U.S. House of Representatives Committee on Small Business,
Subcommittee on Rural and
Urban Entrepreneurship hearing

Second Generation Biofuels: The New Frontier for Small Businesses

Wednesday, June 11, 2008
Room 1539 of the Longworth House Office Building

Thank you Chairman Shuler.

Members of the Subcommittee, my name is Robert Wooley and I am Director of Process Engineering for Abengoa Bioenergy. I appreciate this opportunity to participate in today's hearing to discuss second-generation biofuels. After briefly introducing the company, I will focus my remarks on some of the challenges facing second generation or cellulosic ethanol.

First, I would like to say that Abengoa Bioenergy is committed to the renewable fuels industry. Our corporate leadership believes the existing energy model, based on fossil sources, is showing clear signs of exhaustion. Because of that belief, our company will have invested almost $500 million in research to advance cellulosic ethanol, and signed an agreement with the city of Phoenix to provide them with greenhouse gas free, solar power. Extending the 30% investment tax credit for solar, as the House has done, is very important to our parent company.

As I mentioned, my name is Robert Wooley. I have spent the last 12 years developing and engineering the cellulose to ethanol process as the Biofuels Technology manager at

the National Renewable Energy Laboratory, as the Biomass Technology Development leader at Cargill's NatureWorks and now at Abengoa Bioenergy.

I would like to provide subcommittee members with some background on Abengoa Bioenergy. We entered the US market when we purchased the High Plains Corporation in 2002. Abengoa produces starch-based ethanol in York, Nebraska – where our cellulosic ethanol pilot plant is located- Ravenna, Nebraska, Colwich, Kansas, Portales, New Mexico, and we are in the process of building two new plants, one in Illinois and a second one in Evansville, Indiana, in your District, Mr. Ellsworth,. In addition, we have four starch based ethanol plants in Europe, including a demonstration scale cellulosic plant that should be operational yet this year, and recently purchased an ethanol company in Brazil that produces ethanol from sugarcane.

We are designing a hybrid facility to be built in Hugoton, Kansas. This hybrid facility will produce 88 million gallons a year of starch based ethanol and 12 million gallons a year of cellulosic-based ethanol. The launching of the second generation cellulosic industry will only be possible through first generation (starch-based) cash flows, know how, and infrastructure.

Our pilot cellulosic plant in York, Nebraska is the proving grounds for the technology that we will be incorporating into the Hugoton plant. We have produced cellulosic ethanol at that facility. In fact, cellulosic ethanol can be produced today; however, the main concern is how much it costs to produce that gallon of cellulosic ethanol. We are working as quickly as we can to figure out how to produce and lower that cost of production.

Fuel production from biomass is currently offering considerable savings in greenhouse gas emissions from transportation energy use and has the potential for more. The current technology has a life cycle reduction of greenhouse gas as compared to fossil fuels such as gasoline of about 28%. Introducing biomass as the energy supply for converting corn

to ethanol increases the reduction to 52%. By using cellulose, rather than corn, as the raw material for ethanol the reduction in greenhouse gases can be as high as 90%.

Regarding the impact of biofuels on world food prices, the current starch ethanol has little impact and production from cellulosic materials will have no impact (if residues of current starch production are utilized) or little impact if dedicated energy crops are used. Many other factors, such as growing demand in developing countries, dietary changes, commodity funds, and energy prices have contributed most. . Energy prices have a much bigger impact, as much as 3 times more. Grain production in developing countries is considerably below that if the US and other leading countries. The potential productivity increases by improving agronomics practices in these countries could easily exceed the demands for food even while some less productive land is used for dedicated energy crops.

What are the barriers to lower the cost of production?

First, because of the rapid increase in the price of feedstocks, banks and Wall Street are concerned about the profitability of the industry. Financing for new starch- ethanol plants is difficult to obtain and almost impossible for new, unproven technology like cellulosic ethanol. For that reason, we worked with the Agriculture Committee to create a loan guarantee program at USDA that its Rural Development agency will operate. We are also working with DOE regarding their loan guarantee program created in the Energy bill but are afraid that they will not be available in time for use on this project.

To obtain a financing package, financial institutions will require the cellulosic industry to line up long-term contracts with feedstock suppliers. Feedstock collection, harvesting, storage and transportation will be significant challenges that the industry will need to addressed. We will need 700 to 1100 tonnes of biomass daily to operate just our cellulosic ethanol and steam facility and we will need 90,000 bushels a day to operate the starch facility. That is about 100 trucks delivering sorghum or corn stover, or wheat straw and another 100 trucks delivering corn or milo starch to our processing facility every day.

Storing the feedstock to maintain the quality of the feedstock will be important also. Significant resources need to be dedicated to this issue over the next year to make a system work.

To insure the stable supply of cellulosic feedstocks for fuel production, the development and deployment of energy crops, such as switch grass, miscanthus and others is a must. There are lands that are not necessarily suitable for prime commodity crops that could support the growth of these low impact feedstocks. These crops generally require less water and fertilizer and because they are perennial help further enhance the soil. These crops will further improve the greenhouse gas emission reductions, and stabilize the availability of feedstock to the processing plant. These crops are currently being developed. Producers need to be encouraged and supported to deploy these in large quantity.

Cellulosic biomass needs to be developed as a commodity market. Specifications, quality control and the assurance of a reliable supply needs to be developed to insure a prospective cellulosic ethanol producer that a long term supply of feedstock will be available to enable the investment to be paid off.

There are still areas of technology development that can help reduce the cost of converting cellulosic material to ethanol freeing up more of the cost of production to be available to the farmer to produce the feed material. These include the cost of enzymes for conversion of cellulose to sugar. Currently starch conversion to ethanol spends a few cents per gallon of ethanol produced on enzymes. Initially cellulosic processes will probably spend between 50 cents and 1 dollar per gallon. With further research this can be reduced to 10 cents per gallon (it will always be a few times greater than with starch conversion). In addition, cellulosic feedstocks contain glucose and non-glucose sugars. The fermenting organisms to make ethanol from these non-glucose sugars are in their infancy and need more development.

In conclusion, Abengoa is committed to the renewable fuels industry. Unfortunately, pressure from those who defend fossil energies can make us all have doubts. We will have to show that we are able to understand the advantages of renewable energy sources, confident in knowledge of renewable fuels and continue to devote significant financial resources to research.