An Economic Examination of Potential Ethanol Production in Texas (Abbreviated Version)[1]

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[1] This abbreviated version of the full report includes the Executive Summary and the Summary and Conclusions- Chapter 5 of the full report.

Executive Summary

The resurgence of interest in ethanol production has prompted various stakeholders in Texas to call for an unbiased analysis of the economic potential for ethanol production in Texas. There are a number of reasons for the increased interest in ethanol production, including:

- Depressed commodity prices for producers of potential feedstocks;
- Potential for increased gasoline prices due to international events and interest in renewable sources of energy;
- Finding that methyl tertiary butyl ether (MTBE), which is a competing oxygenate with ethanol, contaminates groundwater; and
- Local, State and Federal officials see ethanol production as a source of business activity and tax base.

Much of the research on ethanol production and economics, particularly from the early 1980's, are quite dated and not relevant to today's industry. Government regulations are stricter on clean air non-attainment cities leading to increased ethanol demand. Technological innovations in ethanol production have led to substantially lower production costs than 20 years ago.

Ethanol is an additive used primarily to produce cleaner burning fuels. The majority of ethanol is produced with a fermentation process using a high starch content feedstock such as corn or grain sorghum. Ethanol can also be produced through the chemical breakdown of biomass material such as grasses, hay, or even saw dust. However, these processes have not been developed to the point of commercial production. As a final consumer product, ethanol is used in the following forms:

- As an additive to gasoline – typically using 10% ethanol,
- As a component of reformulated gasoline both directly and/or in the form of ethyl tertiary butyl ether (ETBE),
- Blended with 15 percent (or sometimes more) gasoline known as E85, and
- In its pure form to be used in diesel engines specifically configured for that purpose.

The impact of a major business activity on the local, regional, and state economy can be significant. In fact, the primary interest in bringing ethanol production to Texas lies in the extended economic benefits to rural communities and regional economies. While the focus of stakeholders calling for this analysis is not the profit potential of ethanol equity investors, the profit potential is a primary focus of this study. The reason for this focus is that regardless of plant size, economic activity, or number of jobs created, the potential economic benefits will not be realized if the equity investor, seeing no profit potential, does not support development of the industry in Texas.

This project is designed to assess the feasibility of ethanol production in Texas. While not intended to determine the feasibility of an individual site or region of the state, the feasibility of constructing a plant in several regions of the State is assessed. An attempt is made to focus on both the positives and negatives for various regions of the state in terms of the economics of locating an ethanol plant in the area and on the feasibility of the plant. Obviously, there will be additional site specific factors not covered in this report that can enhance or reduce the economic viability and therefore, the success of a plant.

The following assumptions were adopted:

- Existing information from industry and other sources on ethanol production costs were used;
- Feedstock prices (corn and grain sorghum) reflect local Texas market conditions.
- A state incentive program of $0.20 per gallon for a maximum of $3 million. This is similar to legislation in other states and past proposals in Texas.

Risk is incorporated into the analysis through the use of stochastic simulation modeling techniques. This method of economic and financial analysis recognizes that prices are variable, both higher and lower. Corn, grain sorghum, natural gas, ethanol, and

DDGS prices are modeled with the variability seen historically. This is the preferred method of analysis compared to deterministic, static models because it not only provides an average financial outcome, but also, a range of possible risky outcomes. The results then incorporate the variability in prices as seen historically.

Construction costs for 20, 40, 60, and 80 million gallon per year plants (MMGY) are $30, $55, $78, and $100 million, respectively. Variable costs, not including feedstocks, range from $0.55 per gallon for the 20 MMGY plant to $0.44 per gallon for the 80 MMGY plant. There are economies of size in ethanol production, as highlighted by these production costs.

A plant feasibility analysis was conducted for the Panhandle, Central, and Southeast regions of the state, for each of the four plant sizes. In brief, the results for corn based plants indicate that net present values (NPV) range from -$11.9 to -$33.1 million. The probability of the NPV being greater than zero, meaning that the plant generates greater than an 8 percent return, is 10.6 percent for the 80 MMGY corn based Panhandle plant. The results are much more positive for grain sorghum fueled plants. An 80 MMGY Panhandle grain sorghum plant is estimated to have an $11 million average NPV and a 75 percent probability of a positive NPV.

While the results for some of the plant sizes and regions are not positive, sensitivity analyses indicate that only small changes in factors, such as ethanol or feedstock prices, are needed to generate positive results. An ethanol price increase of less than 2 cents per gallon would generate positive results for the 20 MMGY Panhandle grain sorghum plant. A $0.10 per gallon increase in ethanol price would generate positive results for the 20 MMGY panhandle corn based plant. Price changes (both

higher and lower) of this magnitude are well within the historical range of prices. In addition, proposed changes in federal energy policy, when enacted, could easily result in higher ethanol prices.

