

Newsletter

Number 4, August, 2002

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EDITORS NOTES

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In a further attempt to reduce the size of the newsletter and still cover the liquid biofuels we are looking at a dynamic headline feature within the Task 39 website (<http://www.forestry.ubc.ca/task39>) that will gather pertinent information from syndicated newsfeeds and websites. The resulting daily information feed will replace the content in the World Events/Information section of the newsletter. This feature should be available before the next newsletter.

I want to thank all those individuals that have sent in weblinks to publicly available work in their country or organization. Please keep those links coming.

WORLD EVENTS/INFORMATION

European Union: Now we must turn World Summit agreement into concrete results

http://europa.eu.int/rapid/start/cgi/guesten.ksh?p_action_gettext=pt&doc=IP02/12680IRAPID&lg=EN&display=

World Summit on Sustainable Development Summary

<http://www.un.org/events/wssd/summaries/envdevj35.htm>
<http://www.un.org/jsummit/index.html>

Biobased Manufacturers Association Launches Interactive Website and Online Survey

<http://biobased.org/list.php?storyid=2358>

New RFA publication highlights potential synergies for ethanol and fuel cells

<http://www.ethanolrfa.org/pr020904.html>

World oil summit long on pledges to better protect the environment

<http://www.bbiethanol.com/news/view.cgi?article=587>

Australia "considering options" for ethanol in gasoline

<http://www.bbiethanol.com/news/view.cgi?article=583>

Group to Build Largest Ethanol Plant in Australia

http://www.ethanolmarketplace.com/australia_plant.asp

Brazil to Revive Ethanol Car Program

http://www.ethanolmarketplace.com/brazil_carprogram.asp

Biodiesel fuel arrives in Western New York

<http://www.bbiethanol.com/news/view.cgi?article=579>

BP extends ethanol trial in Brisbane

<http://www.bbiethanol.com/news/view.cgi?article=578>

Pacific Ethanol Post-Conference News

<http://www.pacificethanol.com/>

India to sell only ethanol-mixed gasoline in nine states

<http://www.bbiethanol.com/news/view.cgi?article=574>

Updated California Report Finds Ethanol Production Capacity Scheduled to Reach 4.5 Billion Gallons by End of 2005

<http://www.bbiethanol.com/news/view.cgi?article=567>

USDA Report: Ethanol Has Large, Growing Positive Energy Balance

<http://www.bbiethanol.com/news/view.cgi?article=566>

Eight companies set to produce ethanol in Thailand

<http://www.bbiethanol.com/news/view.cgi?article=552>

Praj Industries To Take Up Ethanol Plant Projects In China

<http://www.bbiethanol.com/news/view.cgi?article=532>

Brazil Proposes Sugar Export Tax To Regulate Ethanol Production

<http://www.bbiethanol.com/news/view.cgi?article=523>

Brewery makes beer fit for a pharaoh

<http://stacks.msnbc.com/news/789133.asp?cp1=1>

Biofuel May Clean Up as World Farm Prices Flounder

<http://www.bbiethanol.com/news/view.cgi?article=503>

Towards greater energy security: the Council reaches agreement on several crucial Commission proposals

[http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=MEMO\(02\)112\(08\)AP04&lg=EN&displays=1](http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=MEMO(02)112(08)AP04&lg=EN&displays=1)

Intelligent Energy for Europe": the Commission proposes a new energy action programme

[http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=IP\(02\)52\(08\)AP04&lg=EN&displays=1](http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=IP(02)52(08)AP04&lg=EN&displays=1)

European Union ratifies the Kyoto Protocol

[http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=IP\(02\)79\(08\)AP04&lg=EN&displays=1](http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=IP(02)79(08)AP04&lg=EN&displays=1)

Commissioner Wallström Says New Impetus Needed in Transatlantic Environment Cooperation

[http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=IP\(02\)50\(08\)AP04&lg=EN&displays=1](http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=IP(02)50(08)AP04&lg=EN&displays=1)

Margot Wallström Member of the European Commission, responsible for Environment "EU and US Approaches to Environment Policy" to European Institute Washington DC, 25 April 2002

[http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=SPEECH\(02\)14\(08\)AP04&lg=EN&displays=1](http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=SPEECH(02)14(08)AP04&lg=EN&displays=1)

Results of G8 Environment: time to move from words to deeds on world sustainable development

[http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=IP\(02\)50\(08\)AP04&lg=EN&displays=1](http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=IP(02)50(08)AP04&lg=EN&displays=1)

CO₂, air quality and emissions: Commission opens infringement procedures against eight Member States to implement EU laws on air quality

[http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=IP\(02\)55\(08\)AP04&lg=EN&displays=1](http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=IP(02)55(08)AP04&lg=EN&displays=1)

Meeting of G8 Environment Ministers: "On the Road to Johannesburg"

[http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=MEMO\(02\)76\(08\)AP04&lg=EN&displays=1](http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=MEMO(02)76(08)AP04&lg=EN&displays=1)

European ESC and European Commission to hold a Forum on Sustainable Development, 12-13 September 2002

[http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=CES\(02\)24\(08\)AGED&lg=EN&displays=1](http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=CES(02)24(08)AGED&lg=EN&displays=1)

The European Commission outlines how environmental technology can contribute to sustainable development

[http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=IP\(02\)51\(08\)AP04&lg=EN&displays=1](http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=IP(02)51(08)AP04&lg=EN&displays=1)

The Kyoto Protocol and climate change

[http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=MEMO\(02\)46\(08\)AP04&lg=EN&displays=1](http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=MEMO(02)46(08)AP04&lg=EN&displays=1)

2413rd Council meeting ENVIRONMENT Brussels, 4 March 2002

[http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=PRES\(02\)47\(08\)AGED&lg=EN&displays=1](http://europa.eu.int/rapid/startcgi/guestres.ksh?_action=getres&doc=PRES(02)47(08)AGED&lg=EN&displays=1)

POLICY/REGULATORY ISSUES SUBTASK

Don Stevens

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UTRECHT MEETING – MARCH 13-14, 2002

Representatives of the IEA Bioenergy Task 39 on Liquid Biofuels met in Utrecht, Netherlands on March 13-14, 2002. The Working Group on policy and regulatory issues met to review progress on projects selected by the group.

