

## WHERE WILL THE NEW ETHANOL PLANTS BE?

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The expansion of the corn ethanol production capacity is progressing at an increasingly rapid pace. The passage of the renewable fuels standard in last year's energy bill along with increased fuel prices and now President Bush's call in his state of the union speech for more research and focus on renewable fuels will only cause this feverish pace to continue for the next few years. So, where will the new ethanol plants be built? If we look to the media for our information one would conclude that they will be built everywhere. Reading through only one source, since January 1, 2006 there have been articles on 21 potential plants in 12 states. Within this same source, there were also 15 biodiesel plants in 9 states. This is a small percentage of what is really happening across the United States. Many of the announcements are in the traditional ethanol production areas of the cornbelt, however there are several announcements in the northeast, southeast, southwest and on the west coast.

Current ethanol production is located in the cornbelt for one fundamental reason, a large supply of inexpensive feedstock, corn. By August, 2006, it is anticipated that there will be nearly 3 billion gallons of ethanol produced in the states of Iowa, Minnesota, Illinois, Nebraska and South Dakota alone. But as we look beyond 2006, grain origination and price, ethanol price and many other factors will dictate where new ethanol capacity will be located.

Ignoring the hysteria and the "everybody wants one" mentality, what would the fundamentals of ethanol production tell us about where this capacity should be built? This paper will consider four key areas of ethanol production costs and revenues, corn availability and price, energy costs, ethanol prices and demand, distillers grains demand and other extraneous factors.

Corn, as a primary feedstock, is the single largest cost factor in producing ethanol today. Corn can account for up to 65% or more of the input costs for an ethanol plant. Today we ship large amounts of corn out of the cornbelt to foreign export and domestic livestock markets. Given a trendline crop this year, we will ship over 2 billion bushels of corn to feed livestock in states outside the cornbelt and another 2 billion bushels of corn to foreign markets while maintaining a carryout of over 2 billion bushels.

Corn yields have been increasing steadily over the last 30 years with the US trend line yield increasing about 1.8 bushels/year. However, in the late 1990s a change in the yield trend can be detected. An analysis of this change shows a much different trend line in some states over the last 15 years. Iowa for example has a 30 year trend line increasing at slightly over 2 bushels per year. However, the 15 year trendline for Iowa is increasing at over 3.5 bushels per year. Illinois, though not as dramatic shows a similar increasing trendline going from 1.8 to 2.8 bushels per year. With the exception of Nebraska, the 5 largest corn producing states, accounting for nearly 2/3 of US corn production, are all showing similar increases in the trendline yields. Given these factors, in general there should be adequate corn to support increased ethanol production.

Given adequate supplies, price is an important component of ethanol production. Cheap corn has been the driver behind ethanol production historically. Promotion of ethanol plants was initially done to help stabilize or raise the price of corn for the producer. The same reason for promoting plants was the same reason plants located where they did, cheap corn. Some of the cheapest corn in the US historically has been in South Dakota, Minnesota and North Dakota with Iowa and Wisconsin close behind. This factor plus the large supplies discussed earlier are continuing to push ethanol plant construction in these states as well as Nebraska.

This new production will have an impact on the price of corn in these states. Nebraska's corn price has averaged slightly below the US price. There is a close correlation between the amount of corn exported from Nebraska to western states and the Nebraska price differential to the US. Each change of 50 million bushels of Nebraska corn exports equals about \$0.015 change to the price differential to the US. Assuming nearly 1 billion gallons of additional ethanol capacity in Nebraska and perfect trend yields, the Nebraska corn price could go from slightly below the US price to \$0.045 to \$0.06 above the US price over the next ten years.

Similar correlations can be found for eastern corn movements and prices. Large amounts of new ethanol production in the eastern cornbelt could mean several years of \$0.04 to \$0.06 above trend price differentials to the US. Corn price relationships will not change going forward as prices in low production regions will simply reflect transportation costs from supplying markets.

Natural gas is the second largest cost factor for ethanol production in most plants today. Relatively "cheap" natural gas price has continued the ethanol plant construction in the cornbelt. Again states such as Minnesota and North Dakota have historically had cheaper natural gas prices. Other states such as Iowa and South Dakota while higher than the US average are still lower than many other states.

