IEA Bioenergy Task 39

Commercializing 1st- and 2nd-Generation Liquid Biofuels from Biomass

IEA Task 39 Newsletter Issue 18 April 2007

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EDITOR'S NOTES

Welcome to the April 2007 issue of the Task 39 newsletter. This spring marks the beginning of a new triennium for our Task, which is now renamed *Commercializing 1st- and 2nd-Generation Liquid Biofuels from Biomass.* Our website has been updated to reflect this change and hosts a new 'members only' section that will be populated with all of our past, present, and future reports on biofuel implementation. The newsletter will also be receiving an update; we are committed to expanding the role of the newsletter to include new sections on employment and exchange opportunities, and will continue bringing you in-depth articles covering topics of interest to our members.

On April 28, we will be hosting a Country Representatives meeting in Denver, CO, as part of the 29th Symposium on Biotechnology for Fuels and Chemicals; this will be followed by a Special Session within the Symposium on May 1. Please check your calendars and save these dates. An agenda is now available.

As always, we encourage all IEA Bioenergy Task members to make use of this newsletter, to contribute content, and to suggest improvements. - *Warren Mabee*

FROM THE TASK LEADER

Welcome to this, the first issue of the Task 39 Newsletter for the 2007-2009 triennium! In this issue, we report on the development of biofuel implementation agendas around the world; an in-depth report has been generated on this topic and will be available on our website shortly. We also have completed an evaluation of 2nd-generation biofuels which will be released in conjunction with IEA Headquarters.

The new iteration of our Task will continue to blend both policy development and technological innovation around liquid biofuels. The Tasks that comprise IEA Bioenergy have been given a mandate to work more closely over the next few years in order to build upon synergies in our respective programs, and to cover emerging technologies that otherwise might get less attention. Examples of the types of collaborations that Task 39 will exploring include closer work with Tasks 33 (gasification technologies) and 34 (pyrolysis platforms) to explore biomass-to-liquid synthesis, and better dialogue with Task 37 to explore biogas applications in the transportation sector. This closer collaboration will include joint meetings with other Tasks, and will deliver added value to our membership. We look forward to working closely with our partner Tasks and to the enriched program of research and dialogue that this will entail.

I also want to take this opportunity to welcome all Task 39 members, new and old, to the current triennium of work. Norway, Australia, and Japan join our long-standing members from Sweden, Finland, Denmark, the Netherlands, Austria, Germany, the United Kingdom, the United States, the European Commission, South Africa, the United States, and Canada. As I stated in our last newsletter, our Task is now a truly global group of experts and I look forward to exploring the potential that this expanded partnership will bring!

Upcoming meetings and opportunities for Task members to participate include a Business Meeting and Special Session at the 29th Symposium in Denver, CO (April 28 and May 1), and a more focused Task meeting to be held in the autumn of 2007. I would appreciate it if you would keep checking our website (www.task39.org) for details, particularly on the autumn meeting, and if you could register for each event as soon as possible. Look for more information on the autumn meeting this summer in our next newsletter.

As always, the success of Task 39 rests upon the dedication and contributions of our members. I look forward to seeing you all soon, and to receiving your input into our next triennium's activities! - *Jack Saddler*

IEA BIOENERGY TASK 39 2007-09: COMMERCIALIZING 1ST- AND 2ND-GENERATION LIQUID BIOFUELS FROM BIOMASS

The Country Representatives of Task 39 will be holding a business and planning meeting on April 28, 2007 in Denver, CO. This meeting will fall directly between ExCo59 and the 29th Symposium on Biotechnology for Fuels and Chemicals, and offers all participants in Task 39 with an opportunity to get together and discuss the workplan for the current triennium.

As described in our previous newsletter, the work in the 2007-2009 triennium will be focused on the policies and implementation strategies for 1st- and 2nd-generation biofuels, and on the continued technical development of 2nd-generation biofuels derived from lignocellulosic biomass through biochemical or thermochemical platforms. We have now begun to prioritize issues under these headings, and will be finalizing the Task workplan at the business meeting.

The Task will also take the opportunity to finalize reports from the previous triennium. In particular, we will review our summary of the current state of ***Biofuel Implementation Agendas***. This report is summarized on the following pages.

Policy, Markets and Implementation Issues Subtask
Proposed reports for this subtask include the following topics:

1. Market drivers and barriers for 1st-generation biofuels
Report on the development of 1st-generation biofuels markets within the framework of market drivers and barriers established by the IEA.

