

ENERGY AND BIOFUELS

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Until recently Indiana had little activity in renewable energy and biofuels. Up until 2006, Indiana only had one corn based ethanol plant, which produced about 100 million gallons/year. There was no investment in wind energy, and biogas also had minimal activity. Recently, all this has changed. It is expected that by 2009 Indiana will have about 13 ethanol plants with about 1 billion gallons of total capacity, and 7 biodiesel plants will have 135 million gallons of capacity. Wind energy installations have taken off, and there is now some biogas production from animal manure.

Corn Based Ethanol

The 2007 energy bill increases the renewable fuel standard (RFS) to 36 billion gallons by 2022. The standard is partitioned among corn ethanol (15 billion), biodiesel (1 billion), and advanced biofuels including cellulose based ethanol (20 billion). By the end of 2008, the national level of corn ethanol capacity will reach 13 billion gallons. Thus, there is little room for corn ethanol to grow to reach the 15 billion standard. In addition, infrastructure issues, high corn costs, concerns over green house gas reductions, and other impediments limit the potential for additional investment in corn ethanol. We do not expect to see much significant additional investment in corn ethanol in Indiana beyond the 13 plants already in operation or under construction.

Associated with the growth of corn based ethanol production in Indiana are far-reaching changes for transportation needs and infrastructure demands. The transportation system built to facilitate the large-scale export of grain from Indiana by unit trains and barge is quickly shifting to a system with a much greater reliance upon trucks for inbound shipments of corn and beans, as well as outbound movements of ethanol biofuels and DDGS. Vehicle Trip Miles to move corn, beans, ethanol, and DDGS in Indiana will climb from 35 to 52 million annual miles from 2006 to 2010, with most of this increased traffic focused in the counties with new ethanol plants. Geography favors Indiana as a source of ethanol for eastern US markets.

Cellulose Ethanol

As indicated above, the RFS calls for massive investments in cellulose based ethanol. Indiana is well positioned to produce ethanol from cellulosic materials including corn stover, high yielding grasses (switchgrass), and fast growing trees (poplar). Of these sources under current practices, by far the cheapest is corn stover. We estimate corn stover could be delivered for about \$40 per dry ton compared to about \$80 for switchgrass. So the state could foresee investments in cellulose ethanol production beginning in areas with high production levels of corn stover.

Biodiesel

Current national biodiesel capacity estimates from the National Biodiesel Board (NBB) indicate the industry can produce 864 million gallons of biodiesel, not far from the biodiesel RFS. In 2006, NBB estimated that the industry produced 250 million gallons. The disparity between production and capacity illustrates the current excess capacity in the industry due to poor economic conditions. In addition, the high cost of feedstocks, particularly soybean and other vegetable oils, is causing margins for the industry to be very low or negative. Projections for food use demand for vegetable oils over the next 3 to 5 years remain high, leading to projections for vegetable oil prices to remain very high. As a result, the margins for biodiesel are expected to be under severe pressure for the next several years, given current projections of prices for regular diesel.

Given this situation, growth in biodiesel production in the next 3 to 5 years is expected to be very slow, with only a few of the plants currently expected to be built coming to fruition. Once the 1 billion gallon RFS is met additional industry expansion is unlikely. The future of biodiesel will depend on the advancement of alternative feedstocks (such as yellow grease and inedible tallow) along with the potential to expand production of higher oil producing crops (such as canola or new varieties of higher oil yielding soybeans) to reduce the cost of feedstocks.

Wind Energy and Electricity Issues Important for Indiana Agriculture

Utility scale wind farms have recently become a significant source of stable income for farmers in northern Indiana counties, with Indiana's first wind farm currently under construction and expected to begin production in 2008. This 130 MW Benton County Wind Farm owned by the California based wind developer Orion Energy Group has signed long term power purchase agreements to sell all its output to two of Indiana's electric utilities, Duke Energy and Vectren. Other wind farms are being developed. The upsurge in the construction of wind farms nationwide and in Indiana is a reflection of efforts by electric utilities to have in place non-carbon emitting technologies to meet growing electric demand in the face of expected national legislation to regulate carbon emissions or to meet renewable energy standards. Although Indiana is not as generously endowed with wind energy as other states as the Plain States, it has the unique advantage of having adequate transmission capacity linking it to two of the nation's largest electricity markets (the Midwest ISO and the PJM ISO).

Another potential energy related revenue stream for farmers is the conversion of livestock waste into useful energy. Large, concentrated livestock operations, such as dairies and hog farms, already collect and process manure for odor control and other environmental concerns, but typically end up flaring the resulting biogas. However, at least three dairy farms in Jasper County are already using anaerobic digestion technology to capture the biogas and convert it into electricity for a combined total of approximately 1400 kW. In general these anaerobic digesters are not viable economically if selling electricity to the grid is the main outlet. Substantial investment and scale economies generally are required for such operations.

Prospects for the Near Future

In the energy and biofuels area, the prospects with greatest potential for Indiana are cellulose ethanol and wind energy. Indiana has or could have sufficient cellulose resources to produce 400 million gallons of ethanol from cellulose sources at current conversion yields and 600 million gallons with anticipated future yield increases. In other words, the ethanol industry could increase in size in Indiana by 60 percent through the use of cellulosic resources. If other raw materials such as municipal and industrial wastes were used, the increase could be even larger.

There are also prospects to increase the fraction of renewable electricity produced in Indiana using wind energy. Wind, like corn and cellulose ethanol, is not viable with market incentives alone. Either government subsidies or a renewable energy standard or some combination of the two are necessary to foster growth in the industry.

Policy Options and Programs to Foster Development of These Industries

For cellulosic ethanol, the policy options and programs that could be considered include the following:

- Cellulose plants require transportation of massive amounts of cellulosic material to a central plant. At current conversion rates, a 60 million gallon plant would require 1 million tons of cellulose per year, or 77,000 trucks per year or 210 trucks per plant per day. To enable this substantial increase in road loads, advance planning will be necessary to enable the plant supply of cellulosic materials.
- Growth of total ethanol consumption much beyond current levels will require investments in infrastructure. One investment that would facilitate expansion of the ethanol market in Indiana would be additional outlets for E85 fuel. The main paths of growth for ethanol consumption are changing the base blend from E10 to E15 or E20 or massive increases in E85. Changing the base blend level is a federal decision. Thus, the action that states can consider is incentives to expand the distribution system for E85. Some other states provide tax credits or other incentives to gasoline stations that add E85 capacity. This approach could be considered in Indiana.
- For both corn and cellulose ethanol, investments in ethanol transportation infrastructure could be considered. Investment in a unit train ethanol shipping terminals, similar to that in Manly, Iowa, might solidify the long term viability of the industry.

For renewable electricity generation, the most popular incentive is a renewable energy standard. Twenty five states now have renewable energy standards requiring a certain percentage of electricity to be produced from renewable sources. This incentive

guarantees a market to investors in renewable electricity production. Legislation was introduced in the Indiana legislature in the last two sessions, but it did not become law. Because the states in the Northeast have limited opportunities for renewable electricity generation, yet many have renewable energy standards, Indiana is well positioned to serve this market, and investors in renewable electricity production are likely to be able to sell the power they produce even if Indiana does not adopt a renewable energy standard.