Economic impact analysis estimate an increase in annual sales tax revenue ranging from $353,000 for the 20 MMGY to $1.29 million for the 80 MMGY plant (pp. 102-103). The impact on economic output from the same size plant is estimated to be $232 million annually. Economic output increases can vary depending on the extent to which inputs to the ethanol plant are sourced within the state.

Summary and Conclusions[1]

The recent resurgence of interest in ethanol production has prompted various stakeholders in the State to call for an unbiased analysis of the potential in Texas. Unlike the experience with ethanol during the 1980s which found it to be a relatively expensive fuel alternative, there appears to be a number of plants operating in the U.S. that are significantly more cost effective. Two major changes have occurred that have aided ethanol production. First, EPA regulations on non-attainment cities have increased the demand for ethanol. And second, technological innovations in the production of ethanol have resulted in lower costs of production.

Many state governments, as well as, the Federal government have provided various financial incentives intended to assist in the development of production facilities leading to an increase in ethanol production.

Much like the push in the 1970s and 1980s to revitalize rural areas by attracting industry, locating an ethanol plant in a rural area is seen as a major boost to rural communities and their tax base.

The ethanol industry in the United States tends to be located in the Midwest. This is primarily due to the abundant supply of relatively low priced corn used as the primary feedstock. This means that to compete with plants located near cheap feedstocks, a plant located in another area will need to have some other advantage.

This project was designed to assess the feasibility of ethanol production and its economic impact in Texas. While not intended to determine the feasibility of a specific site, the feasibility of constructing a plant in several regions of the State was assessed.

[1] This Summary and Conclusion section is Chapter 5 from the full report. It has been appended to the Executive Summary in this abbreviated version of the report to aid the reader.

This study should not be viewed as a replacement for a specific feasibility study that would include site specific factors, situations, and relationships. An attempt was made to focus on both the positives and negatives for various regions of the state in terms of the economics of locating an ethanol plant in the area and on the economic feasibility of the plant.

The impact of any major business activity on the local, regional, and state economy can be significant. In fact, the primary interest in bringing ethanol production to Texas lies in the extended economic benefits to rural communities and regional economies. While the focus of stakeholders calling for this analysis is not the profit potential of ethanol equity investors, that potential is a primary focus of this study. The reason for this focus is that regardless of plant size, economic activity, or number of jobs affected, the potential economic benefits will not be realized if the equity investor, seeing no profit potential, does not support development of the industry in Texas.

One major contribution of this study is the use of risk analysis which has not been performed in any of the previous feasibility studies. Risk analysis incorporates variability in input (e.g., corn, grain sorghum, natural gas) and output (ethanol and DDGS) prices. Understanding this variability and incorporating it in the analysis is critical to understanding the feasibility of ethanol production in Texas.

The portrayal of financial results for an ethanol plant in a probabilistic framework gives decision makers much more information than singular estimates of annual outcomes. This report contains annual averages and probabilities of reaching a required return. A critical risk assessment of feasibility is more powerful than previous feasibility studies.

The projected financial feasibility results show little economic incentive to entice equity investment in Texas ethanol production using corn. The projected net present value (NPV) of any size plant is well below zero, and shows only slight probabilities of being positive under the best of conditions.

The financial projections for plants using grain sorghum show greater potential for generating interest in equity investment. The different sized grain sorghum plants in the Panhandle show a 50 to 75 percent probability of realizing a positive NPV. The two larger plants show a positive NPV on average. The Panhandle region appears to be the most likely area to attract grain sorghum based ethanol production.

The promising results for the grain sorghum plant in the Panhandle region should be viewed with caution. The analysis assumes the presence of a plant would not significantly change the local market price for grain sorghum. The assumption is reasonable, given the likelihood of a particular region increasing the acreage of grain sorghum to match the added demand. However, it is possible that a plant may have to pay higher prices for grain sorghum to encourage continuous supply. Higher grain sorghum prices would certainly dampen the financial outlook for the grain sorghum based ethanol plant. In the event that grain sorghum prices increase due to the presence of a grain sorghum ethanol facility, the financial projections for the grain sorghum plant would more closely match the corn plant projections.

The additional business activity associated with new and existing jobs and output can generate increased household income and consumer demand, boosting a local economy and the sales tax base. An increase of $24 and $79 million in household income could be expected from the construction phase of a 20 MMGY and 80 MMGY

plant, respectively. The operating phase of an ethanol facility could increase household income by $11 million annually for a 20 MMGY plant and as much as $41 million for an 80 MMGY plant. Expected sales tax revenue generated from a 20 MMGY plant would be approximately $700,000 during construction and roughly $350,000 annually during operation. An 80 MMGY plant could boost the sales tax revenue by as much as $2.4 million during construction and $1.3 million annually during operation.

The extended economic benefits from the business of an ethanol production facility can be significant. However, it is important to note these benefits assume continued profitable ethanol production. As a direct reflection of the risky financial outlook for the equity investor, the overall benefits to the local economy are also quite risky. The financial failure an ethanol plant would obviously preclude the realization of any benefits to the local economy.