BIOENERGY NEWS

July 2007

FEATURE ARTICLE:

Building Better Biofuels

The U.S. Department of Energy has set a goal of replacing 30 percent of gasoline used in the United States with fuels from renewable biological sources by 2030, and President Bush has made ethanol production a priority. So it is hardly surprising that some biotech startup companies are positioning themselves to take advantage of an anticipated booming market for biofuels.

While much of the focus is on ethanol, LS9, of San Carlos, CA, is using the relatively new field of synthetic biology to engineer bacteria that can make hydrocarbons for gasoline, diesel, and jet fuel. Hydrocarbon fuels are better suited than ethanol to existing delivery infrastructure and engines, and their manufacture would require less energy. To make biological production of hydrocarbons a reality, the company is bringing together leaders in synthetic biology and industrial biotechnology.

LS9 is at a very early stage: the company was formed in 2005, but its existence was announced only this winter. It plans to engineer microbes to incorporate gene pathways that other microbes, plants, and even animals use to store energy. Other startups, such as Amyris, of Emeryville, CA, and SunEthanol, of Amherst, MA, are also trying to use synthetic biology to develop microorganisms that produce biofuels. Stephen del Cardayre, a biochemist and LS9's Vice President for Research and Development, says LS9 microbes produce and excrete hydrocarbons that are useful as fuels.

Now the company is working to customise the rate of production and the products themselves. “We certainly have gone beyond what we think anybody else was even thinking of doing in terms of producing hydrocarbons from microbes,” says George Church, a geneticist at Harvard Medical School and one of LS9's two founders. The other is Chris Somerville, professor of plant biology at Stanford University.

The company has $5 million in funding from Khosla Ventures, of Menlo Park, CA, and Flagship Ventures, of Cambridge, MA. Its acting CEO, Douglas Cameron, is former director of biotechnology research at Cargill and chief scientific officer at Khosla Ventures. Flagship CEO Noubar Afeyan cautions that no one can tell the extent to which any biofuel will displace fossil fuels. "That is a subject of great debate and great prognostication," he says. "The opportunity is so large that I don't have to believe in much more than a few percentage points of market penetration for it to be worth our investment."

Stephen del Cardayre, a biochemist and LS9's vice president for research and development.

The company is looking for areas where synthetic biology's potential to produce specific types of molecules will pay off. This could mean making high-performance jet fuel, Afeyan says,

or it could mean creating gasoline that has no pollution-causing sulphur content. Beyond custom-developing hydrocarbons, LS9 foresees licensing its technology. In particular, the company might someday forge agreements with ethanol producers, whose manufacturing plants could be put to more profitable and efficient use making hydrocarbon fuels.

LS9 is counting on the fact that ethanol is not really the best biofuel. Del Cardayre notes that ethanol can't be delivered through existing pipelines. It also contains 30 percent less energy than gasoline, and it must be mixed with gasoline before being burned in conventional engines. LS9's fuels would have none of these disadvantages. What's more, LS9's fuels might be produced more efficiently than ethanol. For example, at the end of ethanol fermentation, the mixture has to be distilled to separate ethanol from water. LS9's products would just float to the top of a fermentation tank to be skimmed off. Overall, the LS9 process consumes about 65 percent less energy than today's ethanol production, the company says.

LS9 now needs to prove that its technology is economical and can produce fuels on a large scale, says Jim McMillan, principal biochemical engineer in the National Renewable Energy Laboratory's Bioenergy Centre, based in Golden, CO. "I don't doubt that [making hydrocarbon fuel from microbes] can be done; the question is how quickly and at what cost," he says. LS9 says it hopes to bring its hydrocarbon biofuels to market in four or five years.

NEWS BRIEFS:

Survey of Wood Waste

CSIRO's entity for wood research Ensis is collaborating with Sydney consultancy Warnken ISE to conduct a national study to quantify the volume and types of wood waste being dumped at facilities across Australia. The data is expected to help fashion resource recovery options.

