

BIOFUELS EAST 2010 CONFERENCE

With well in excess of 100 delegates attending and first-class speakers presenting, the Biofuels East 2010 Conference, hosted in Cambridge on 17th March, offered a timely perspective on the contribution that the UK can make to the development of low carbon biofuels.

Bianca Forte and Richard Parker

The global biofuels industry is expanding and diversifying in response to the need to address issues of climate change and energy security. Richard Parker, BioEnergy Development Director at Renewables East, opened the Biofuels East 2010 Conference urging stakeholders to consider the economic opportunities available for UK Plc in the biofuels sector.

BIOFUELS IN THE UK

Every year nearly 50 billion litres of road fuels are consumed in the UK, producing a fifth of the UK's total annual greenhouse gas (GHG) emissions. In 2008/09, biofuels represented 2.7% of the total road transport fuel supplied in the UK and delivered a 46% GHG saving compared to their equivalent fossil fuels.

Under the Renewable Transport Fuels Obligation (RTFO), UK biofuels suppliers are required to report on non-mandatory standards for carbon savings and sustainability principles. Compliance is achieved through the RTFO **meta-sustainability standard** or voluntary schemes accredited by the Renewable Fuels Agency (RFA), such as the ACCS.

According to Nick Goodall, Chief Executive Officer at the RFA, the reporting system implemented by the RTFO is the first of its kind in the world. The UK has also made a substantial contribution to the debate on the carbon and sustainability of fuels through research and published reports have been used to inform policy developments in the field. The UK regulator is working with other countries to transfer best practice.

The landscape for biofuels supply in the EU is evolving fast. To count towards the targets of the Renewable Energy Directive (RED), biofuels supplied within Member States will have to offer a minimum GHG savings of 35% from 2010, 50% from 1 January 2017 and 60% from 1 January 2018 for installations in operation from 1 January 2017. Clare Wenner, Head of Renewable Transport Fuels at the Renewable Energy Association, said that UK biofuel producers are doing well against EU targets. "According to the latest report on Year 2 of the RTFO (Apr – Dec 2009), the average GHG savings for UK biodiesel is 74% and for UK bioethanol is 81%".

RED is also implementing mandatory sustainability standards for biofuels to protect high biodiversity land and carbon sinks. According to the latest report on Year 2 of the RTFO, most UK feedstock is tallow and used cooking oil or ACCS accredited crops. Nick said that almost 100% of UK sourced biofuel crops met the sustainability requirements.

Claire said that the EC is working with research scientists globally to find a methodology to account for Indirect land Use Change (ILUC) and must report by end 2010. Work commissioned from E4Tech by the UK Government has shown preliminary indications that UK and EU grown oilseed rape and wheat show insignificant ILUC effects. The major issues arise when displacement of

biofuel crops into agricultural areas cause indirect destruction of carbon-rich habitats.

Whilst UK biofuel producers are performing well against the RED requirements on GHG savings and sustainability, only 10% of biofuels reported under the RTFO in this financial year were sourced from UK feedstocks. Only 4% of the biofuels supplied from feedstocks cultivated outside the UK on Year 1 of the RTFO met the sustainability standards. Clare stated that according to the REA modelling for feedstock availability to 2020, there is feedstock capacity to supply bioethanol from UK and EU; the volumes of UK biofuel supplied are limited by market factors. According to the model, bioethanol imports will continue and add to a potential surplus of 18.3 billion litres in the EU and 0.3 billion litres in the UK. A significant feedstock deficit for biodiesel is forecasted: 20.8 billion litres in the EU and 1.52 billion litres in the UK.

Tom Parker, Senior Associate at Transport and Travel Research Ltd (TTR), pointed out that “the RED target cannot be solely met by supply of low-blend biofuels with current, and agreed future, vehicle-fuel specifications”. A study produced for the Low Carbon Vehicle Partnership last year looked at 72 fuel and vehicle combinations for the opportunities for high-blend liquid and gas biofuel penetration in the UK. Tom said that higher blend biofuels “are a relatively cost effective mechanism for additional greenhouse gas reduction in transport” and that policy is required to address barriers for higher blends penetration such as availability of vehicles and warranty.

