



## FOCUS ON...

### *The Art and Science of Bioenergy Project Financing*

*"If we knew what it was we were doing, it would not be called research, would it?"*

Albert Einstein

*"A billion here, a billion there, pretty soon it adds up to real money."*

Former Senate Minority Leader  
Everett Dirksen (R-IL)

Financing bioenergy projects, which cost \$5 million to \$150 million (or more), is not for the fainthearted. Companies wanting to launch a biomass-to-energy conversion technology business have to prove to potential financiers that the technology is sound and profitable. This is especially true for bioethanol producers.

The idea of high risk project financing took hold some 50 years ago in the power generation industry. It has since become quite commonplace in industries such as bioenergy that generally do not have substantial balance sheets because it helps with high capital costs and project management. Today, the bioenergy business, and particularly the bioethanol industry, is using investment capital to compete and expand their role in an oil dominated market.

### **The "Big Three" Biomass Companies**

In October 1998, BC International (BCI), a relatively small technology company, dedicated a former molasses-to-ethanol plant in Jennings,

Louisiana, to produce ethanol from agricultural residues (see *Biofuels News* vol. 1, no. 4, p. 1). BCI successfully combined significant equity (some from its principals, some from private investors, some from DOE); good business sense; varied technological expertise; and entrepreneurial energy to launch this \$90 million project. It garnered the talents of The Industrial Company, a well-respected engineering firm, to guarantee its processes and equipment. With all this, BCI was able to obtain essential debt financing from Prudential Insurance to complete the renovation by the year 2000.

During 1999, Arkenol, a technology company based in Mission Viejo, California, plans to begin building a new biomass-to-ethanol plant near Sacramento. The plant, which will use rice straw as a feedstock, will be a stand-alone unit. Arkenol hired Bateman Engineering to be the engineering, procurement, and construction contractor and provide the guarantee for the process. DOE has signed a \$4 million dollar contract to fund the engineering, permitting, and various financing activities for the project. According to Michael Fatigati, project development director, an ethanol purchase contract with a

*continued on page 2*



*"Arkenol plans a \$100 million plant that will make 8 million gallons per year of ethanol and 40 million gallons per year of citric acid. The company plans to solve the problem of rice straw's high silica content by co-producing precipitated silica." Michael McCoy, "Biomass Ethanol Inches Forward," Chemical & Engineering News, December 7, 1998, pp. 29-32*

large regional refiner is close at hand, as are equity and debt financing from Enron Capital, and other funding from Prudential.

Masada Resource Group, based in Birmingham, Alabama, plans to develop a \$130 million waste disposal/recycling facility in Middletown, New York. On the front end, it will recycle plastics, glass, metal, and wastepaper. It will also use fermentation techniques to turn wastepaper and other cellulosic material into ethanol. The surrounding municipalities will pay Masada to accept its municipal solid waste, and will share in the profits from the ethanol sales. Stone & Webster Canada, Ltd. (Toronto) is guaranteeing the processes for this project, which is planned for startup by the year 2000.

### Financing—Making a Convincing Case

The technologies for converting biomass to ethanol have very high capital costs relative to revenue projections; therefore, they pose quite high financial risks. Their advocates need to not only defend the technological validity of a product or process, but—just as importantly—to present solid arguments for its financial soundness. Also, a lender looks for good business sense and experienced personnel. A bank will want to see operations and maintenance contracts and key staff resumes, and will need to be made aware of any operations or maintenance issues. It will also need to know that the engineering firm guaranteeing the processes is very reputable.

Before committing money to a project, a lender will have its own engineers assess the technology, and independently determine the viability of the target market. Some questions the lender will ask are: Who is supplying the feedstock...how much...for how long? Who is buying the product...how much...for how long? What are the unit operations? What is unique about this technology? Who guarantees that it will work? What kind of money will it return?

A company should complete four key steps before it can expect to obtain financial backing:

1. Enter into feedstock contracts. A company must look for opportunities to obtain feedstock at the lowest possible cost. This helps determine the plant site, which should be less than 100 miles (preferably less than 50 miles to minimize transportation costs) from the feedstock. Feedstock suppliers should be able to guarantee the supply of the feedstock for a specific length of time related to the financing term.


