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COLUMN FOR IMMEDIATE RELEASE May 4, 2006

Blowing Winds Soon to Provide Assist in Midwest Corn Production

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No, this is not some new type of genetically modified corn variety. This is a University of Minnesota West Central Research and Outreach Center pilot project in which wind energy, water, and air will be used to produce nitrogen fertilizer.

Strong winds can punish growing crops but with the emergence of locally owned wind farms, land owners are beginning to appreciate the financial opportunities presented by capturing the energy in the wind. Community based wind energy is a growing sector of the wind industry and agriculture producers and others in rural communities are able to benefit through land lease payments and by participating in the ownership of the wind farms. The Midwest has enormous potential for wind energy but only a small percentage of the potential is currently utilized.

Unfortunately, there are several bottlenecks for community based wind energy to reach its full potential. The ability to move the wind energy from the rural areas to the populated load centers requires transmission line capacity. Transmission capacity is extremely limited in the windiest portions of Minnesota; therefore wind farm development is also limited. Furthermore, if wind energy exceeds 20 % of a utility's energy portfolio, it can be difficult to manage due to the variability of wind. Contracts for sale of the wind energy can also be difficult for community based wind farms to obtain. Legislation passed in the 2005 Minnesota Legislative session for Community Based Energy Development (C-BED) has made this process more feasible and has resulted in power purchase contracts for locally owned wind farms. However, potential still outweighs actual wind energy development.

The solution to these issues with wind energy may rest in the nitrogen fertilizer that is applied to corn fields every growing season. A project to convert wind energy into hydrogen that can be used for anhydrous ammonia fertilizer is underway at the West Central Research and Outreach Center (WCROC). The project aims to provide a locally produced, renewable alternative that can meet part of $300 million of anhydrous ammonia currently derived from fossil fuels and used as nitrogen fertilizer in Minnesota agriculture. "We are pleased to lead the development of this globally unique pilot project

and believe that the technology developed will make a positive and substantial impact on the state's economy and environment, " Greg Cuomo, WCROC Department Head.

The University of Minnesota and the state's wind energy, hydrogen, and agriculture industries received a huge boost when the Minnesota Legislature and Governor, as part of the 2006 Bonding Bill, provided $2.5 million to construct this globally unique Wind-to-Hydrogen-to-Ammonia Pilot Project at the WCROC. Representative Torrey Westrom (R, Elbow Lake) and Senator Dallas Sams (D, Staples) were the chief authors of the initial legislation and bill was also co-authored by Representatives Al Juhnke (D, Willmar) and Aaron Peterson (D, Madison). The project will leverage previous resources provided by the University of Minnesota Initiative for Renewable Energy and the Environment and the Environment and Natural Resources Trust Fund.

The production of anhydrous ammonia is an ideal use for hydrogen in rural Minnesota," Cuomo said. "Anhydrous ammonia has many applications, but the most important use may be as nitrogen fertilizer. In addition, the infrastructure needed to store, move, and use renewable nitrogen fertilizer is already in place in almost every rural community in rural Minnesota."

The goal of the globally unique Wind-to-Hydrogen-to-Ammonia Pilot Project at the WCROC is to provide these benefits:

1) Provide substantial economic development opportunities for farmers and rural communities.
2) Limit dependence on natural gas and decrease resulting green house gas emissions.
3) Establish Minnesota as a world leader in renewable hydrogen production and wind energy.
4) Create a solid foundation from which to grow Minnesota manufacturing companies and attract complimentary hydrogen related industries.
5) Open a new market for an estimated 2 gigawatts of nameplate wind capacity within the state stimulating wind energy development in Minnesota.
6) Diminish the need for additional transmission capacity to accommodate wind energy.
7) Enable utility companies to manage the variable nature of wind energy and electrical demand.

A major dividend in developing this wind to hydrogen to anhydrous ammonia project is that Minnesota can be a national leader in hydrogen production. This may lead to the state advancing more rapidly into the hydrogen based transportation and fuel cell industries.

"Using Minnesota wind to make nitrogen fertilizer for farmers could transform agriculture, wind, and hydrogen economics overnight," says Rolf Nordstrom, director of the Great Plains Institute's Upper Midwest Hydrogen Initiative (UMHI). The fact that this could reduce input costs for farmers and boost wind development without the need for transmission lines or power purchase agreements while at the same time creating a hydrogen industry across the Midwest makes this approach a potential grand slam," said Nordstrom.

In the 1920's, world wide food demand required the development of synthetic nitrogen fertilizer. Companies and institutions were able to innovate to meet this world wide challenge. Now we are again faced with new challenges to our nation's agriculture industry, economy, energy system, and environment. The Wind-to-Ammonia pilot project could be major part of the solution and enable Minnesota to continue as a world leader in renewable energy.

The Wind-to-Hydrogen-to-Ammonia Pilot Project is part of the University of Minnesota Renewable Energy Research and Demonstration Center that is led by the University in partnership with stakeholders in rural west central Minnesota. The Center features community-scale renewable energy research and demonstration systems including a Hybrid Wind System and a Biomass Gasification System. Other systems under development include a Renewable Energy & Sustainable Building and an Anaerobic Digestion System.

The WCROC, part of the University's College of Food, Agriculture and Natural Resource Sciences, is an agriculture-based research station emphasizing interdisciplinary research designed to improve the lives of Minnesota citizens. For more information on its programs, see wcroc.cfans.umn.edu.

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