

# BIOENERGY NEWS

April 2007



## FEATURE ARTICLE:

### *First Commercial Cellulosic Ethanol Plants*

The Secretary of the U.S. Department of Energy (DOE) announced it potentially invest up to \$385 million over the next four years in six cellulosic ethanol biorefinery projects. Though it requires a more complex refining process, cellulosic ethanol is characterized by a greater net energy balance and lower greenhouse gas emissions than traditional starch-based ethanol. The proposed plants are expected to produce over 130 million gallons of cellulosic ethanol annually, making a major contribution to President Bush's goal for increased production of low-cost renewable transportation fuels. The President's Advanced Energy Initiative (AEI) is pursuing reduced-cost cellulosic ethanol by 2012, while the "20-in-10" Initiative seeks to increase alternative fuels consumption to 35 billion gallons per year by 2017. The selected biorefinery projects were announced as a significant step to advance the nation's capabilities for efficient and effective conversion of cellulosic biomass into ethanol, synthesis gas, heat, and co-products.

Section 932 of the Energy Policy Act of 2005 (EPAAct) authorized DOE to solicit and fund proposals for the commercial demonstration of advanced biorefineries that use cellulosic feedstocks to co-produce ethanol, bioproducts, heat and power. The initial solicitation issued in February 2006 announced \$160 million in

financial assistance for three projects. Secretary Bodman requested that funding be doubled as part of the effort to expedite achievement of President Bush's goals.

Of the 24 companies that applied for assistance, 15 complied with requirements, and underwent a full technical review. Through a competitive solicitation and technical review process, six private companies were selected, to negotiate awards of no more than \$80 million each. The final selected companies, located in six different states, are to provide 60 percent or more of their respective projects' costs. DOE will in turn be an equity partner, providing up to the remaining 40 percent cost-share. Agreements for actual cost-share levels will be negotiated between DOE and each project partner. Combined industry and government investment is expected to top \$1.2 billion. DOE will monitor the projects' technical progress with regular reviews.

The projects selected include maximum diversity of technology, feedstock variety, geographic dispersion, and participant type. Applied technologies include both biochemical (enzyme and organism fermentation) and thermochemical (application of heat and pressure) conversion processes, as well as a hybrid thermochemical-biochemical option. Cellulosic biomass feedstocks come from various non-food sources: agricultural residues like corn stover and cereal straws, industrial plant waste including saw dust and paper pulp, and perennial grasses specifically grown for energy uses, such as switchgrass. These first cellulosic plants will be located across the country in the Great Plains, Southeast, Midwest, and the Pacific Coast. Establishment of cellulosic biorefineries in California, Florida, Georgia, Idaho, Iowa, and Kansas ensures practical utilization of a wide variety of regional feedstocks. Project participants range from venture capitalists and start-ups to conventional ethanol suppliers and global corporations, as well as conventional energy suppliers, chemical companies, waste management, and forestry. Some are farmers, entrepreneurs, and industry leaders. Those selected all presented unique business cases demonstrating their ability to produce ethanol from cellulose which can compete in starch-based ethanol markets. All six project timelines anticipate achieving competitive parity by 2012.

The following six projects were selected to negotiate awards:

**Abengoa Bioenergy Biomass of Kansas, LLC, Chesterfield, Missouri.**

Integrated Biorefinery for Conversion of Biomass to Ethanol, Synthesis Gas and Heat.

*Site of Proposed Facility:* Colwich, Sedgwick County, Kansas.

*Participants:* Abengoa Bioenergy R&D, Abengoa Engineering, Novozymes & Others.

*Feedstocks:* 700 tons per day (tpd), consisting of corn stover, wheat straw, milo stubble, switchgrass, and other opportunity feedstocks.

*Annual production:* 11.4 million gallons per year (gpy) ethanol, sufficient energy to power the operation and sell excess to starch plant.

*Technology:* Co-processing of agricultural residue at a corn dry grind facility via biochemical and thermochemical routes. 400 tpd into ethanol via biochemical routes, 300 tpd syngas for energy via thermochemical routes with the long term strategy of using the syngas for ethanol and chemicals production.

**ALICO, Inc., LaBelle, Hendry County, Florida.**

Production Facility that will Co-Produce Ethanol, Electricity and Other Commercially.

