatment gently peels off the lignin of the biomass without deconstructing it, and gives excellent access to the cellulose fibres for the enzymes in the following hydrolysis. Very efficient liquefaction has been demonstrated with very low enzyme doses, and the fermentation is very robust.

The process developed by Inbicon is under continuous testing and optimisation at the pilot facility. The process is based on an autohydrolysis where no chemicals are used for the pretreatment, and it works at a very high dry matter content (30 - 40 %), producing high concentrations of ethanol in the beer. In addition to ethanol, the process produces a supreme dry biofuel suitable for bio pellets and a C5-molasses, which can be used for animal feed or ethanol production with suitable organisms.

Mika Anttonen

Chairman of the Board, St1

St1 Biofuels – small scale demonstration on Waste-Based Ethanol (WBE)

Various studies have been conducted on volume potential of WBE in Finland. Combining quantity and quality of different types of waste, containing sugar or starch, St1 has estimated the theoretical potential to be ~600.000 m³/a. This volume would be sufficient to cover the entire estimated annual demand of ~400.000 m³ fuel ethanol by 2020. WBE is also a solution to global waste problem.

High energy prices make long distance transportation of feedstock with high water content uneconomical, as well as ecologically unsustainable. Competitiveness of large scale production units will suffer under these circumstances. Hence the relative position of distributed small scale units will improve. Distributed production helps also to significantly reduce GHG emissions.

St1 Etanolix[®] technology is a solution to all of these challenges. It uses food industry sidestreams (waste) to produce 85% Ethanol, which in turn is transported to a centralised dehydration unit to remove remaining water. Fuel grade ethanol is then blended with gasoline and distributed to consumers using existing logistics. Animal feed and fertilizers are produced as co-products. Etanolix[®] is modular and can be built anywhere in the world. New plant types will allow use of different waste types as feedstock.

The value chain of WBE extends from waste producers through St1 units and existing fuel logistics to final consumers. Minimising the transportation of water, and maximising the utilisation of energy containing fractions, makes WBE with the lowest possible CO₂ life-cycle emissions, the most sustainable transportation fuel in the world.

St1 has 3 Etanolix[®] and 1 Dehydration units in production and 3 Etanolix[®] in the pipeline. Low Etanolix[®] Capex of ~1,2 m€ combined with low Opex of 35c/l makes WBE also economically viable. Renewable energy sources, e.g. pellets are used for production, in cases where Etanolix[®] is not integrated with the production unit of the waste producer itself.



Anders Lay Tuxen

Manager Energy Strategy, Novozymes

Mr. Tuxen works with Novozymes on strategy in relation to energy sector related applications – especially biofuels. This includes business strategy, stakeholder strategy and communication strategy. Prior to joining Novozymes, Mr. Tuxen worked for the management consulting firm Booz Allen Hamilton, in the Danish Ministry of the Interior and Health, and in the Danish Parliament. Mr. Tuxen holds a Bachelor's degree in Political Science from University of Copenhagen and a Master in Public Administration from the Harvard Kennedy School at Harvard University.

Cellulosic ethanol: Pilot and demonstration scale activities in the US

The US government has provided strong and continued strategic support to bring biofuels to life – and make biofuels a key instrument in tackling with energy security and climate change challenges. This support has involved not only ambitious and long term biofuel mandates – but also a significant level of support to enable further development and scale-up of the biofuel supply-chain.

As part of the Advanced Energy Plan the US Department of Energy will have invested \$1 billion in advanced biofuel RD&D partnerships between the private sector and academia by 2012. This includes support for bioenergy centers as well as support for demonstration and commercial scale biorefineries.

Most notably, \$272 million has been committed to support development of commercial scale biorefineries, \$114 million to support development of small scale biorefineries, and \$33.8 million to support development of improved enzyme solutions for conversion of cellulosic material.

Novozymes' presentation will give an overview of these activities and provide examples on how some of the supported projects are progressing.



FINANCING DEMONSTRATIONS

Moderator: Olivier Appert

Member of the Steering Committee (SC), EBTP

In 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.



Tomas Kåberger

Director General, Swedish Energy Agency (STEM)

Tomas Kåberger holds a PhD in Physical Resource Theory from Chalmers University of Technology and is an adjunct professor at the International Institute of Industrial Environmental Economics at Lund University. Besides research he is served in leading positions of energy companies as well as on boards of environmental organisations, industrial federations in the energy area and government committees. He is now Director General of the Swedish Energy Agency.

Overview of Member States funding schemes

Harry Boyle

Lead Analyst Biofuels, New Energy Finance

Harry Boyle leads the New Energy Finance bioenergy team and is based in London. He has been researching and analysing the global biofuel markets for three years. He previously spent two years working as a researcher in the current affairs department of the BBC. Harry holds a Masters degree in Modern History from the University of St Andrews.

Private Equity funding of advanced biofuels technologies: a European and North American outlook

If the progress of next generation biofuel technology development is to be measured in terms of press coverage then this fledgling industry is advancing nicely. However, in terms of investment volumes, the picture has been more opaque. New Energy Finance covers all deal data relating to clean energy investment, including next generation biofuels. In the following presentation we will illustrate where next generation technology investment is going and attempt to explain why.