2. Biomass availability, markets and incentives for biofuel production
Comprehensive report covering biomass availability, with specialized country-level presentations as requested by Task membership.

3. Vision for realistic biofuel use over future timeframes
Examine the realistic outcomes of different approaches by which biofuels might be encouraged.

2nd-Generation Biofuels Subtask
Proposed reports for this subtask include the following topics:

1. Update on biomass-to-energy options
Update a gap analysis examining North American and European options for biomass-to-energy, including linkages to other IEA Bioenergy Conversion Tasks. Includes an update of past work that lists the status of various stages of biomass-to-ethanol technologies

2. Biorefining applications specific to technical platforms
A report describing biorefining applications within the context of the technical platforms under investigation (in conjunction with biorefining task);

3. Carbon and energy balance issues
Examination of the potential for improving carbon/energy balance in biofuels.

Commissioned Reports:
One commissioned report has already been completed, in conjunction with IEA Headquarters. This report, entitled ***Evaluation of 2nd-generation biofuels***, is an evaluation of the current state of technical platforms for 2nd-generation biofuels and provides a series of policy-relevant recommendations..

Other potential commissioned reports include:
1. Overview of feedstock supply and fate of different feedstocks within production systems;
2. Response to the Stern report on climate change;
3. Filling gaps (to be identified) between other IEA Bioenergy Tasks' work and the production of liquid biofuels;
4. Evaluation of how biofuels and bioenergy might impact developing countries (with FAO);
5. Combination of FAO and EIA data which could determine the potential for biofuel production in developing countries;
6. Examination of the potential for improving carbon/energy balance in biofuels, based on a review of the literature and a selection of 'best practice' cases;
7. Possible re-launch of the VIEWLS project (VIEWLS 2) to update existing information and to potentially lead into the 'best practice' study;

Other Proposed Activities:
Other potential activities include:

1. Release of a publication folder containing a series of country analyses summarizing technological needs, and abilities of active industrial participants;
2. Investigation into biomass supply issues aimed at identifying ideal plants for production of biofuel and/or bioenergy;
3. Review of the status of microbes available for use in various stages of lignocellulosics-to-fuel production;
4. Comparison of pilot plant technologies in use for biological and thermochemical conversion of biomass to liquid fuels;
5. Examination of land demand for biomass production
6. Evaluation of the potential for integrating 1st- and 2nd-generation biofuel systems

BIOFUEL IMPLEMENTATION AGENDAS

Summarized by Warren Mabee with input from John Neeft and all Task 39 Country Representatives

Biofuels for use in the transportation sector have been produced on a significant scale since the 1970's, using a variety of technologies. The biofuels widely available today are predominantly sugar- and starch-based bioethanol, and oilseed- and waste oil-based biodiesel, although new technologies under development may allow the use of lignocellulosic feedstocks. Measures to promote the use of biofuels include renewable fuel mandates, tax incentives, and direct funding for capital projects or fleet upgrades. A recent report by IEA Bioenegy Task 39 provides a review of the policies behind the successful establishment of the biofuel industry in countries around the world.

Brazil is one of the world's largest bioethanol producers. Brazil produces bioethanol from sugar- or starch-based material in the form of sugar cane and sugar cane residues. Because of Brazil's optimal climate, two seasons of sugarcane growth can be achieved, adding greatly to the potential production of both sugar and bioethanol products. In response to the first oil crisis of the 1970's, Brazil invested heavily in fuel alcohol primarily as a means of increasing fuel security and saving foreign currency on petroleum purchases. Today, Brazil controls more than 75% of the world's export market, with primary exports going to the USA, Europe, Korea, and Japan; Brazil's estimated total exports will be approximately 3.1 billion in 2006[1]. Many countries, including Japan and members of the European Union, have made Brazilian bioethanol a part of their renewable fuel strategies.