Over the last 9 months we have seen some of the highest natural gas prices ever. This has prompted many to look at alternative energy sources. Currently we have one coal fired plant in operation and 2 others under construction. Other alternative energy sources are being explored and tested such as burning corn syrup and manure. Reports indicate burning corn syrup has reduced energy costs by nearly half in one plant testing such a process. Livestock manure, long a concern for livestock producers, could greatly reduce or eliminate the energy costs for plants. If this is the case, along with other factors discussed later, the higher costs of corn in non-cornbelt areas could be mitigated enough to greatly improve the returns of a plant located in areas of the southwest near large livestock feeding areas.

Input costs will continue to encourage ethanol plant construction in traditional ethanol producing areas. New cheap energy sources in other areas of the country could mitigate higher feedstock costs and encourage construction of plants in these areas.

Ethanol price like any commodity has been driven by supply and demand. Demand for ethanol historically has been mandated through state initiatives or bans on MTBE as an oxygenate. Recently, price has been the demand driver for ethanol. As fuel prices soared after last years hurricanes, ethanol became price competitive as a gasoline extender. Typically, supply has caught up with new demand through legislation because there was a cap to the amount of ethanol needed to meet these mandates. Persistent high gasoline prices will encourage continued blending of lower cost ethanol and as such supply has further to go to meet this demand.

Historically, reported terminal prices by Hart's Renewable Fuel News have shown little difference in price between cornbelt locations and coastal markets. However, in recent months this has changed with

price differentials between coastal markets and cornbelt markets growing beyond transportation costs. At the end of 2005, ethanol in Upstate New York got as high as \$0.15/gallon above the reported Decatur, IL price. Larger differentials are seen in a west coast comparison with Los Angeles, CA terminal prices reported as high as \$0.50/gallon over Cedar Rapids, IA prices. This is a recent phenomenon, but if sustained could lead to greater interest in ethanol production in these coastal markets.

The other major output of an ethanol plant is distillers grains. Without a ready, local market (i.e., within 50 miles), distillers grains must be dried to increase shelf life and improve transportability. Major livestock markets are located in the cornbelt as well as beef and dairy operations in the southwest and California and hog operations in North Carolina. Locating near these large animal feeding units which can consume the large quantities of distillers grains wet can greatly reduce the production costs of an ethanol plant. Eliminating the drying costs can save \$0.04 to \$0.09 or more per gallon of ethanol produced depending on the cost of natural gas.

Combine this with alternative energy sources such as manure and the profitability of plants located outside the cornbelt could increase to a point of being competitive with cornbelt plants. One firm, Panda Energy, has announced intentions of building three 100 million gallon per year plants near large cattle feeding areas with the intent of burning manure and not drying distillers grains.

Finally there are other extraneous factors that can impact the construction of an ethanol plant. These include railroads, state and local governments, local communities, construction firms and banks or financiers. Railroads are striving to maintain and increase velocity on their lines. With this goal in mind, limitations may be placed on service and/or shipping directions in some locations. Railroads will play an important role in the future of ethanol distribution.

State and local governments are continually looking for ways to enhance the economy through development. Governmental entities can encourage or discourage plant development through taxes and incentives. Many states have developed incentive programs just to encourage ethanol development. Incentives will be continually compared to find the "best deal". Desire for economic development can be a major driver for ethanol plant construction.

Many rural communities will do everything in their power to promote and build an ethanol plant. However, other communities simply do not want an ethanol plant near them. The acceptance or rejection of a plant by citizens of a community will dictate plant locations across the country.

Construction firms have helped shape the growth of ethanol production in the past. They will continue to be one of the decision makers in the plant location process. As demand for new plants increases, additional builders will become involved and lessen the constraint on building capacity. However, this could also cause disruptions because of insufficient labor or materials.

Last, but not least are the financiers, either debt or equity partners. The final decision to build a plant falls with this group. All other factors which have been discussed are reviewed by this group and without capital a plant will not be built.

So, where will the new ethanol plants be? The cornbelt continues to be the primary location of new production capacity. This will come from both new plants and expansion of existing plants. Will the industry overbuild? Probably, but it will be localized and more intense in some areas. If all the plants proposed in central Nebraska get built, this area could become a corn deficit market, something hard to

imagine knowing that Nebraska typically will ship out 400 million bushels of corn annually. However, overall, the corn production capability appears adequate to meet the new demand from ethanol. The coastal markets as well as the southeast and southwest will most likely see some new plants built. The extent of the construction will depend on issues addressed previously, namely energy costs, ethanol prices and livestock feed markets.

The ethanol industry is one that will change significantly over the next few years. This could be enhanced by the economical production of cellulosic ethanol. The timing of these factors will dictate industry growth and change and will create many challenges and opportunities for both the ethanol and grain industry going forward.