Biofuels news

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FOCUS ON...

DOE's Enzyme Sugar Platform Project

"The most valuable way to improve the availability of biofuels is to develop advanced methods of overcoming the resistance of agricultural, forest-based, and urban feedstocks to enzymatic and fermentation treatments."

-from "Biomass Research and Development Technical Advisory Committee Recommendations," December, 2001.

(see article on page 3)

Julie Tuttle, NREL/PIX 10941, 10944, 10945

Representatives from government, industry, and academia at the Enzyme Sugar Platform stage-gate meeting in Golden, Colorado.

DOE Hosts Stage-Gate Review of the Enzyme Sugar Platform Project

On January 30 and 31, representatives from government agencies, universities, and industry met in Golden, Colorado, to discuss the future of the Department of Energy's (DOE) Enzyme Sugar Platform Project. The Enzyme Sugar Platform meetings were part of the project's stage-gate review; a process in which DOE, the National Renewable Energy Laboratory (NREL), and external reviewers meet to discuss the project's progress and future directions. The meetings were also intended to give potential industrial partners information about the Enzyme Sugar Platform Project.

An external review panel that included Rod Fisher from Cargill, Scott Nichols from Dupont, Dale Monceaux from Katzen International, and Mel Pearson from Kvaerner attended the meeting to assess how well the project's objectives are being met. In addition, approximately 80 individuals representing a wide variety of government, university, and industry groups also attended the meetings. Representatives from DOE included John Ferrell, Amy Miranda, Gerson Santos-Leon, Valerie Sarisky-Reed, Andy Trenka, and Jim Spaeth.

The Enzyme Sugar Platform Project focuses on researching and proving the technologies that will allow industry to build biorefineries capable of making a variety of products from lignocellulosic materials. At the stage-gate meetings, Biofuels Program presenters emphasized that in order to develop lignocellulosic biorefinery technology it is necessary to develop a process that will economically convert lignocellulosic biomass to sugars to allow fermentation to ethanol and other products (see figure on page 2). In order to develop this process, researchers are utilizing market analyses, technical assessments, and economic assessments.

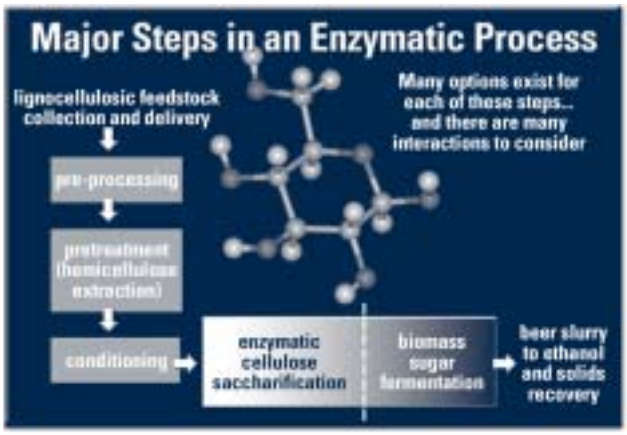
Another important part of the project is the development of a life-cycle analysis to measure "cradle to grave" effects of feedstock collection and its conversion to ethanol. "Life-cycle analysis is where all the pieces have to come together … we use life-cycle analysis to tell us if we have a strategic fit with the Biofuels Program," said NREL senior engineer John Sheehan. "The real goal for life-cycle analysis is that we end up with a usable tool to help people make sustainable choices."

continued on page 2

WHAT IS THE STAGE-GATE PROCESS?

The stage-gate process is used as a project management tool by Biofuels Program staff to manage biofuels projects. The process helps to insure that research projects are aligned with national and program objectives. It also insures industrial and financial relevance, and guides research in the most valuable directions. Projects are reviewed at key points in their progress—called "gates." A project must successfully pass through this gate review to proceed to the next stage. DOE, NREL, and external reviewers assess how well the previous stage's objectives were met, and whether it is appropriate for the project to move to the next stage, remain in the current stage, or be canceled. For projects that continue, the gate review helps refine the project's objectives for the next stage. For the Enzyme Sugar Platform Project, the recent stage-gate review occurred between Stage 2 (detailed investigation efforts), and Stage 3 (process development efforts).

Enzyme Sugar Platform Project *continued from page 1*



Program researchers also discussed DOE's goal of commercially producing ethanol from agricultural residues by 2010 at a cost of $1.10 per gallon, and by 2025 at a cost of $0.60 per gallon. When commenting on these goals, reviewer Mel Pearson stated, "What we need out of this is a flexible, robust breakthrough on costs, as I see it, to get over the hurdle of the capital and operating costs and the immediate extreme difficulty of getting to [the target cost of] $1.10 … or even $1.30 [per gallon]."

Although the external reviewers recommended that the project move to the next stage, they also raised concerns about adequacy of funding and the ambitious timeline.