Seven of the nine participants (Austria, Denmark, Finland, Netherlands, United Kingdom, United States, and European Commission) were represented at the meeting. Canada and Sweden were not represented. In addition, an observer from Brazil and two representatives from IEA Headquarters-Paris attended the meeting.

OVERVIEW OF BIOFUELS IN BRAZIL

Prof. Jose Moreira attended the meeting as an observer and presented an overview of the biofuels situation in Brazil. Brazil produces about 13 billion liters of anhydrous plus about 9 billion liters of hydrous ethanol annually from sugar crops.

The Brazilian government has established mandates that require gasoline motor fuels to contain at least 20-24% ethanol. While 24% blends are preferred, the range provides some flexibility to accommodate changes in the sugar market. The Brazilian push to increase ethanol use in motor fuels began in the early 1980's when programs to run vehicles on neat, hydrous ethanol were started. In the mid-1980's, the number of vehicles operating on hydrous ethanol increased from zero to about 4 million in a five-year period. By 1989, however, the world market created demand for sugar, and subsequent shortages of ethanol nearly eliminated the use of the hydrous ethanol vehicles. While most vehicles today operate on the gasoline/ethanol blends, there are still about 1000 vehicles per month sold that use hydrous ethanol as a fuel. The current mandate of 24% ethanol in motor gasoline was established in 1998. The Brazilian federal government operates a "green fleet", and MTBE has been prohibited in motor fuels.

Brazilian interests at present are mostly in the area of ethanol from sugar-based crops, but there is also some interest in lignocellulosic biomass. A small demonstration facility for woody crops is now being considered.

COUNTRY UPDATES

The Netherlands: Eric van den Heuvel presented an overview of developments in the Netherlands. Bioenergy has become the most important part of this country's sustainable energy policy, both in the areas of power generation and in fuels.

Biomass power increased rapidly from 600 GWe in 1996 to 1500 GWe in 2000, and is expected to increase more due to liberalization of the "Green Market" in 2001. The liberalization policies provide ways for the utilities to market green power and recover the additional costs. Consumers in Netherlands seem willing to pay extra for green power.

Biofuels are also an important part of the program for climate-neutral fuels in Netherlands. The overall goals of this program are to reduce CO₂ emissions from the transport sector by at least 80% using the existing infrastructure and early involvement with industry partners. Four projects were funded to explore the formation of alliances between the government and industries. These four included:

- TNO-MEP, production of Fischer-Tropsch liquids using coal and biomass.
- GASTEC, production of synthetic natural gas of pipeline quality from biomass
- HGP, production of biomethanol, which would be used for H₂ production at filling stations.
- SDE, "once-through" Fischer-Tropsch with CHP generation

USA: Don Stevens indicated that the situation in USA had not changed significantly since the previous meeting. Biofuels are seen as contributing significantly to energy security, an increasingly important issue since September 11. Government interest in biofuels continues at a high level, and the tax exemptions for ethanol blended motor fuels will continue for several years. The national R&D program to produce ethanol from lignocellulosic biomass is continuing as well. Biodiesel use is increasing in USA, with the biggest increase recently coming from the use of waste cooking grease. Stevens also reported that the Department of Energy had recently re-prioritized its research efforts, and that biofuels were a very high priority. Other topics such as co-firing and crop production were lower priorities, and funding in those areas is being reduced or eliminated.

Austria: Manfred Wörgetter reported that Austria is awaiting the outcome of European Union decisions before making significant changes in its energy policies. Bioenergy has been supported individually by the federal states in Austria, and there has been significant development of bioenergy as a result. The Austrian Bioenergy Association has now assumed the task of developing a common strategy for Austria as a whole. This association is calling for 40% of the heat demand, 4% of motor fuels, and 4% of electricity to be produced from biomass by the year 2010. The association is requesting that policy mechanisms such as tax exemptions, implementation of the White Paper policies, and flexible ecological tax reform be enacted.

Denmark: Finn Bertelsen described major changes occurring in Denmark. The new government elected in November 2001 has the priorities of "no new taxes" while simultaneously making greater expenditures for public health care. To meet both objectives, the government has cut many other programs including renewable energy. The budget for development of renewable energy projects has been cut from about 20 MM Dk to zero, and the R&D budget has been cut from about 15 MM to about 5 MM. Denmark believes that it can still meet its CO₂ goals through its continued use of biomass for CHP and by increasing the use of biodiesel for heating oil and transport. Bio-heating oil presently has zero taxes. The Danish Energy Agency has ceased to exist, and its functions have been transferred to a new, smaller Ministry of Economy and Business Affairs. The reorganization has required reductions of staff in the energy area to about half of the previous levels.

Finland: Liisa Viikari indicated that there had been few changes in Finland since the previous meeting. The program on R&D for bioethanol is continuing. Finland anticipates that blends of 2% ethanol in premium 98-octane fuel will be used in Helsinki.

United Kingdom: Tony Sidwell provided an update of the situation in UK. Higher priority drivers for biofuels at this time are the environmental, social, and economic benefits from these technologies, but energy security is currently viewed as a lower priority. The duties and taxes that apply to diesel fuels are being reduced for biodiesel. The reduction would apply to biodiesel from all sources in principle, but the level of support is only sufficient to make biodiesel produced from waste cooking grease competitive. A national Commission on the future of agriculture has proposed that duties on biofuels be set at the same levels as LPG, which is lower than gasoline or diesel. The recommendation would cost the government about £2 billion/year in tax revenues, which the government is currently unwilling to give up.