James Turner, Chief Engineer of Powertrain Research at Norfolk firm Lotus Engineering, introduced an alternative approach to break the biomass limit of ethanol. Lotus Engineering has been investigating how petrol, ethanol and methanol can be blend together, so that methanol can extend the benefit of ethanol blending in displacing fossil fuels. According to James, such blends can be made invisible to existing E85 flex-fuel vehicles and methanol can offer a 70 per cent greenhouse gas saving. The methanol could be produced from biomass via gasification, where feedstocks are properly sustainable, or by chemically liquefying hydrogen using CO₂.

OPPORTUNITIES FOR BIOFUELS R&D

A number of stakeholders have been looking to develop the potential that biofuels can play in a sustainable, low carbon transport sector in the UK. The Department for Transport (DfT), the leading body on biofuel policies, and Chief Scientific Advisors for DECC, DEFRA, DFID and BIS, are overseeing progress and strategic alignment on biofuels research across Government and public sector through the Cross-Government Biofuel Research Group.

According to Ignacio Vazquez, Biofuels Research and Negotiations Project Manager at DfT, a survey of UK and international research commissioned by DfT in Spring-Summer 2009 identified 100 research gaps in the field. DfT has since developed a research programme to: understand and reduce displacement effects of biofuels; improve evidence on the environmental, social and economic impacts of biofuels; promote best practice in biofuel production; foster innovation and support deployment to meet targets; and remove infrastructure and vehicle capability barriers.

According to Duncan Eggar, Bioenergy Champion at the BBSRC, the EU targets has also increased emphasis on technology research for second generation biofuels through the Research Councils Energy Programme. Commitments to bioenergy research to date include: the BBSRC Sustainable Bioenergy Centre; SUPERGEN Bioenergy, led by EPSRC; RELU Biomass, led by ESRC; TSEC Biosys, led by NERC; the IBTI Club, led by BBSRC; and the Renewable Materials LINK Programme, led by DEFRA and NNFCC.

Lignocellulosic biofuels

According to Duncan, the BBSRC Sustainable Bioenergy Centre, is the biggest ever UK investment in bioenergy with a budget of the £27M. The programme is aimed at unlocking the potential of lignocellulosic bioalcohols. Imperial College and Rothamsted Research are working to improve Short Rotation Coppice willow and Miscanthus as sources of sustainable biomass for bioenergy and biofuels. According to Dr Nick Brereton, Porter Alliance PhD Researcher, the group is developing tools for selecting genotypes in which more of the carbon in the lignocellulosic component can be captured for bioenergy. Researchers will identify crop variants with improved composition and optimise sustainable biomass yield by genetic improvement of plants to increase the amount of sunlight captured, the amount of carbon assimilated over a growing season and the partitioning of the carbon in harvested biomass.

Prof Keith Waldron, Head of Sustainability at the Institute of Food Research, presented on the latest advancements by the British BioAlcohols Group (BBAG). According to Keith, waste approximates to 30% or more of the processed material in the agri-food supply chain. BBAG and industry collaborators are developing tailored processes to produce bioalcohols from residues available in the East of England. Keith said that the main challenges in exploring waste residues include microbiological instability and heterogeneity of sources.

TMO Renewables Ltd, a company founded in 2002 to licence technologies to biofuel producers, focuses on integration of pre-treatment, enzyme hydrolysis and fermentation processes. According to Dr Steve Martin, R&D Director, the full integration reduces operational costs and minimises capital expenditure. Steve said that companies working on advanced biofuels need to prove that new processes can work reliably on an industrial scale if they are to successfully win funding and attract commercial interest. TMO's UK's first cellulosic ethanol demonstration facility, a £7.8 million Process Demonstration Unit, commenced operations in June 2008 and has flexible capability to process multiple feedstocks.