Project managers indicate that in 2002-2003 the project will focus on testing selected technology options, financial assessment and life cycle analysis work, increasing industry involvement, and extending the current market assessment.

The Enzyme Sugar Platform Project—Designing Tomorrow's Biorefinery

The Enzyme Sugar Platform Project focuses on using enzymatic hydrolysis to break cellulose into its component sugars and researching and proving the core technologies that will allow tomorrow's lignocellulose biorefineries to be built. Although bioethanol technology breaks down both cellulose and hemicellulose into their component sugars, hemicellulose hydrolyzes more readily during chemical pretreatment. Cellulose hydrolysis is more challenging and the key to process economics. In the future, the biomass sugars from cellulose and hemicellulose will be used as "platform" chemicals to make a variety of products, including ethanol.

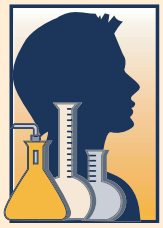
According to project leader Jim McMillan, the Enzyme Sugar Platform Project is the Biofuels Program's largest and most complex process development project. The project seeks to exploit low-cost, high-volume lignocellulosic feedstocks like corn stover, rice hulls, or grasses in order to develop a biorefinery capable of making not only ethanol fuel, but also a range of other biobased products. "I think your technology is going to be useful and will produce a variety of different value products. Ethanol will be one of them, but I think that others will be even more valuable," stage-gate reviewer Mel Pearson told researchers.

For more information on the Enzyme Sugar Platform Project and the recent stage-gate meetings, visit ***www.ott.doe.gov/biofuels/enzyme_sugar _platform.html.***

ENZYME SUGAR PLATFORM SCALE-UP FACILITY SOLICITATION

The primary objective of the Enzyme Sugar Platform Project is to enable industry to construct and operate a scale-up facility to produce engineering data that will enable them to design and construct a commercial facility for converting biomass to fuel ethanol or other biobased products. To support this objective, DOE has issued a request for letters of interest in participating in designing or constructing and operating the scale-up facility. All phases of the project will be cost-shared between DOE and industrial partners. DOE invites potential partners to suggest feedstocks, technologies, and products from the project, and to specify which of the project's phases they would like to participate in. For information about the request for letters of interest and planned solicitation, visit the DOE Golden Field Office Web site at ***www.golden.doe.gov/businessopportunities.html*** and view announcement DE-PS36-02G-092007.

MEET THE BIOFUELS STAFF



Jim McMillan – Senior Biochemical Engineer

Nicole Kusy, NREL

Jim McMillan has led the Enzyme Sugar Platform Project at NREL since 1998 and has worked at NREL since 1990. As the head of the Enzyme Sugar Platform Project, Jim leads a multidisciplinary team that develops and demonstrates economically attractive technology for producing sugars and ethanol from abundant lignocellulosic agricultural residues (corn stover is the model feedstock). The objective is to integrate established pretreatment and fermentation strain technologies with the next generation, lower-cost cellulase enzymes.

Jim holds a PhD in Biochemical Engineering and an MS in Chemical Engineering Practice from the Massachusetts Institute of Technology, and a BS in Chemical Engineering from Colorado State University (CSU). He is an active member of the American Institute of Chemical Engineers and serves on the organizing committee for the annual Symposium on Biotechnology for Fuels and Chemicals. Jim is also a member of the Advisory and Development Boards for CSU's College of Engineering, and an affiliate faculty member at several universities where he serves on chemical engineering masters and PhD theses committees. He is a reviewer for numerous scientific journals and was previously on the editorial board of the *World Journal of Microbiology and Biotechnology*. Jim was part of the team that won an R&D 100 award for Ethanol from Corn Fiber in 1993, and holds two patents issued in 1998.

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On the Federal Front

Biomass R&D Advisory Committee Releases Recommendations

The Biomass Research and Development Technical Advisory Committee recently submitted a recommendation report to Secretary of Agriculture Ann Veneman and Secretary of Energy Spencer Abraham. The report was developed as part of the Biomass Research and Development Initiative and is the response to a Congressional charge to recommend ways to advance the availability and use of biobased products. The Committee proposed several goals and recommendations for biofuels, three of which were specific to biofuels development:

1. "By 2010 triple production of fuel from biomass sources, from 2000 levels, by removing technology and policy barriers."
2. "Provide benefits to farmers and forest landowners by increasing the value of agricultural and forestry products and assisting rural communities with economic development."
3. "Encourage investment by mitigating the financial risk involved in biofuels."

The Committee also identified several areas in which they felt that more research was needed, including lignocellulosic materials, pretreatment, catalytic and chemical processing, and biorefineries.