The UK government has issued a Green Fuel Challenge where it invited companies to propose ways to increase the use of alternative fuels. Successful projects included one on methanol-powered compression engines (diesel), and on dealing with H₂-powered buses. A third project has not yet been announced.

European Commission: Kyriakos Maniatis presented information from the EC. The Commission had released proposals for mandatory use of alternative fuels in Europe in late 2001, at about the same time as the previous Task 39 meeting. Significant informal feedback had been received by EC since then. There appears to be general agreement in principle with the mandates to increase the use of alternative fuels. In addition there is widespread support for the flexible taxation policies proposed to increase their use. However, there is some resistance to the specific mandatory levels and the time-line proposed. Parliament will provide guidance and feedback to EC in late spring 2002.

The EC has also announced the results of a call for proposals for biofuels demonstration facilities. Three winning proposals include a facility in Spain for lignocellulosic ethanol, another in Spain for biodiesel, and a biodiesel facility in UK using animal fat and waste cooking oil. The call also included a category titled "company measures", and proposals were funded in that area as well. Two proposed originating out of Netherlands were selected, and negotiations are underway to combine both into one contract. The two efforts include work on "Agreed Standards" dealing with life-cycle CO₂ and energy balances, and a second on green certificates. Task 39 is participating in the work on agreed calculations with an in-kind services provided by the participants. The commission expects about 20 MM will be awarded for 4-5 demos in new calls during 2002. Maniatis also highlighted other biofuels news in Europe, including the use of about 70,000 l/y ethanol and 50,000 l/y biodiesel in Greece.

ALTERNATIVE FUELS PROJECT – IEA HEADQUARTERS-PARIS

Lew Fulton and Tome Howe from IEA Headquarters in Paris presented an overview of a project to analyze the impacts of alternative fuels. At the previous Task 39 meeting in late 2001, the Task 39 participants had reviewed a copy of the preliminary proposal from IEA-HQ. At that time, the specific work tasks and the relationships between that proposal and Task 39 was not clear. This meeting provided the opportunity to discuss opportunities for collaboration in this area.

FOLLOW-UP FROM THE PREVIOUS MEETING

Agreed Calculations: At the previous meeting, the Task participants had discussed the need for "Agreed Calculations." The Agreed Calculations would provide a common set of assumptions for energy and CO₂ balance calculations. Presently, the results from life-cycle analyses can vary significantly, even when standard ISO-based methodologies are used.

In Brussels, Task 39 had agreed to participate in drafting a proposal to EC in this area. Since then, a proposal entitled "Clear Data for Clean Fuels" was prepared and submitted to EC. NOVEM is the lead on that proposal, and Task 39 assisted by providing background information. Task 39 agreed to contribute to the work on an "in-kind" basis where the national participants would assist by identifying and providing relevant background information from their countries. There is no commitment of direct funding from the Task. The proposal was submitted to EC in April 2002. Maniatis indicated that the proposal had been reviewed and was likely to be funded later in 2002.

REVIEW OF PROJECTS

At the previous meeting in Brussels, Task 39 had agreed upon specific projects. They were reviewed by the group.

Country Updates: Meijer and van den Heuvel presented a draft of the questionnaire that would be used to update the "country reports" from each participant. The group discussed the content at length. The general consensus of the group was that the original draft requested more detailed information than was practical to collect. While participants agreed that it would be useful to include as much information as possible, it was also agreed that the form had to be simple enough to get reasonable responses. As a result of the discussions van den Heuvel agreed to produce a new draft for review by participants shortly after the meeting.

It was agreed that the input for the country reports should be as broad as possible, and not simply limited to IEA countries. Fulton suggested that the resources of IEA-HQ could be used to obtain country contacts for non-Task 39 countries where needed.

Case Studies: In Brussels, Task 39 had agreed that case studies should be prepared in a format similar to those prepared for EC. Maniatis reported that he was selecting appropriate documents and would send out copies for comment shortly after the meeting. The group agreed to the basic content of the studies as being descriptions of commercial and near-commercial biofuels facilities. They

should be approximately 4 pages in length and include a photo, a description, and similar information. Each participant agreed to try to find 2 commercial and 2 near-commercial facilities in their own country for possible inclusion into the document.

Standards: In Task 27, information on biofuels standards had been compiled, and this information was distributed to participants at the meeting. The information included a compilation of major North American and European standards for fuel ethanol. In addition, there is ongoing effort in Europe to develop standards for biodiesel. In the following discussions, the Task 39 group agreed that the information currently available was sufficient for now. Further work in this area should include an update of changes to the standards, if any, and an ongoing monitoring of the situation surrounding biofuels standards. Participants were asked to provide any additional information on standards by early summer.

Financial Instruments: At the previous meeting, the group had discussed the need for additional information on the role that financial instruments play in the implementation of biofuels. A. Segerborg-Fick, who had agreed to take the lead in that area, was not at this meeting, but the group continued discussions on the topic. Moreira suggested that measures to reduce the cost of money were needed since capital costs are approximately one third of the total in biomass systems. Various mechanisms including capital cost reduction, loan guarantees, and other mechanisms are available. Tax reduction for feedstock production could also be considered. The group discussed the various concepts briefly and concluded that some have been shown to be more effective than others. Moreira suggested that the Task might want to consider “learning by doing”, which could include implementing a biofuels demo in a region that currently doesn’t use biofuels. While the group agreed that this was probably beyond the scope of the current Task, that such a project could be organized within IEA Bioenergy if there were sufficient interest.

In continuing discussions of financial instruments, van den Heuvel indicated that Netherlands will have a report on this subject relating to biopower in early June 2002. He agreed to see if this report could be made available so that Task 39 could evaluate whether the results can be extrapolated to biofuels. The group agreed this would be a good approach, and agreed that funding may be required depending on the amount of work required. The Task will re-examine the issue after the report is available.

Roadmaps: The group had previously agreed that a compilation of “Roadmaps” and other existing Strategy Documents would be useful to participants. It was agreed that participants would compile major reports from their

countries. A one-page summary of the report would be provided, and a web reference will be made available so participants can directly retrieve documents they want. E. van den Heuvel and A. Segerborg-Fick will send out the request for information.

