Overview of Ethanol as a Motor Fuel

The use of ethanol-blended fuel is on the rise in the United States, and particularly in Michigan, where the annual use of such fuel has surpassed the 151 million gallon mark in 2003 alone. Ethanol-blended fuel is a mixture of conventional gasoline and ethanol. The result is a much cleaner-burning gasoline fuel that is just as efficient as standard gasoline fuels. In Michigan, the mix is typically set at 10 percent ethanol to 90 percent unleaded gasoline. This mixture is optimized for a combination of clean exhaust and efficiency, and will function properly in any non-diesel car, truck, or tractor, as well as in small engine vehicles such as motorcycles, snowmobiles, and gas lawnmowers. Michigan motorists used an average of 5 billion gallons of gasoline annually in the last few years.

SO, WHAT IS ETHANOL?

Ethanol is an alcohol fuel that is a clean-burning, high-octane motor fuel compared to regular unleaded gasoline. Alcohol fuels can be made from various starch sources. Ninety percent of the ethanol made in the United States is made from field corn. Yet, it can also be produced from other biomass starch feedstock found in Michigan including potatoes, sugar beets, molasses, corn stalks, switch grass, food processing wastes, and even wood chips from trees. More information on ethanol, corn-to-ethanol plants, and related national websites is available from the Corn Marketing Program Committee of Michigan website, *www.micorn.org* .

President Bush signed into law the 2005 Energy Policy Act on August 5, 2005, which includes a 7.5 billion gallon renewable fuels standard by 2012. This mandates the use of ethanol (and biodiesel) in the American fuel supply. Annual U.S. production of ethanol has surpassed the 4.5 billion gallon mark as of July 1, 2006.

E-85 ETHANOL AND FLEXIBLE FUEL VEHICLES

In addition to the 1:9 mixture of ethanol to gasoline, there is another mixture produced that is legally designated as an "alternative fuel" by the U.S. Department of Energy and U.S. Environmental Protection Agency, specifically for new flexible fuel vehicles (FFVs). This fuel mixture is called E-85 ethanol and consists of 85 percent ethanol to 15 percent gasoline. It should be noted that this fuel mixture will not burn well in conventional cars, trucks, and other vehicles.

New Public/Private Partnerships Formed

April 18, 2006 Press Announcement of 20 new E-85 Pumps in Michigan in 2006-07

Higher Standards meijer Lower Prices

FFVs, however, are specially designed to run well on this high-ratio mixture of ethanol to gas, E-85. Moreover, they are able to detect the specific ratio of ethanol to gasoline and adjust themselves accordingly to run as efficiently as possible. FFVs can also run on regular unleaded gasoline. A disadvantage with E-

85 fuel used in typical FFVs is usually a fuel economy mileage penalty of at least 10 percent due to the lower energy (BTU) content of E-85 compared to regular gasoline. FFV engineers are engaged in promising fuel economy research to overcome this penalty. The research is focused on optimizing engines to run on E-85 by engaging original equipment manufacturers to devote their products to use E-85 fuel.

Big Three automakers have manufactured nearly five million FFVs in the United States, yet most people don't know they're driving an FFV and simply fill them up with unleaded gasoline. It's estimated that nearly 225,000 FFVs were in use in Michigan in early 2006. For more information on E-85 stations and FFVs, see the National Ethanol Vehicle Coalition website, *www.e85fuel.com* .

Nearly all of Michigan's ethanol consumption (99 percent) is in E-10 blends (10 percent ethanol and 90 percent gasoline blend). There is limited use of E-85 alternative fuel infrastructure with only 16 stations having E-85 pumps in Michigan as of August 1, 2006 (see *www.e85fuel.com* for locations). More E-85 pumps at Michigan service stations are expected to be installed this fall and next year as a greater supply of Michigan-produced ethanol fuel becomes available and a variety of economic incentives become available for service stations to install E-85 and biodiesel pumps.

The State of Michigan fleet totals approximately 9,000 vehicles (cars and trucks), with 1,650 FFVs (E-85), 22 Compressed Natural Gas (CNG) vehicles, 10 electric/gasoline hybrids, and about 25 electric vehicles, as of the beginning of 2006. Also, some of the Michigan Department of Transportation vehicles use biodiesel fuel (B-20). The State Of Michigan has always complied with the U.S. Energy Policy Act of 1992 for alternative fuel vehicles.