2. If possible, site the plant next to a biomass or coal power plant with an economical supply of process steam. This way, the ethanol plant can buy low-grade process steam and electricity from the power plant and avoid the capital costs for on-site steam and electricity generation.

3. Establish off-take contract guarantees with vendors interested in ethanol. The lender will need to know that the revenue from the product and coproducts will at least equal the amount of debt that is financed. Here too, the lender will favor a contract that is long-term

(related to the financing term) and available from a vendor with a proven track record. The contract will typically refer to a floor price with provision for escalation over time. Any alternative is not considered financeable.

4. Obtain a guarantee from the technology supplier or constructor

that the technology will produce ethanol in the quantities and quality necessary to meet the contract requirements. In order to reduce the total risk of a project, the lender will seek a “deep-pocket” for recourse should something go wrong with the technology. Efficacy insurance may be available, at a significant cost, to offset some of the risk to the lender’s money.

The process is complex, and a bioethanol project may take years from conception to completion. But these technologies are worth the effort. After all, the production and use of bioethanol can enhance this country’s economy, improve its environmental outlook, and strengthen its energy security. 

*“Some questions the lender will ask are: Who is supplying the feedstock...how much...for how long? Who is buying the product...how much...for how long? What are the unit operations? What is unique about this technology? Who guarantees that it will work? What kind of money will it return?”*

Michael Fatigati,  
project development director, Arkenol

*For more information contact an engineering and construction company, ethanol development and producing company, or venture capitalist.*





## IN THE SPOTLIGHT

### Diversity – Key to the RBEP’s Success

#### Regional Biomass Energy Program Manager

Michael Voorhies; phone, 202-586-1480;  
email: michael.voorhies@ee.doe.gov

The Regional Biomass Energy Program (RBEP) is a national effort administered by the Office of Fuels Development (OFD), and implemented through five regional programs. It strives to match local biomass resources to local energy needs. Program objectives are:

- Improve state and local government, and industry capabilities and effectiveness in bioenergy production and use.
- Support resource availability and planning efforts.
- Encourage economic development through bioenergy technology investment.
- Accelerate market acceptance of bioenergy technologies by reducing or eliminating market barriers and understanding economic and environmental costs and risks.

Each regional program works both independently and jointly to focus on goals that reflect the unique aspects of its geographic region. To help further this work, DOE’s Office of Transportation Technologies (OTT) is making available \$1 million in additional funding in 1999. The money is being allocated through a competitive process that involves the individual RBEPs submitting proposals to OFD. Several proposals have already been funded.



#### The Northeast Regional Biomass Program (NRBP)

is run by the Coalition of Northeastern Governors and the Council of Great Lakes Governors. Rick Handley, program manager for NRBP, said, “We are creating a network of technical experts to educate the regional biomass board

members so they can better understand current projects and industry developments, which can provide benefits to their state, region, and country.” NRBP proposed a \$50,000 project to promote public support for new biomass-to-ethanol plants in the Northeast. A qualified consultant will research and prepare a white paper on biomass-to-ethanol technology, its current and projected contribution to fuel supplies, the need for state-supported credit assurance, and the external economic and environmental benefits that would arise from such investments. This research could be applied to other geographic areas

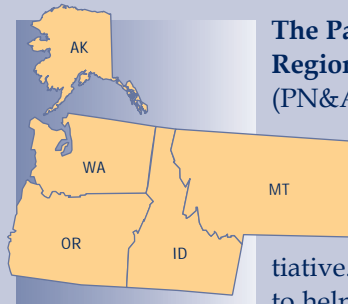
as well. For more information, contact Richard Handley, Northeast Regional Biomass program manager, at 202-624-8454; email: nrbp@ssso.org; or visit the website: www.nrbp.org.



#### The Southeast Regional Biomass Energy Program

is managed by Tennessee Valley Authority. It proposed a \$200,000, multi-year workshop program that will involve all five regions. Each state-level workshop will target energy, agricultural, environmental, and economic

development agencies and will involve community leaders, state legislative committee leaders, and the general public. The workshops will include presentations about biofuels used as octane enhancers or in blends, the economic and environmental benefits of biofuels, and available vehicles. Primers and other publications will also be distributed at the workshops. The goals are to educate state and local governments and other interested parties about the potential of biomass in their states. For more information, contact Phil Badger, Southeast Regional Biomass Energy Program manager, at 256-386-3086; email: pcbadger@tva.gov; or Warren Zurn, Southeast Regional Biomass Energy Program administrator, at 404-347-1047; email: warren.zurn@hq.doe.gov.