Green Premiums: The group discussed the role of green premiums in promoting biofuels. Green premiums are important in the area of biopower but were found by Task 27 to be less important for biofuels. Consumers in general appear to prefer “clean fuels”, but they are unwilling to pay much more at the pump. The information related to biofuels, however, is mostly anecdotal in nature, and little quantifiable information exists. It was agreed that the participants would look for quantifiable information on biofuels green premiums such as examples of marketing schemes, ethanol labels, and others. The topic will be discussed more at the next meeting.

New Fuels: The group discussed “new” biofuels such as Fischer-Tropsch liquids, dimethyl-ether (DME), and biohydrogen. These are attracting increasing attention from national programs and may provide opportunities for expanding biofuels in the future. At present, most of the work is in the conceptual or early R&D stage. The participants agreed it would be useful to have additional information about the various fuel possibilities organized as case studies with descriptions of the technologies and current information about ongoing RD&D activities. It was suggested that the IEA Advance Motor Fuels Agreement (AMFA) might have additional information about these fuels. Stevens agreed to contact AMFA and report at the next meeting.

Biomass Feedstock Availability: At the previous meeting, the group had briefly discussed the availability biomass resources and its influence on biofuels. It was agreed that better information on regional biomass availability would be useful, but that this Task did not have particular expertise in that area. The issue of biomass availability is expected to become more important in Europe if the biofuels mandates proposed by EC are adopted. Since the previous meeting, Stevens contacted the IEA Bioenergy Task 31 to determine if information on biomass availability was already available. While specific studies have been performed in most countries, but that no general summary was currently available. Task 31 suggested there could be the potential for a joint project if Task 39 were sufficiently interested.

The Task 39 group continued the discussion of the feedstock availability issue. It was noted that there are many different types of biomass and many questions relating to what constitutes “land availability.” Further, the productivity of biomass in any one area also influences

biomass availability. Maniatis indicated that estimates by EC suggest that 1.2–5.0% of motor fuels in Europe can be produced on the set-aside lands in Europe. This information had been included in a presentation that Sidwell agreed to distribute electronically. It was also noted that Eastern Europe also has the potential for substantial biomass production.

Following the discussions, it was agreed that the group should make an additional attempt to gather existing information. Wörgetter agreed to ask about current work in Europe relating to this topic, and Stevens agreed to work with Hogan to see if new information was available from North America. Further decisions on this topic will be made in late 2002.

FUTURE MEETINGS

Policy and Regulatory Working Group Meeting:
November 13-14, 2002, Vienna

Lignocellulosic Working Group Meeting (tentative):
December 9-10, 2002, York, UK

Joint Task 39 Meeting
Spring 2003 (Sweden?)

BIODIESEL SUBTASK

Manfred Wörgetter
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Here is an interesting website that contains relevant news items for biodiesel:

<http://www.biodiesel.org/biobasedheadlines.shtml>

ETHANOL SUBTASK

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Last April we had a successful meeting in Gatlinburg, Tennessee as a Special Topics Session within the 24th Symposium on Biotechnology for Fuels and Chemicals. I particularly want to thank the Oakridge National Laboratory staff (Brian Davison,) for their tireless help and kindness. There were presentations from five (Canada, Denmark, Finland, Sweden and USA) of the nine Task countries and 57 participants (16 government, 19 academic, 22 corporate).

Our next technical meeting will be in York, UK this coming December 9-10th, 2002. Due to the size of the facility this will be a “by invitation only” meeting with the results being provided to other interested parties in a CD format similar to the successful Espoo meeting last year.

For 2003 we are currently in the process of planning for two technical meetings, one in the spring at Breckenridge, Colorado and a fall meeting in Vancouver, Canada. The Breckenridge meeting will be a Special Topics Session within the 25th Symposium on Biotechnology for Fuels and Chemicals. This will be an open meeting with all attendees having to register as participants in the larger symposium. We know there are some exciting events being organized for the 25th anniversary of this Symposium so plan on attending.

SPECIAL TOPICS SESSION 24TH SYMPOSIUM ON BIOTECHNOLOGY FOR FUELS AND CHEMICALS

Several of the member countries of Task 39 are approaching demonstration of the biomass-to-ethanol process and many have a range of fundamental projects which look at various aspects of pretreatment, enzymatic hydrolysis, fermentation and lignin utilization.

Presenters from several of the participating countries described their country's/organization's biomass to ethanol projects and factors such as the type of biomass available, the maturity of the agricultural or wood processing industry and the willingness of the government to bear the risk/cost of development and demonstration.

Bill Cruickshank
Natural Resources Canada
Canada
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Biofuel production in Canada is driven by commitments under the Kyoto Protocol, efforts to enhance agricultural diversification and biomass residue management.

Canadian biofuel production programs are attempting to increase the supply and use of biofuels and make them cost competitive with gasoline on an unsubsidized basis. There are a number of methods that are currently being used to achieve these objectives. These methods include the Federal government supporting R&D to improve production technology and both the Federal and Provincial governments providing fiscal measures to support biofuel supply and usage.

This talk concentrated primarily on the R&D efforts being supported through Federal programs.

Federal Support for Improved Ethanol Production Technology

Federal support for improved ethanol production support falls within three main areas:

- Renewable Energy Technology (RET) Program – Biochemical Conversion subprogram within the Panel on Energy R & D (PERD);
- Climate Change Action Fund within GHG Emission Reduction Initiatives;
- Sustainable Technology Development Canada.

Renewable Energy Technology Program (RET)

This program is a contracted out, cost shared R&D program that involves ethanol, bio-oils and value added co-products from cellulosic biomass via biochemical and thermochemical processes. Until recently, the majority of the interest was cellulosic ethanol. Currently there is a renewed interest in bio-oils and an increasing emphasis on value added co-products. Below is a list of the types of R&D contracts associated with fuel ethanol within this program.