In the United States, the drivers for the industry were in part the rapid surges in global oil prices experienced in the 1970's and 1980's, which led to rising prices of fuel. There was and is also the presence of a strong agricultural lobby which is interested in creating additional revenue streams for farmers. The US bioethanol industry uses corn, and to a lesser extent wheat, as a feedstock for wet- and dry-milling processes. A number of different policy options have been employed to help build the industry. Both federal and state governments have offered the industry direct funding in the form of public-private partnerships and research funds, as well as tax incentives and state-level renewable fuel mandates, i.e. legislated amounts of renewable fuels contained in fuel sales within the state, defined by blending level or by renewable fuels [22, 23]. US production of biofuels is significant with capacity of over 19 billion litres in 2006, but today only comprises about 2.6% of liquid fuel consumption. In order to become a more significant component of the transportation fuel sector, biofuel production must grow tremendously, which will require access to cellulosic biomass. The Advanced Energy Initiative includes the Biorefinery Initiative, which sets a goal of making cellulosic bioethanol cost-competitive by 2012 and which provides significant funding to achieve this goal (US $91 million in 2006, US $150 million in 2007)[2]. Most recently, the USDOE announced significant funding of up to US $385 million to fund six cellulosic ethanol plants across the United States. In February 2007, British Petroleum announced that the BP Energy Biosciences Institute, a US $500 million investment over 10 years, would be headquartered in the USA at UC Berkeley.

In the European Union, the primary policy tool behind the development of a bioethanol industry is the Directive on the promotion of the use of biofuels for transport (Directive 2003/30/EC)[3]. The motivations behind this Directive include improving the security of energy supply, and reducing the environmental impact of the transportation sector. The Directive mandates an increasing share of biofuels from 2% of total fuel supply in 2005 to 5.75% of total fuel supply in 2010 (based on energy content) in order to meet these priorities. Due to relatively slow growth in the industry, it is currently anticipated that renewable fuels will occupy about 4.8% of the market by 2010, which is significantly less than the existing policy target. Many member states have passed the biofuels Directive into national law, including Belgium[4], the Czech Republic[5], France[6], Germany[7], Greece[8], Latvia[9], Lithuania[10], and Sweden[11]. A parallel Directive was created in order to restructure the community framework for the taxation of energy products and electricity (Directive 2003/96/EC), allowing excise-tax exemptions for biofuels produced or blended within European countries[12]. Today, most EC member states, including Austria, Belgium, Cyprus, Denmark, Estonia, France, Germany, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Slovakia, Slovenia, Spain, Sweden and the United Kingdom have introduced exemptions at various levels up to 100%, using the precepts laid down in Directive 2003/93/EC.

[1] F.O. Lichts (2006) World Ethanol & Biofuels Report 5:48

[2] US Gov (2006) Advanced Energy Initiative. National Economic Council, Washington DC, USA

[3] EC (2003) Promotion of the use of biofuels and other renewable fuels for transport. Directive 2003/320/EC. OJEU L123, 17 May 2003. Brussels, Belgium

[4] Anon (2006) Progress report on the promotion of biofuels in Belgium in 2006. Federal Public Service of Finance, Brussels, Belgium

[5] Anon (2006) Report for 2005 by the Czech Republic for the European Commission on the implementation of Directive 2003/30/EC. Memorandum SN 3231/06. Prague, Czech Republic

[6] Deguen L (2005) Promotion de l'utilisation de biocarburants (directive 2003/30/CE).

[7] Neumann L (2006) Third national report on the implementation of Directive 2003/30/EC. Federal Ministry of Food, Agriculture and Consumer Protection, Berlin, Germany

[8] Anon (2004) 1st national report regarding promotion of the use of biofuels or other renewable fuels for transport in Greece. Ministry of Development, Athens, Greece

[9] Anon (2006) Report pursuant to Article 4(1) of Directive 2003/30/EC. Riga, Latvia

[10] Anon (2006) Report on measures encouraging the use of biofuels and other renewable resources. Vilinius, Lithuania

[11] Guldbrand L (2006) Report pursuant to Directive 2003/30/EC. Memorandum M2006/2879/E. Stockholm, Sweden

[12] EC (2003) Restructuring the Community framework for the taxation of energy products and electricity. Directive 2003/96/EC. OJEU L283, 31 October 2003. Brussels, Belgium

As of late 2005, only one country exceeded the goals set out in the Directive. German biofuel use (primarily biodiesel) accounted for 3.75% of total fuel consumption in 2005[7]. Swedish biofuel use (primarily bioethanol) accounted for 2.2% of the total in the same year, which came closest to achieving the goal[11]; however, since most cars in Sweden are now running at E5 bioethanol blends, the country has encountered a constraint in the form of the EU Directive on Fuel Quality, which limits renewable fuel blends to 5%. Other countries, including the United Kingdom, have identified this Directive as a barrier to achieving the goals of the Directive on Biofuel Use. In France, about 1.2% of fuel sales consisted of renewable fuels in 2005, mostly in the form of bio-ETBE or bioethanol. In Austria, biodiesel production had reached almost 100 million litres, which is approximately 1.1% of national fuel consumption[13]. Spain used significant amounts of both bioethanol (1.49% of total petrol) and biodiesel (0.10% of total diesel)[14]. Most European Union members had not yet reached their biofuel use goals under the biofuel Directive in 2005, although the situation is changing rapidly as new capacity comes on-line.