#### The Pacific Northwest and Alaska Regional Bioenergy Program (PN&ARBP)

will coordinate bio-diesel and ethanol projects with the DOE Clean Cities Program on the Green Fuels and Clean Parks Initiative. The goal of Clean Cities is to help the National Park Service

(NPS) adopt and use alternative fuel vehicles. The goal of the PN&ARBP is to increase the awareness and use of biofuels in the national park system. The program will work with the NPS to select four to eight national parks for funding transportation-related activities and demonstrations. A workshop will be conducted for NPS staff to identify and resolve transportation issues and to garner support from NPS managers who wish to participate in public outreach activities and demonstration projects. Also, a program to work with surrounding communities to increase the use of biofuels in transportation corridors leading to the national parks will also be available. Finally, the program will provide technical assistance, evaluate progress, and prepare and disseminate information to the public and to other national parks via print, television, and on-line media, as well as additional conferences and workshops. For more information,

continued on page 4



contact Jeff James, Pacific Northwest and Alaska Regional Bioenergy Program manager, at 206-553-2079; email: jeffrey.james@hq.doe.gov.



Other projects are under way in the other regions. **The Great Lakes Regional Biomass Energy Program (GLRBEP)**, for example, is focusing on using waste sugar (abundant in the beverage and confection industries) as an alternative to traditional feedstocks. It will examine the availability of the feedstock, the feasibility of blending it with corn, and its profitability for ethanol production. Other projects include research using ethanol production wastes as a surface de-icer and the use of E85 and E95 in light- and heavy-duty engines. For more information, contact Fred Kuzel, Great Lakes Regional Biomass Energy Program manager, at 312-407-0177; email: fkuzel@cglg.org or visit the Council of Great Lake Governor's website at www.cglg.org.



**The Western Regional Biomass Energy Program (WRBEP)** is managed cooperatively by the DOE Golden Field Office and the Nebraska Energy Office. This 13-state region has numerous projects under way that seek ways to use feedstocks such as forestry wastes, municipal solid wastes, soybeans and other oil-based feedstocks, and rice straw to produce biofuels. For more information, contact Dave Waltzman, Western Regional Biomass Energy Program manager, at 303-275-4821; email: dave\_waltzman@nrel.gov; or Jeff Graef, Western Regional Biomass Energy Program administrator, at 402-471-3218; email: jgraef@mail.state.ne.us; or visit the website at www.westbioenergy.org.



## DID YOU KNOW?

### Upcoming Conferences and Events

**21st Symposium on Biotechnology for Fuels and Chemicals**  
May 2-6, 1999, Fort Collins, CO  
Contact: Liz Willson, 303-275-4457  
www.nrel.gov/biotech\_symposium

**The National Marketplace for the Environment**  
May 3-5, 1999, Anaheim, CA  
Contact: Mark Merson, 800-334-3976

**President's Council on Sustainable Development**  
May 3-5, 1999, Detroit, MI  
Contact: Mark Merson, 800-334-3976

**Canada's Energy Efficiency Conference**  
May 18-20, 1999, Ottawa, Canada  
800-342-7146 (North America) or  
613-233-5773 (Ottawa area)  
www.ethanol.org

**Fifth National Clean Cities Conference**  
May 23-26, 1999, Louisville, KY  
Contact: Clean Cities Hotline 800-CCITIES  
www.cities.doe.gov

**15th Annual International Fuel Ethanol Workshop and Exposition**  
July 22-25, 1999, Cedar Rapids, IA  
Contact: Bryan & Bryan, 719-942-4353



DOE/GO-10099-698 For more information, contact the National Alternative Fuels Hotline at 800-423-1DOE.



Produced for the National Biofuels Program, Office of Fuels Development, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, D.C. 20585-1121.

NONPROFIT  
U.S. Postage  
PAID  
Permit No. 258  
Golden, Colorado



National Renewable Energy Laboratory  
National Alternative Fuels Hotline  
1617 Cole Blvd, MS: 1633  
Golden, CO 80401