University of British Columbia – “Resolution of Key Technical Steps in the Conversion of Softwood Residues to Ethanol”

Enerkem Technologies Inc. – “Fundamentals of Biomass Hydrolysis at Low pH to Reduce Sugar Costs”

Iogen Corporation - “Improving Cellulase Enzymes, Enhancing Conversion of Cellulose to Fermentable Sugars and Reducing Finished Ethanol Costs”

Tembec Inc. – “Increasing Pentose/Hexose Co-fermentation Efficiency & Ethanol Yield”

Iogen Corporation – “Microbial Strain Development for Xylose Fermentation to Ethanol”

Organosolv pretreatment and syn gas/landfill gas to ethanol efforts are also new areas of pursuit.

Thermochemical efforts are continuing with the production of bio-oil from pyrolysis of biomass materials, gasification of biomass and wastes for heat and power production and conversion of waste grease and fats for fuel substitutes and additives.

There is also Federal support for biofuels production and use in the pre-commercial demonstration plant for the lignocellulosic residue to ethanol process at Iogen, the use of E85 in the Federal fleet of vehicles and E-diesel and Biodiesel trials in association with the Canadian Renewable Fuels Association.

In summary, development and deployment of new technology for biofuels production is progressing well in Canada give the limited budgets available and stronger measures/incentives are required to increase the demand for fuel ethanol in Canada.

Bob Benson
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Commercialization of Byproducts from Tembec’s Waste Biomass Streams

Tembec is a leading integrated Canadian forest products company principally involved in the production of wood products, market pulp and papers. With sales of over \$3 billion dollars, the Company operates over 50 manufacturing units in the Canadian provinces of New Brunswick, Quebec, Ontario, Manitoba, Alberta and British Columbia, as well as in France and the United States. It employs approximately 10,000 people.

History of Silvichemicals at Tembec

1983	Installation of evaporators and recovery system for lignosulfonates, spray dryer for lignosulfonates
1990	Startup of alcohol plant
1995	Pentose fermentation Pilot Plant
1997	Conversion process for ammonia to sodium lignosulfonate
2002	Joined two lignosulfonate operations at Temiscaming and Tartas

Raw Materials for Conversion Processes

Raw Material	Oven dry metric tonnes/day
Spent sulfite liquor	~650
Chip screenings	~100

Raw Material	Oven dry metric tonnes/day
Combined primary and secondary sludge	~100
Fly ash and grate ash	~30
Bark and Wood Waste	~240

Kosher food grade alcohol is produced from a yeast (*Saccharomyces cerevisiae*) fermentation of the hemicellulosic monomeric sugars. Both hardwood and softwood furnish are used in the sulphite mill that produces the Spent Sulphite Liquor (SSL) feed stream. The yeast is recycled so there is no waste stream.

Lignosulfonates (sodium and ammonium, no calcium yet) are produced from the evaporated residue produced in the fermentation. Fuel value is the minimum price for the lignosulfonates although they are also sold whenever possible as value-added dispersants and binders. As with the alcohol the lignosulfonates are derived from hardwood, softwood and blended feedstocks.

New Development Projects

- Chemicals from wood to replace phenol in Phenol-Formaldehyde (PF) resin
- Pyrolysis Oil for energy and chemical value
- Modified lignosulfonates
- Extracts from bark
- Alcohol from biomass such as bark and hog fuel
- Gasification of biomass
- Pentose fermentation
- Process efficiency improvements

What do we look for in new projects?

- The truth the whole truth and nothing but the truth
- An application of the technology at a Tembec site preferably Temiscaming
- 25% ROCE when applied at our site

- Business plan based on our project not on future sales of technology
- “Impact Zero” on the environment
- • Reduction in use of petroleum derived products

What can Tembec bring to the table?

- Low cost simple financing for projects on our site
- Small projects are financed with internal cash flow
- Large projects can be financed by Tembec’s usual sources
- No venture capitalists or share offerings needed
- Access to Government funding at Provincial and Federal level
- Excellent tax regime for scientific development projects
- In-house expertise
- Treatment facilities
- Energy distribution infrastructure
- Marketing capability
- Leveraged purchasing

We are always seeking partnerships to pursue our R, D & D efforts. These partnerships have been and will likely continue to be from all sectors (Academic/Research, Entrepreneurial (those with solid technical knowledge and jointly beneficial proposals), Corporate and Governmental (both Federal and Provincial)).

Lisbeth Olsson
Technical University of Denmark
Denmark
<mailto:lisbeth.olsson@biocentrum.dtu.dk>

This summary of the presentation from Denmark at the IEA meeting at the Gatlingburg conference presented in the Newsletter No. 4, 2002 was based on work performed at The National Laboratory at Risø, Denmark by Senior Researcher Anne Belinda Thomsen <mailto:anne.belinda.thomsen@risoe.dk> and in the Group for Environmental Microbiology & Biotechnology at DTU headed by Professor Birgitte K. Ahring <mailto:bka@biocentrum.dtu.dk>. Contacts regarding the

Danish Concept for Bioethanol Production should be directed to any of these persons.

Bioethanol production in Denmark

The bioethanol production program in Denmark has defined a process that includes a wet oxidation pretreatment, (195°C, 12 bar O₂, Na₂CO₃) of wheat straw, an SSF fermentation (40°C) of the glucose to ethanol, thermophilic fermentation (70°C) of the xylose to ethanol and an anaerobic treatment (55°C) that combines the fermentation effluent with manure to produce biogas. This process produces theoretically no waste products as the fibre from the manure is then sent to be combined with the wheat straw for pretreatment.

The effectiveness of pretreatment in recovering the various components from the feedstock has been evaluated. Cellulose yields are in the 87-97% range and hemicellulose recovery is 50-70%.

