

FAST FACTS *on* WISCONSIN'S ALTERNATIVE ENERGY ECONOMY



CORN-BASED ETHANOL IS TODAY'S FAST-GROWING TECHNOLOGY

- Wisconsin didn't have an ethanol plant six years ago; there are seven today.
- In the U.S. alone, motor fuel demand will rise by more than 40 percent from 2004 to 2030. In the past decade, gasoline and ethanol purchases rose by 20 billion gallons per year.
- Global biofuels use will climb steadily, about seven to nine percent more per year until 2030, according to The Kiplinger Agriculture Letter.
- Worldwide, acreage devoted to biofuel crops will more than double, maybe quadruple, over 25 years. Today, it's about one percent of arable land. By 2030, it will be 2.5-4 percent.
- In the United States, ethanol output will double by 2010. Biodiesel will triple in ten years.
- Ethanol delivers 35 percent more energy than is used to produce it, according to U.S. Department of Energy. Gasoline? Nineteen percent less.
- To meet the demand for ethanol, the U.S. must grow a lot more corn ... about 15 billion bushels per year. That's one-third more than the average for 2004-06. That will take about 90 million acres, or roughly what farmers planted in the 1930s and 1940s, before hybrids, fertilizers and pesticides began to dramatically improve yields.
- Production of corn-based ethanol is bringing new vibrancy to parts of Wisconsin. The technology to make these plants more efficient is working. For example, a

plant in Friesland, Wis., is producing 2.93 gallons per bushel versus the national average of 2.80 gallons per bushel. In less than five years of operations, a plant in Monroe, Wis., has returned \$368 for each \$100 invested; the Friesland plant has returned \$90 for each \$100 invested in just two years.)

- In Wisconsin, C5.6 Technologies is developing enzymes to make ethanol from soybeans and also increase efficiency in ethanol production from corn. A ten percent improvement = \$1 billion a year in savings.

THIS IS TREMENDOUS PROGRESS, BUT ...

- Converting the entire U.S. grain harvest to ethanol would supply only sixteen percent of America's motoring fuel needs, according to the Earth Policy Institute.
- Unlike gasoline, natural gas and oil, ethanol attracts water and other chemicals, so it can't be sent through long-established pipelines that move those fuels. That means ethanol has been forced into a marriage with the railroads. About 60 percent of this year's ethanol output will be shipped by rail.
- Questions remain about using marginal land for corn production, using land now held in conservation reserve, and the amount of water associated with ethanol production.
- As ethanol production technology improves, the demand for corn is likely to moderate as producers turn to other sources ...



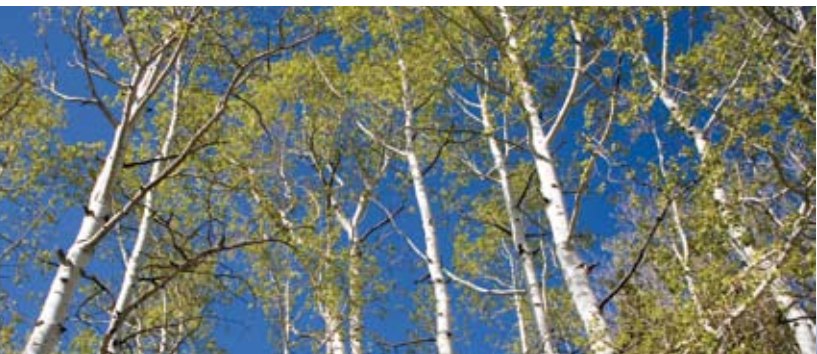


CELLULOSE WILL EMERGE AS THE PRIMARY ETHANOL FEEDSTOCK

- This includes prairie grasses, woody plants, wood waste and crop waste such as cornstalks and straw. About 1.4 billion tons of such biomass could be harvested each year at a fraction of the cost of producing corn and without the risk of squeezing food supplies.
- Wisconsin can be a leader in cellulosic ethanol because of its forest cover (16 million acres out of 34.7 million total), its existing paper and pulp industries, and its experience in managing this resource.
- By removing the excess cellulosic material in our forests and converting it to energy, we would actually improve the health of our forests. And have fewer fires.
- But cellulose is far from profitable yet. Capital investment is 3 times a corn ethanol plant; right now, enzymes are 10 times the cost of those used in corn ethanol process.
- The UW–Madison, the UW System and Michigan State University recently received a five-year, \$125-million grant to find new and better ways to produce cellulosic ethanol. This grant from the U.S. Department of Energy is one of only three in the United States.

NEW BIOMASS CROPS WILL BE CELLULOSE SOURCES, TOO

- Guayule, a drought-hardy crop used to make latex and rubber.
- Mesquite, a shrubby southwestern tree that covers 50 million acres in Texas alone.
- Pennycress, a pesky Midwestern weed with an oil content of up to 40 percent; it yields 1,500 pounds of oil per acre and can grow in winter.
- Poplar trees. Already a fast grower, scientists have now sequenced its genome.



SOLAR POWER HAS POTENTIAL, BUT ...

- Across the world, solar power represents just one-tenth of one percent of the energy supply, but technological improvements and growth could help bring down the cost of renewable power from solar panels.
- Passive solar and tech-based conservation is helping business reduce energy use and cut costs.



ON THE HORIZON: THE HYDROGEN ECONOMY

- Virent Energy Systems of Madison signed an agreement with Shell Hydrogen of Houston to produce a system capable of making hydrogen at the fueling station. It could result in on-site production of hydrogen at a fueling station in three to five years.
- Most hydrogen today is produced by fossil fuels, including natural gas and coal. A renewable source for hydrogen is being sought as a way to reduce emission of carbon dioxide, the leading greenhouse gas.
- Virent can create hydrogen and biofuels from glycerol and sugars found in cornstocks and other feedstocks.
- California is the most likely spot for the first hydrogen fueling station because of efforts to get a critical mass of hydrogen-powered cars.

From a June 2007 speech by Wisconsin Technology Council president Tom Still to an alternative fuels conference in Visalia, Calif.