Other major biofuel producers include China, which has grown its bioethanol production sector rapidly since 2000 to become the third-largest single bioethanol producer after the United States. Total capacity from four plants in 2005 was about 1.3 billion L. A country poised to be a major biofuel producer is Canada, which currently produces about 250 million litres annually[15]. Much of the funding being made available to fund research and development in biofuels in Canada has depended upon the federal government's environment strategy. This strategy has evolved significantly with the ascension of a Conservative minority federal government in 2005, who made a campaign promise to introduce a 5% biofuels mandate.

From this review, it is clear that successful policy options to support biofuel implementation may take a number of forms, including targets and mandates, exemption of biofuels from national excise taxation schemes, direct government funding of capital projects to increase capacity or upgrade distribution networks, or consumption mandates for government or corporate vehicle fleets. These policies can be differentiated by their relative emphasis on government, industry, or consumer actions. In most biofuel-producing countries examined here, a number of policies have been enacted in order to develop industrial capacity and encourage consumption. It is very difficult to measure the individual success of these policies because of the synergistic effects that multiple policies may have.

In the United States, direct funding and support may be seen to play a much more positive role in the national biofuel implementation agenda. Strong funding for establishment of facilities, including all aspects of research, development and deployment, is present in each of the states where significant bioethanol production was present. In advising other governments on the creation of policy to support biofuel implementation agendas, the US experience offers some valuable lessons to consider. The bioethanol industry has been more successful in meeting social criteria such as rural employment. The ability of the industry to increase energy security, on the other hand, has been limited by the relatively small capacity of their production facilities at the current time. This should serve as a cautionary measure for governments in both Canada and the European Union, which have invested biofuel-related policy with more emphasis on the environment and on energy security than they have upon social or economic concerns. Improved energy security through biofuel production can only be achieved when enough capacity is brought on-line. Thus, security-related policy geared to the short-term cannot succeed to any great extent. Policymakers must realize that, in the immediate future, the goals of most successful policies will be related to the economy, and perhaps to the environment. The implication here is that security-related policy, such as mandated renewable fuel use, is likely to take the form of long-term programs that have very little immediate reward.

The experiences gained in developing bioethanol capacity, using both sugar- and starch-based processes, contain many lessons for other biofuels, including biodiesel and the lignocellulose-based bioethanol industry. These fuels can be seen as a response to a variety of domestic issues, including the need to diversify local economies, increased concerns over environmental damage associated with fossil fuel use, and a growing security rationale for a shift to domestic fuel sources. The emerging industry, including the lignocellulosic-based sector, may in turn find opportunities for strategic linkages and partnerships that capitalize upon these political issues.

Our findings indicate that successful implementation agendas can take many forms, but that success measured as biofuel production capacity is equally dependent upon external factors which include feedstock availability, an active industry, and competitive energy prices. It is important that policies be crafted that reflect 'realistic' use scenarios for bioethanol and other biofuels over future timeframes.

The full report on Implementation Agendas will be made available to our Country Representatives through the Task 39 website, www.task39.org. If you are not a Country Representative and would like a copy, please contact Warren Mabee or John Neeft (contact information at the end of this newsletter).

[13] Salchenegger S (2005) Biofuels in the transport sector in Austria: 2005. Federal Environment Agency, Vienna, Austria

[14] Anon (2006) Report by the Directorate-General for energy policy and mines regarding Article 4(1) of Directive 2003/30/EC. Ministry of Industry, Tourism and Trade, Madrid, Spain

[15] CRFA (2006) Canadian Renewable Fuel Statistics. Canadian Renewable Fuels Association, Ottawa ON, Canada. Available online at www.greenfuels.org.