Valuable By-Products from Carbon-Based Feedstocks.

*Site of Proposed Facility:* LaBelle, Hendry County, Florida.

*Participants:* Bioengineering Resources, Inc. of Fayetteville, Arkansas; Washington Group International of Boise, Idaho; GeoSyntec Consultants of Boca Raton, Florida; and BG Katz Companies/JAKS, LLC of Parkland, Florida.

*Feedstock:* 770 tpd, consisting of yard, wood and vegetative wastes (citrus peel) and eventually energycane.

*Annual production:* 13.9 million gpy ethanol, 6,255 KW power, 50 tpd ammonia and 8.8 tpd hydrogen.

*Technology:* To produce fuel in the Bioengineering Resources Incorporated process, raw material is first gasified in a two-stage process that reaches temperatures as high as 2350° F, producing a mixture of CO, H<sub>2</sub> and CO<sub>2</sub>. The hot gases are scrubbed, cooled to 100° F, put through activated carbon filtration and introduced into a bioreactor where ethanol is produced.

**BlueFire Ethanol, Inc, Irvine, Orange County, California.**

El Sobrante Ethanol Biorefinery.

*Site of Proposed Facility:* Corona, Riverside County, California.

*Participants:* Waste Management, Inc., JGC Corporation (who successfully demonstrated the project at smaller scales), MECS Corporation, NAES, and PetroDiamond, a Mitsubishi Corporation company.

*Feedstock:* 700 tpd of sorted green waste and wood waste from landfills.

*Annual production:* 24 million gpy ethanol.

**Broin & Associates Inc, Sioux Falls, South Dakota.**

Launch of an Integrated Bio-refinery with Eco-sustainable and Renewable Technologies in Year 2009 (LIBERTY).

*Site of Proposed Facility:* Emmetsburg, Palo Alto County, Iowa.

*Participants:* - Lignocellulose fermentation technology - E. I. du Pont de Nemours and Company (Wilmington, DE); Commercial enzymes for biomass conversion - Novozymes North America, Inc. (Franklinton, NC); Analytical services - National Renewable Energy Laboratory (Golden, CO).

*Feedstocks:* 842 tpd, consisting of corn fiber, corn stover (cobs and stalks).

Annual production: 26.4 MM gal.

*Technology:* Broin will transform an existing conventional corn dry mill ethanol facility into a commercial scale bio-refinery that utilizes advanced corn fractionation and lignocellulosic conversion technologies.

**Iogen Biorefinery Partners, LLC, Arlington, Virginia.**

Launching America's Cellulosic Ethanol Industry.

*Site of Proposed Facility:* Idaho Falls, Bonneville County, Idaho.

*Participants:* Iogen Energy Corporation, Iogen Corporation, Goldman Sachs, and Royal Dutch Shell Oil Company.

*Feedstock:* 700 tpd consisting of the following Ag residues: wheat straw, barley straw, corn stover, switchgrass and rice straw.

*Annual production:* 18 million gallons ethanol, first plant, 250 million gpy in future plants.

*Technology:* To be located just south of Idaho Falls, ID, this 700 tpd integrated biorefinery will commercially demonstrate, using enzymatic hydrolysis, stand-alone cellulosic ethanol and associated co-product production from five major feedstocks - wheat straw, barley straw, corn stover, switchgrass, and rice straw.

**Kergy, Inc (now Range Fuels, Inc.)  
Broomfield, CO.**

Commercial Demonstration of a Thermochemical Process to Produce Fuels and Chemicals from Lignocellulosic Biomass.

*Site of Proposed Facility:* Near Soperton, Treutlen County, Georgia.

*Participants:* Merrick and Company, Praj Industries Ltd., Western Research Institute, Georgia Forestry Commission, Yeomans Wood and Timber.

*Feedstocks:* 1,200 tpd of wood residues and woody energy crops.

*Annual Production:* ~40 million gpy ethanol and 26,000 gpd methanol.

*Technology:* The purpose of the plant is to demonstrate commercial viability of a novel thermochemical process for producing ethanol. A patented gasification technology will be used to convert the feed in to a mixture of CO and H<sub>2</sub> (syngas). After appropriate gas cleanup, syngas will be compressed to about 1,500 psi and converted into ethanol in a catalytic synthesis step at temperatures up to 650Å° F.