THREE COMMERCIAL CORN-TO-ETHANOL PLANTS IN MICHIGAN

The first commercial ethanol plant in the state, Michigan Ethanol LLC in Caro, Michigan, started operations in November 2002 and continues to operate very well. This 40+ million-gallon-per-year facility has 30 percent stock ownership from Michigan corn growers; the rest is privately owned by Broin Companies of South Dakota and other investors from Michigan. The State of Michigan provided significant financial assistance and Renaissance Zone tax incentives to encourage the development of this first commercial corn-to-ethanol plant.

Michigan is proud of the fact that the Michigan Ethanol LLC plant has "state of the art" air pollution control equipment built in, which the Michigan Department of Environmental Quality (MDEQ) believes meets the new national air quality standards for ethanol plants. It is one of the best plants in the nation because it is using thermal oxidizers with its grain dryers and meets all of the MDEQ environmental permit requirements. All other corn-based ethanol plants in Michigan meet the same requirements.

The second commercial corn-to-ethanol plant opened in Albion, Michigan, in early August 2006 with more than 500 people in attendance, along with Governor Granholm and Congressman Joe Schwarz. The Anderson's Ethanol Inc. plant in Albion (in Calhoun

County) put in a $70 million investment to create 30 full-time jobs to produce ethanol fuel and a livestock feed co-product called Dried Distillers Grain Solubles or DDGS. Additional investment and jobs will also be created for a carbon dioxide processing plant at the site, as carbon dioxide is another associated by-product of these commercial ethanol plants. Carbon dioxide is often used for carbonation of soft drinks and beer beverages.

The third commercial corn-to-ethanol plant opened in Woodbury, Michigan, in mid-September 2006 with nearly 1,000 people in attendance, along with Governor Granholm and MDA Director Mitch Irwin. US Bioenergy Woodbury Inc. (in Barry County) invested over $56 million to create 335 full-time jobs and produce approximately 50 million gallons of ethanol annually along with DDGS co-product.

MDA knows of a building boom with two additional corn-to-ethanol plants under construction as of August 1, 2006 in Michigan, each having approximately 50 million gallons per year (MGY) production capacity. They completed feasibility studies and prepared sound business plans and have been designated as Agricultural Processing Renaissance Zones (APRZ) by the State Administrative Board that provided competitive tax incentives with recommendation from MDA and the Michigan Strategic Fund Board. They each have committed to meet MDEQ environmental permit requirements and to use primarily Michigan corn for the 18 million bushels of feedstock needed to produce 50+ million gallons of ethanol and co-products DDGS and CO_2 (carbon dioxide). These new ethanol plants are:

- Great Lakes Ethanol LLC in Riga, in Lenawee County, an initial $85-million investment to create 37 jobs that will build an $8.5 million CO_2 processing plant to create 25 more jobs; and
- Marysville Ethanol LLC in St. Clair County, a $95 million investment to create 35 full-time jobs once operational.

Additional interest for building more ethanol plants in Michigan and the nation is evident, with several recent public announcements. Both comprehensive feasibility studies and sound business plans should be developed for each of these new proposed commercial ethanol plants, including sound studies on where and how to procure adequate corn and other commodity feedstock. More information on ethanol, corn-to-ethanol plants, and related issues is available from the Corn Marketing Program Committee of Michigan website, *www.micorn.org*.

Each commercial 50 MGY ethanol production plant will employ approximately 400 construction workers and 30–40 operational employees. Once operational, they will have an annual economic impact of over $110 million on the local economy through the purchase of approximately 18 million bushels of corn, buying other supplies and products, and creating almost 750 indirect jobs in the Michigan economy. The new plants will likely raise area corn prices by 5–20 cents per bushel and help preserve Michigan farmland through a more profitable and viable agricultural economy.

Finally, the Nebraska Ethanol Board issued a valuable publication during the summer of 2006 in cooperation with the Clean Fuels Development Coalition and the U.S.

Department of Agriculture. *A Guide for Evaluating the Requirements of Ethanol Plants* is primarily focused on ethanol plant development but many of the site location requirements, permits, and business models discussed in the publication may be applicable to the development of biofuel projects here in Michigan. This publication is available in print by contacting *kylie.meyer@ethanol.ne.gov* or online at *www.ne-ethanol.org* .