Enzyme Requirements Glucose Yields from Pretreated Corn Stover

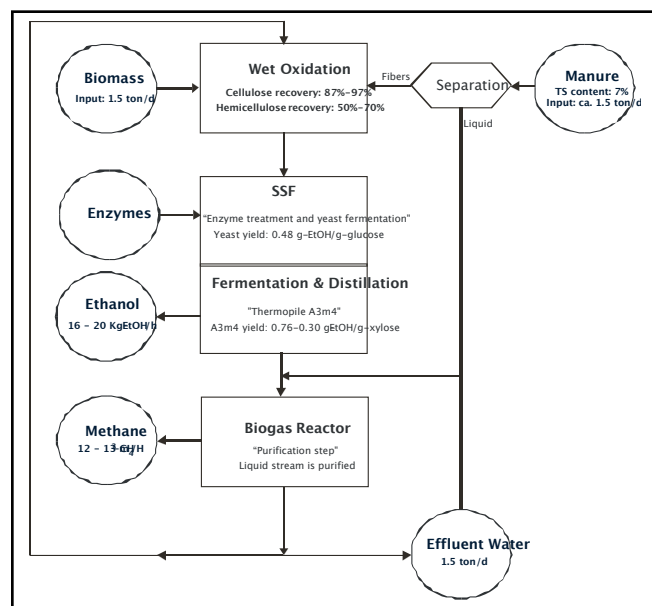
Glucose Yield from Whole Slurry

	Pretreatment Method	
Enzyme Loading (FPU/g cellulose)	Steam Explosion	Wet Oxidation
10	54%	88%
20	59%	96%

Glucose Yield from Filter Cake

	Pretreatment Method	
Enzyme Loading (FPU/g cellulose)	Steam Explosion	Wet Oxidation
10	50%	72%
20	60%	75%

Commercial enzymes are costly and may not be an effective hydrolytic catalyst with the substrate being used as a feedstock. Thus alternatives to commercially produced enzymes must be found and produced in sufficient quantity to



support a commercially sized facility. We are currently involved in two activities associated with enzyme production:

- Screening for filamentous fungi producing cellulose and hemicellulose degrading enzymes. Five organisms were evaluated and *Penicillium brasilianum* proved to be the one with the most favorable features. Details were presented and are available on request. Enzymatic hydrolysis comparisons between this organism and a commercial enzyme preparation on a wheat straw substrate showed equal or better performance.
- Physiological investigations of *Penicillium brasilianum* have also been carried out.

Anaerobic treatment studies revealed a complete or almost complete reduction of fermentation inhibitors (2-furoic acid, 4-hydroxybenzaldehyde, 4-hydroxybenzoic acid, vanillic acid, homovanillic acid, syringic acid, syringol, acetovanillone, acetosyringone).

Optimal Bioconversion can be accomplished through the combination of aerobic and anaerobic fermentation. The extra step producing methane ensures optimal utilization of the biomass as methane is produced from anything that is not transformed into ethanol.

DTU Pilot Plant

A pilot plant is in the process of being funded and built. The various components are shown in the attached block diagram and the economics of producing the ethanol have been estimated.

Process Input/Output	Average (DKK/L ethanol)	% of total cost
Biomass - buy	1.43	60
Enzymes – buy	0.22	90
Other Prod. costs	0.79	33
Total - Bioethanol Plant	2.44	
Manure - buy	0.07	3
Other Prod. costs	0.06	2
Total – Biogas Plant	0.13	5
Depreciation	0.32	13
Interest Rate	0.32	13
Electricity - sale	-0.82	-34
Total	2.38	100

Liisa Viikari
VTT Biotechnology
Finland
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R&D for bioethanol continues primarily through VTT. Finland anticipates that blends of 2% ethanol in premium 98-octane fuel will be used in Helsinki. Feedstock availability is the prime concern as almost all of the agricultural, forestry and municipal sources are currently being utilized for other purposes.

Barbel Hahn-Hägerdal
Lund University
Sweden
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Barbel discussed the progress made by Sweden in implementing their plan for large-scale fuel ethanol introduction into the marketplace. The largest area of progress has been on the 400-500 liter ethanol/day pilotplant facility being built in Ornskoldsvik. Financing

has been completed and the project is on track to be operating in the first half of 2003. More details on the facility and the rest of the national implementation plan are provided in the past couple of IEA Task 39 newsletters available at the website <http://www.forestry.ubc.ca/task39>.

The plant is located together with an existing biobased municipality heat and powerplant in Northern part of Sweden. On the existing site there is also a pelletising plant with the annual capacity of about 75 000 ton dry pellets for household heating or delivery to MHP plants in the Stockholm area.

Process design for the production plant is basically the same as the pilotplant. Annual capacity of this plant will be about 75 000 000 liters of ethanol. The investment costs for the production plant will be about 130 million EURO. The plant can be in operation 2006-7 if the tests of the equipment and process development in the pilot plant follows the plans.

Kelly Ibsen
National Renewable Energy Laboratory (NREL)
USA
mailto:

U.S. DOE Biofuels Program Commercialization Activities

Kelly started off giving a short description of the reorganization (effective May 1, 2002) of the U.S. DOE Energy Efficiency and Renewable Energy Office. The number of Sector Offices has been reduced from five (Power Technologies, Industrial Technologies, Transportation Technologies plus two others) to only two (Technology Development and Business Administration). Within the Technology Development Sector there will be a Biomass Program Office which will include biopower, biofuels, black liquor gasification, and agriculture industries of the future. The reorganization has been done to streamline and integrate the organization with the hope of producing more focused offices.

U.S. DOE Biofuels Budget (Millions \$)

	Biofuels	Biopower
Fiscal Year 2000	38.099	?
Fiscal Year 2001	46.526	40.00
Fiscal Year 2002	93.00	
Earmarks	- 40.05	

Broad Bioenergy Solicitation	- 20.00
Combined Discretionary	39.95

The Biofuels Commercialization Program has been divided into three timeframes (near term, midterm and longterm).