In what is understood to be an Australian first, a team of scientists will conduct the study by sifting through tonnes of urban waste to provide essential information about wood disposed of at landfills. CSIRO maintains that in addition to the environmental benefits of recycling wood resources, there are also opportunities for commercial and economic gain. The project aims to put an end to speculation about the volumes of wood waste available across the country by providing scientific data on volumes and quality, according to CSIRO. Matthew Warnken from Warnken ISE said there were many potentially valuable uses for wood waste currently being disposed of in landfills. The study will be of interest to the timber industry, renewable energy project developers and also wood waste recyclers. Industry will be able to access the information on the online 'Renewable Energy Atlas', which will contain real wood waste data on a national level. A summary report will also be available on the Ensis website.

The study is being funded by the Australian Greenhouse Office with assistance from the Forest and Wood Products Research and Development Corporation.

Plastics from Wood

Genesis Research and Development today reported that it had produced an expanded polyurethane foam made from trees. The company said the production showed the potential to manufacture "green" plastics by reducing the need for petrochemicals in polyurethane production.

The natural lignin extracted from shrubby willow trees was tested by a potential international customer whose name has not been released, with excellent results for thermal conductivity and density. According to Genesis, the customer had indicated interest in purchasing commercial quantities of the product. The company's subsidiary BioJoule, which grows the shrubby willow in New Zealand, said the initial samples had been prepared by a small pilot scale processing plant. However, they hope to secure further funding to allow BioJoule to build a larger pilot processing plant that would allow process design and operating parameters to be optimised and ultimately lead to a commercial refinery.

BioJoule MD, Jim Watson, said the production of urethane foam shows the potential to manufacture green plastics from shrubby willow produced in plantations. "This has the potential to reduce the need for petrochemicals in polyurethane production, thus improving the carbon footprint. BioJoule is also expanding its program to review the use of lignin in a range of composite plastics. Also, the opportunity to grow shrubby willow on low value land to produce ethanol as a transport fuel and other high value by-products such as lignin and xylose has the potential to solve a number of

environmental and economic issues, according to BioJoule.

"The use of Salix (willow), which has a very high energy capture and conversion balance, and the production of multiple high-value products, is expected to create a much more economic biofuel business than using food-grade corn to produce ethanol alone," Watson said. BioJoule is a subsidiary of Genesis Research that has been established to develop and commercialise technology for growing and refining shrubby willow to produce industrial materials such as ethanol, un-sulphonated lignin and xylose.

New Content on the Bioenergy Knowledge Centre

A new case study released on the Bioenergy Knowledge Centre demonstrates the economic efficiencies of using hogging machines in the Central North Island. The study reviews the performance of three different hoggers and identifies the different issues any business considering employing a hogger should keep in mind. This is a must read for anyone interested in caputuring wood waste from forests.

Another case study recently released evaulates the decision and installation of an on-site wood fired boiler at Kiwi Lumber's Dannevirke Sawmill. The boiler was converted from using gas to woodwaste - and resulted in the sawmill providing 89% of it's own energy needs, with electricity covering the rest. This is a real kiwi success story.

And finally there is the evaluation of the cogeneration plant at the Red Stag Mill in Waipa. This Mill uses byproducts, such as sawdust, bark and offcuts, to provide fuel for a 'cogenerator' that produces heat for timber processing, as well as extra electricity that is sold to back to the national grid. In a typical month, the sawmill spends about $40,000 on electricity but also generates and sells $20,000 worth – essentially halving its power bill. This facility is not a hobby for the Mill - but a real powerhouse.

To learn more about any of the above studies, visit www.bioenergy-gateway.org.nz

Bioenergy 2007

This is a reminder of UK Bioenergy 2007. The themes of this year's event are Sustainability, Innovation and Integration. With the imminent launch of the Renewable Transport Fuels Obligation, greater recognition of the importance of renewable heat, the publication of the Biomass Strategy and proposals to band the Renewables Obligation there has never been a more important moment to bring all parts of the UK biomass sector together.

The sustainability issue, particularly around biofuels, has rarely been out of the press over the past six months. Bioenergy 2007 intends to tackle this matter head on with speakers from NGOs and the UN debating the issue along with representatives from the industry.