Algae bioenergy

Algae have attracted considerable attention as the ultimate bioenergy feedstock over the last few years. According to Chris Howe, Professor of the Biochemistry Department of the University of Cambridge and Founder Member of the Algal Bioenergy Consortium, more than US\$1 billion has been invested in algal bioenergy since 2007. Big companies in the race include: Shell, with the partnership with Cellana; Exxon Mobil, investing \$600 million in partnership with Synthetic Genomics; and BP, which has announced a \$10 million investment in Martek.

The number of start-ups that have jumped into the bandwagon is impressive. The Algal Bioenergy Consortium was founded after in response to increasing demand for technology assessment by the industry. The group aims to develop the bioenergy potential of algae and focuses on the identification of strains and growth conditions that yield high levels of target products and minimize financial and carbon costs associated with growth and down-stream processing.

According to Prof Chris How, current biomass productivity in raceway culture (open, shallow, pumped systems) is of 10-50 te/ha/y. Chris said that 20-40 te/ha/y of algal oil ought to be achievable with improved strains and reactor design. Preliminary life-cycle-assessments by researchers at Cambridge have indicated that for algae producing 20 te/ha/y oil, each tonne of biodiesel causes 54% less global warming potential than a tonne of fossil fuel.

Thermochemical processes

UOP, leading supplier and licensor of technologies and technical services to the petroleum refining, petrochemical, and gas processing industries, was invited to present on thermochemical processes for biomass conversion to transport fuels. In Oct 2008 UOP set up Envergent Technologies LLC, a joint venture with Ensyn, to produce hydrocarbons from residual biomass. According to Keith Holder, Refinery Consultant at UOP, applications in power and heat are available today. "The new venture provides a channel for the 3 years UOP R&D program to upgrade pyrolysis oil to transport fuels (gasoline, jet and diesel)".

The technology could use a range of feedstocks, such as: wood chips, sawdust and bark from the forest industry; lignin from the pulp and paper industry; woody construction waste, from municipal waste; and corn stover, straw, expended fruit bunches, from agriculture. Ensyn has tested over 70 types of feedstocks in its pilot plant. Typical pyrolysis oil yield, by wt% of dry feedstock, included: 70 -75 for bagasse, 70-80 for softwood and 60-80 for waste paper.

INDUSTRY AND ACADEMIA COLLABORATION IN BIOFUELS ADVANCEMENTS

Beatrix Schlarb-Ridley, Business Innovation Manager at InCrops, spoke on the challenges in the development of advanced biofuels and on the strategic support available to help bring together the right people in key market sectors. "InCrops has been working with companies based in the East of England to accelerate the development and adoption of new products and processes from non-food crops".

Beatrix has been working with Bianca Forte, Biofuels Co-ordinator at Renewables East, to lever out the regional research base in algae technologies and accelerate innovation to the market. Bianca believes the academic expertise found in the region can add value to international developments in the biofuels field and has been supporting initiatives to foster collaboration in research and technology development and transfer with Brazil.

Summing up the event in his closing remarks, Richard Parker said: "we have a tremendous amount of potential in the East of England, from basic science to automotive R&D. A lot of the work being done in this region is not only important environmentally, but creates jobs and stimulates production. Biofuels East was created to further collaboration between academia and industry to maximize the potential economic gains in this field."

The presentations of the Biofuels East 2010 Conference are available for download from www.biofueleast.org.uk. Biofuels East is a virtual Advanced Biofuels Hub funded by the East of England Development Agency and delivered by Renewables East. It offers intelligence on regional developments and sources of funding for collaborative R&D and pro-actively creates opportunities for partnerships. The benefits of the hub are for members only; membership is free. Please visit the website above to apply to join the hub.

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