## **NEWS BRIEFS:**

### ***Genome Sequencing Reveals Key to Viable Ethanol Production***

Researchers at the University of Rochester have for the first time identified how genes responsible for biomass breakdown are turned on in a microorganism that produces valuable ethanol from materials like grass and cornstalks. The findings in the Proceedings of the National Academy of Sciences may empower scientists to engineer ethanol-producing super-organisms that can make clean-burning fuel from the nation's one billion unused tons of yearly biomass production.

David Wu's technique may prove much more effective than traditional methods. Instead of using separate steps to break down biomass

into glucose and ferment the glucose into ethanol, as is currently done, Wu is working on a way to make a bacterium break down and ferment plant biomass efficiently in just one step.

### ***Turning Potatoes, Grass Into Ethanol***

Researchers at N.C. State University already know they can make ethanol from sweet potatoes and switchgrass. They don't know if they can do it day after day in quantities more meaningful than a lab beaker. A \$1.5 million grant by the Golden LEAF Foundation, could help them figure it out. NCSU will use the money to build a pilot plant capable of making ethanol from products commonly found in the state. It will allow us to get a facility into production within the next 18 months to two years," said Steve Peretti, an associate professor of chemical engineering and organizer of the NCSU project. "It won't be a large-scale plant, but it will let us know if ethanol can be produced with these materials on a larger scale." Three companies, including Novozymes, supported NCSU's project in the bid process.

### ***AD Digestate to be considered by UK waste protocols team***

The REA has just been informed by the Environment Agency Waste Protocols Team that as a result of information on AD submitted to EA over the past six months, and high level political lobbying, AD digestate outputs will be included on the list of materials that will be considered in the next financial year (07/08) by the waste protocols team and this has been confirmed by WRAP. The REA has to complete a formal application to be included on the list.

### ***Biomass generator to save jobs in forest industry***

At a time when many forestry workers face the prospect of mill closures, nearly 1,000 jobs have been secured in Fort Frances after newsprint giant Abitibi-Consolidated approved plans to spend \$84.3 million to build a biomass energy generator at its pulp and paper mill in northwestern Ontario.

Construction will begin this summer and the generator is slated to begin operations in the fall of 2008. Wood waste from its operations and sawmill, along with material gathered from area forestry companies will be used to generate steam and 45.5 MW of electricity for the mill. The biomass boiler will produce 58 per cent of the mill's energy requirements. The addition of

energy produced from small hydro dams raises its self-sufficiency to 86 per cent.

Some 350,000 tonnes of dry biomass or 700,000 tonnes of wet product is required to produce the steam and electricity annually. The municipality of Fort Frances sped up the necessary zoning changes to construct the building across from the local jail.

### **The Forestry Commission supports the development of Woodfuel**

In order to boost the supply of Woodfuel the Forestry Commission has developed a Woodfuel Strategy for England. The strategy was launched on the 28 March 2007 by the Biodiversity Minister Barry Gardiner. The aim is to bring an additional two million tonnes of wood

into the market, annually, by 2020.

### **Funding for Scottish Biomass Projects**

Further to a recent publication of the Biomass Action Plan, Deputy First Minister Nicol Stephen has announced the successful applicants to the Scottish Biomass Support Scheme. Out of more than 130 applications, 74 projects have been awarded funding from a total pot of £10.5M.

It is anticipated that the projects will result in carbon savings of 37,000 tonnes per annum and support up to 50 MW of green energy production. The Scottish Executive press release provides outline details of five of the successful projects.



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](mailto:info@bioenergy.org.nz). Back issues of this E-zine are on the website, [www.bioenergy.org.nz](http://www.bioenergy.org.nz)

## **EVENTS CALENDAR:**

### **15th European Biomass Conference & Exhibition, Berlin, 7-11 May**

Theme "Biomass for Energy, Industry and Climate Protection - From Research to Market Deployment."

Website [www.conference-biomass.com](http://www.conference-biomass.com)

### **23<sup>rd</sup> International Fuel Ethanol Workshop, St Louis, 26-29 June**

Website <https://www.fuelethanolworkshop.com>

### **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>

### **20th World Energy Congress, Rome, 11-15 November**

Theme "Energy Future in an Interdependent World"