Bioenergy 2007 is the only UK event that brings biomass, biogas, energy from waste and biofuels sectors all together. It provides a unique opportunity for networking, exchange of ideas and experiences.

IEA Forecast

The IEA forecast global biofuel output will double from 2006 levels to 1.75 million barrels a day in 2012. In its medium-term oil market report through to 2012, the agency included its second annual report on biofuels. IEA also raised its 2006 biofuel supply baseline by 79,000 barrels a day to 863,000 barrels a day due to stronger-than-expected growth and more detailed capture of projects. Still the agency warned while the forecasts showed a "considerable rate of growth" for global biofuel production they were significantly below capacity planned for 2012. The IEA said it maintained a cautious biofuels stance because high feedstock prices raised doubts over economic viability.

I-CARES

Washington University announced it is spending more than US$55 million on a biofuels and sustainable energy research centre. It will be known as the International Centre for Advanced Renewable Energy and Sustainability, or I-CARES. Its creation marks one of the most significant financial contributions Washington University has made in a dozen years. Many of these partners came together a year ago, when Washington University led a bid for a $125 million federal biofuels research centre. Two or three such sites will be selected this year by DOE but the local group didn't want to wait. "We'd like to get real on-the-ground collaborations that start now, rather than waiting for the future to roll around. "It's time to pull this together and make a statement," said Roger Beachy, president of the Plant Science Centre.

IEA Bioenergy

The July 2007 issue of the IEA Bioenergy Newsletter can now be viewed and downloaded at:
http://www.ieabioenergy.com/Library.aspx

NZ Clean Energy Centre

The New Zealand Clean Energy Centre (NZCEC) is now open for business in Taupo. Plans for the Centre include:

- A business cluster
- An exhibit and events centre
- A source of funds, advice, technology and services designed to accelerate the path-to-implementation for clean energy projects.

The NZCEC has invited BANZ members to share thoughts on how the New Zealand Clean Energy Centre might deliver value to your initiatives, or on how you might deliver value to theirs.

To participate in the survey visit:
www.nzcleanenergycentre.co.nz/survey.php

EECA

nature's flame
Renewable fuel from Solid Energy

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BRIGHTWATER ENGINEERS

Waste Solutions
Biotechnology Group

The Bioenergy Association of New Zealand Inc. (BANZ) comprises companies, research organisations and individuals who have an interest in markets for converting biomass or biowaste into energy. To receive this newsletter regularly contact the Executive Officer of BANZ for membership details by email: info@bioenergy.org.nz. Back issues of this E-zine are on the website, www.bioenergy.org.nz

EVENTS CALENDAR:

Bioenergy Workshop, Wellington,9 August

In conjunction with FIDA Bioenergy Advisory Group meeting.

International Training Workshop on Technology and Utilisation Biomass Gasification, Yingkou, China, 1-20 September

Yongzhi Ren, Biomass Gasification Department, Liaoning Institute of Energy Resources (LIER), Yingkou, Liaoning Province, P.R. China.

Website: http://gasifiers.bioenergylists.org/yinkougasworkshop07

International Bioenergy, Jyväskylä, Finland, 3-6 September.

The main organizer is FINBIO - The Bioenergy Association of Finland.

Website: http://seminaarit.ohoi.fi/default.asp?seminarID=6

Renewable Energy Association, Bioenergy 2007, Oxford, England, 20-21 September.
Website:
http://www.r-e-a.net/content/images/articles/REA%20Bioenergy%202007%20Brief.pdf

10th World Ethanol Congress, Amsterdam, 5-8 November.
Website:
www.agra-net.com/worldethanol

20th World Energy Congress, Rome, 11-15 November.

Theme "Energy Future in an Interdependent World"

Biogas Markets, 27-28, Brussels, 19-20 November.

BANZ AGM, Rotorua, 22 November.

In association with Forest Residues Workshop.

Biofuels Congress & Exhibition, Brussels Expo, 12-14 March, 2008