Near Term

In the near term pioneer plants will be supported to attempt to demonstrate the technology in a profitable situation. These facilities will utilize niche feedstocks with a low or negative cost, attempt to solve specific environmental problems, have unique infrastructural opportunities.

In a general sense the Pioneer Plants can be categorized by process and feedstock. Sulfuric acid processes, both concentrated and dilute, currently have champions working towards building pioneer facilities.

Masada Corporation of Middletown, New York is proposing to build a concentrated sulfuric acid facility to convert municipal solid waste (MSW) to 10 million gallons/yr of ethanol.

There are currently two proponents of the dilute sulfuric acid process. The first is BC International with facilities at Jennings Louisiana (bagasse feedstock, 21 million gallons/yr ethanol) and Gridley, California (rice straw, 15-25 million gallons/yr). The other champion is Sealaska Corporation at Ketchikan, Alaska using woodmill wastes.

Various gasification routes have also been proposed and could be supported and evaluated.

Another important near term activity will be collaboration with the existing corn ethanol processors. The current bottom-line of the starch facilities may be improved through introduction of cellulosic technologies or utilization of on-site fiber for enhanced ethanol yields. Both wet and dry mill corn mill collaborations are planned. Wet mill collaborations are anticipated with the National Corn Growers Association/Archer Daniels Midland Company and Williams Bio-Energy/Purdue University/USDA. Dry mill organizations such as Broin & Associates, MBI International and the Distiller Grains Conversion Study will be likely candidates for collaboration. Enhanced utilization of pentose sugars through yeast development will also be pursued with NCGA/CRA.

Mid Term

Midterm activities will include development of an enzyme sugar platform that will enable the production of low cost cellulase enzymes, identify and test the best integrated process, and partner with industry on a demonstration unit. The most likely feedstock will be corn stover which is currently the largest in volume. There is expected to more interest by chemical manufacturers within this time period as value-added products in addition to ethanol are explored in more depth.

Long Term

Long term work will be directed towards: engineered feedstocks with improved conversion properties and composition; feedstock logistics including the development of advanced methods of harvesting, collecting, storing and transporting; advanced pretreatment as well as enzyme development and utilization technologies to improve processing costs; and larger and earlier industrial involvement in technology evaluation.

Tom Jeffries

Forest Products Laboratory

US Department of Agriculture (USDA)

USA

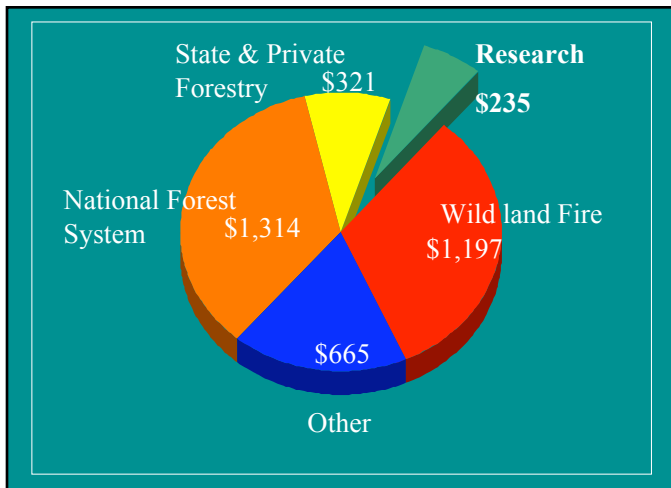
<mailto:twjeffri@facstaff.wisc.edu>

The US Department of Agriculture is composed of three areas of research. These are the Forest Service, the Agricultural Research Service and Nutrition and Health. This means that our user base that consists of American farmers, the food processing industry, the pulp and paper industry, lumber and construction industries and the American consumer. Therefore, our research and development feeds into many aspects of American life.

USDA tries to get the highest value out of a mix of products from agricultural and wood commodities. The lignocellulosic commodities include fiber and oil crops, low density hardwood species, underutilized processing wastes, wood and agricultural harvest residues, recycled papers and wood wastes, and sludges from recycled fibers. The value for these can be enhanced through a series of steps that include: pulping and pretreatment methods; enzymatic conversion to polymeric lignin, fractionated sugars and fractionated fibers; and biochemical and metabolic engineering to produce modified lignin and fibers, fuels, chemicals and precursors for adhesives, films and polymers.

USDA Forest Service Biofuels R&D

USDA Forest Service
FY2002 President's Budget
Discretionary Funds
(Total \$ 3,732 million)



The overall mission of the Forestry Service is to ensure for present and future generations the long-term health, diversity and productivity of the land. The Forestry Service was formed in 1905 and manages 8.5% of the US land area (192 million acres), employs over 30,000 people, a \$3.7 billion annual budget (2001), and a revenue of \$800 million (2001). Forest Products Research started in 1910 at the Forest Products Laboratory (representing the North Central region) and 6 other field locations (Pacific Northwest, Pacific Southwest, Rocky Mountain, Southern, North Eastern and IITF).

Forest and Rangeland Research appropriation is organized under four program areas. They are:

- Vegetation Management and Protection Research
- Wildlife, Fish, Watershed, and Air Research
- Forest Resources Inventory and Analysis
- Resource Valuation and Use Research

With the last one, resource valuation and use research, being the area most pertinent to biofuels.

For fiscal year 2002 there are 7 focus areas:

- Forest Inventory and Analysis (FIA)
- Sustainable Forest Management
- Global Change Research

- Community and Wildland Development
- Watersheds for Multiple Values
- Biobased Products and Bioenergy
- Risk-Based Forest Management

The second last, Biobased Products and Bioenergy, being the focus area of most interest to biofuels.