EXCHANGE OPPORTUNITIES

As many of you know, one of the goals of Task 39 is to facilitate exchanges of personnel, including faculty and students as well as government and industry representatives. We hope to encourage the exchange of ideas and methods between our members and the larger biofuels community around the world, and in the process help to generate new ideas and concepts. Most recently, the Task has helped sponsor Karin Öhgren, a Ph.D. candidate at Lund University, in her six-month visit to the Forest Products Biotechnology lab at UBC. This exchange has proven highly beneficial to both parties. Karin brings tremendous expertise in fermentation technology to the UBC group, and benefits from working with a group dedicated to understanding the fundamental science associated pretreatment and enzymatic hydrolysis of cellulosic substrates.

Typically, Task 39 can assist in facilitating exchanges by providing funds for travel or accommodation costs, with matching funds from the visitor's parent institution and from the host organization. In the past, we have found that the presence of some outside funding has made it easier for host universities to find matching funds.

If any of our members would like to participate in an exchange or host a visitor, the Task Leadership would be very happy to speak with you. Please don't hesitate to contact Jack Saddler or any of the Associate Task Leaders with your suggestions. We look forward to sponsoring more opportunities in 2007!

NEWSLETTER FORMAT

One of our goals in this triennium is to update the look and feel of our newsletter in order to provide our Members with the best service possible. To meet this goal, we would like your feedback on a number of points.

- Do you think the newsletter should be longer or shorter? Currently the average length is about 8 pages.
- Would you like more country-specific articles?
- Would you like more technical articles? Should we try to publish a series of working papers?
- What do you think the primary function of the newsletter should be?
- What type of information would be of more use to you and your organisation?

If you have any comments or suggestions, please let us know! You can contact Warren Mabee via email at warren.mabee@ubc.ca, or by phone at +1 (604) 822-2434. We welcome your input!

FUTURE WORKSHOPS/SYMPOSIA

8th Exhibition 'Bois Energie'
April 19-22, 2007
Orleans, France
http://www.boisenergie.com

3rd International Congress on Energy Efficiency and Renewable Energy Sources
April 25-28, 2007
Sofia, Bulgaria
http://www.viaexpo.com/congress-ee-vei/eng/congress.php

29th Symposium on Biotechnology for Fuels and Chemicals
April 29-May 2, 2006
Denver, CO, USA
http://www.simhq.org/html/meetings.html

15th European Biomass Conference & Exhibition
May 7-11, 2007
Berlin, Germany
http://www.conference-biomass.com

International Conference on Biotechnology Engineering 2007
May 8-10, 2007
Kuala Lumpur, Malaysia
http://www.iiu.edu/my/icbioe

Biomass '07
May 15-16, 2007
Grand Forks, North Dakota, USA
http://www.undeerc.org/biomass07

Eastern Biofuels Conference & Expo III
May 29-31, 2007
Prague, Czech Republic
http://www.easternbiofuels.com

5th European Biorefinery Symposium
May 30-June 1, 2007
Flensburg, Germany
http://websrv5.sdu.dk/bio/workshop07.htm

Nordic Bioenergy 2007
June 11-13, 2007
Stockholm, Sweden
http://www.nordicbioenergy2007.se

Renewable Energy Europe
June 26-28, 2007
Madrid, Spain
http://www.renewableenergy-europe.com

23rd Annual International Fuel Ethanol Workshop & Expo
June 26-29, 2007
St. Louis, Missouri, USA
http://www.fuelethanolworkshop.com

Bioenergy 2007
International Bioenergy Conference & Exhibition
September 3-6, 2007
Jyväskylä, Finland
http://www.finbioenergy.fi/bioenergy2007

Africa Biofuels Conference & Expo I
September 25-27, 2007
Durban, South Africa
http://www.biofuelsconferences.com

IUFRO (International Union of Forest Research Organizations) - All Division 6 Conference
October 29-November 2, 2007
Taipei, Taiwan
http://www.iufro.org

Biomass Asia 2007
October 29-31, 2007
Beijing, China

20th World Energy Congress
November 11-15, 2007
Rome, Italy
http://www.rome2007.it

Asia Biofuels Conference & Expo V
December 11-13, 2007
Singapore
http://www.asiabiofuels.com

4th Annual Canadian Renewable Fuels Summit
December, 2007
Québec, PQ, Canada
http://www.canadianrenewablefuelssummit.com

CONTACT INFORMATION

Please find information below for both the IEA Bioenergy contacts and IEA Bioenergy Task 39 contacts. Additional information is available at www.iea.org, at www.ieabioenergy.com, and at www.task39.org.

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