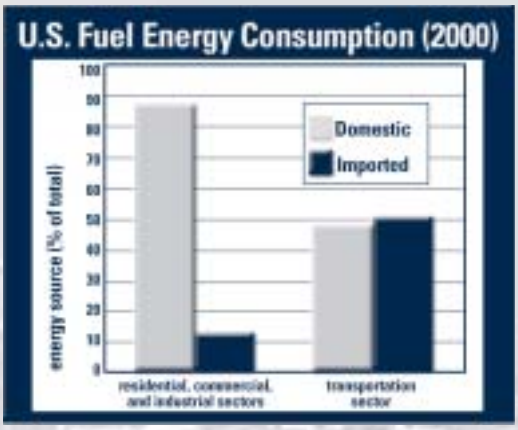
Additional recommendations in the report included increasing the coordination between USDA and DOE, developing an infrastructure to effectively develop products and move them to market, and developing a cohesive and consistent long-term policy to develop and promote biobased products.

A minority report, submitted by David Morris of the Institute for Local Self-Reliance, specifically addressed cellulose-to-ethanol commercialization as the primary issue affecting biofuels. The minority report recognizes DOE's Building a Bridge to Ethanol project and suggests a more aggressive effort in that direction, including government and ethanol industry cost-shared financing of three front-end ethanol facilities. The minority report also recommends improving the dissemination and coordination of information.

For more information on the Biomass Research and Development Technical Advisory Committee's recommendations, visit ***www.bioproducts-bioenergy.gov/pdfs/AdvisoryCommitteeRDRecommendations.pdf***.

In the Spotlight

Biofuels and Homeland Security



Cheap oil fuels America's economy. And as our economy has grown, so has our demand for oil. Unfortunately, at the same time, our easily accessible, low-cost supply of domestic oil has been virtually tapped out. To make up for the shortfall in domestic supply, the United States has steadily increased its reliance on foreign oil. In 2000, according to the Energy Information Administration, net imports totaled 10.4 million barrels per day, or 53% of petroleum supplied. And net imports will keep growing for the foreseeable future, accounting for 62% of petroleum supplied by 2020. This heavy reliance on imported oil jeopardizes our nation's energy and economic security by making us vulnerable to oil supply disruptions and oil price hikes.

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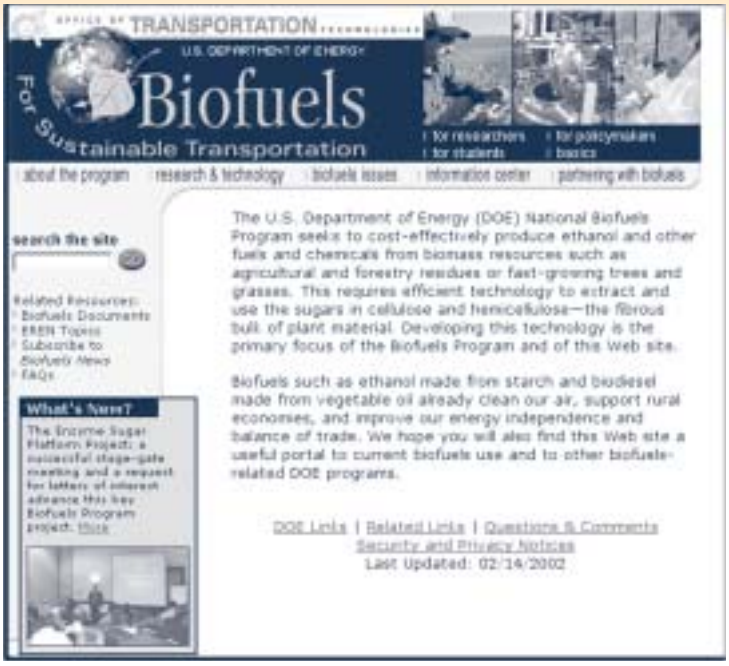
Transportation is particularly vulnerable because more than 50% of the fuel used by the transportation sector is imported—far more than any other part of the U.S. economy. Using biofuels can help to offset some of the transportation sector's demand for oil. A recent consultant study estimated that incrementally increasing the biofuels content of motor vehicle fuel (gasoline and diesel) from 1.2% to 4.0% between 2002 and 2016 would displace a total of 2.9 billion barrels of crude oil. Together with measures such as improving vehicle fuel efficiency, using bioethanol and biodiesel as additives to gasoline and diesel can go a long way toward improving our nation's energy security.

Check It Out

New-and-Improved Web Site

The Biofuels Program Web site has a new look! We've updated many of the sections, improved the navigation, and added some new information. Please visit us at ***www.ott.doe.gov/biofuels***, and let us know what you think.



Did You Know?

New Publications from the Biofuels Program

- Stage Gate Management in the Biofuels Program *www.nrel.gov/docs/gen/fy01/31541.pdf*
- Colloquies on the Yeast Platform Project-Final Summary Report *www.nrel.gov/docs/fy02osti/31690.pdf*

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