Recently there has been a substantial interest in removing the excess growth in the nation's forests. Catastrophic forest fires as a result of this build-up are anticipated and yet controlled burning management strategies have either been ineffective or outlawed due to air pollution legislation. Forest biomass energy projects have focused on practical solutions to this excess growth. Four areas have been suggested as potential solutions:

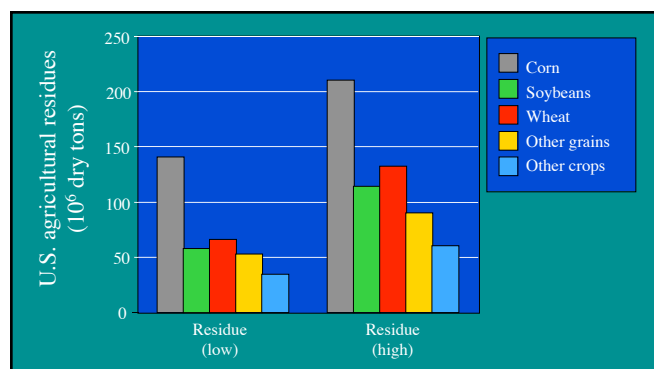
- Thermal (stove)
- Electricity (small 50 MW plants)
- Gasification (hot water heater)
- Biofuels (ethanol)

Current biotechnology research at the Forest Products Laboratory (~2.5 million annual budget) include the following topics with the names of the primary investigator in brackets:

- Fundamental mechanisms of fungal oxidative enzymes (Hammel)
- Molecular genetics of wood degrading fungi (Cullen)
- Enzyme applications in pulp and paper processing (Kenealy)
- Tools for metabolic pathway engineering (Jeffries)

USDA Agricultural Bioenergy Research

Corn, soybeans and wheat constitute the majority of the agricultural residues in the USA.



Research at the USDA facility (NCAUR) in Peoria, Illinois includes biomass pretreatment, enzymatic hydrolysis, inhibitor abatement, ethanol fermentation and fermentation to produce other value-added products.

Corn fibre has been the primary feedstock of interest. Dilute acid pretreatment followed by centrifugation to separate the solids (mostly cellulose) from the syrup (glucose & pentoses). The solids are then combined with liquid residues, dried and used as animal feed. The syrup is fermented to produce ethanol.

There have also been cooperative efforts to investigate other pretreatment methods as well:

- Bruce Dale (MSU) – AFEX or FIBEX;
- Michael Ladisch (Purdue) – Hot Water;
- Jack Saddler (UBC) – Steam Explosion.

Peoria has also been involved with projects to enhance enzymatic hydrolysis. Specific areas of investigation include:

- Characterization of novel enzyme activities to hydrolyze complex xylans;
- Formulation of xylanolytic enzyme mixtures for converting pretreated hemicellulose to monomeric sugars;
- Non-glucose repressed β -Glucosidases.

Fermentation research has been the major focus at Peoria with the development of novel microorganisms for ethanol production. These organisms include the high ethanol yielding recombinant E.coli for the fermentation of sugar

mixtures, catabolite repression mutants for efficient ethanol fermentation of sugar mixtures, and tools for expressing genes associated with ethanol production (pdc and adh) in gram positive hosts.

Other products developed have included lactic acid producing strains of *R. oryzae* and engineered *E. coli*, alternan a novel polysaccharide produced from glucose fermentation and sugar alcohols (xylitol and mannitol).

Current Peoria funding is focused on fuels and currently funds 6 researchers with recruitment for 8 further researchers in the area of organism discovery and value-added products. The current ethanol mandate in the Senate energy bill is expected to triple the demand for ethanol so the push is on to extract more alcohol from fiber.

FUTURE WORKSHOPS/SYMPOSIA

10th Biennial Biomass Conference

Bioenergy 2002

Bioenergy for the Environment

September 22-26, 2002

Boise, Idaho, USA

<http://www.uidaho.edu/bioenergy/>

International Convention on Biofuels

Biofuels-Driving India's Future

7-9 November,

Hotel Taj Palace,

New Delhi

more information

<http://www.ciionline.org/seminar/2002/bdif/index.html>

POLICY/REGULATORY ISSUES

IEA Bioenergy Task 39

Policy and Regulatory Working Group Meeting:

November 13-14, 2002, Vienna

<mailto:Don.Stevens@pnl.gov>

National Conference on Ethanol Policy & Marketing

Feb. 17-19, 2003

Camelback Inn Marriott Resort

Scottsdale, Arizona, USA

<http://www.bbiethanol.com/nce/>

ETHANOL

World Ethanol 2002

November 6-7, 2002

London, UK

<mailto:conferences@agra-net.com>

IEA Bioenergy Task 39
Bioethanol Commercialization Progress
December 11-12, 2002
York, UK

Contacts:

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David Gregg <mailto:djgregg@interchange.ubc.ca>

19th Annual

International Fuel Ethanol Workshop & Trade Show

"Where Practical Application & Research Meet to Improve
Grain & Biomass Ethanol Production"

June 16-19, 2003

Sioux Falls, South Dakota, USA

Sioux Falls Convention Center

<http://www.bbiethanol.com/few/>

CONTACT INFORMATION

Please find information below for both the IEA Bioenergy contacts and IEA Bioenergy Task 39 contacts. Additional information is available at <http://www.iea.org> and <http://www.ieabioenergy.com>.

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IEA MEMBERSHIP

Country/Org.	IEA	Bioenergyy	Task 39
Australia	✓	✓	
Austria	✓	✓	✓
Belgium	✓	✓	
Brazil		✓	
Canada	✓	✓	✓
Croatia		✓	
Czech Rep.	✓		
Denmark	✓	✓	✓
European Comm.	✓	✓	✓
Finland	✓	✓	✓
France	✓	✓	
Germany	✓		
Greece	✓		
Hungary	✓		
Ireland	✓		
Italy	✓	✓	
Japan	✓	✓	
Korea	✓		
Luxembourg	✓		
Netherlands	✓	✓	✓
New Zealand	✓	✓	
Norway	✓	✓	
Portugal	✓		
Spain	✓		
Sweden	✓	✓	✓
Switzerland	✓	✓	
Turkey	✓		
UK	✓	✓	✓
USA	✓	✓	✓
Total	27	19	9