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ARROWHEAD-WESTON: RETURN OF THE DINOSAURS

By Michael Vickerman

Not since the late 1970's, when the utilities' infatuation with nuclear power was at its peak, has the Public Service Commission had to deal with a resource decision as momentous as the proposed Arrowhead-Weston transmission line. Physically, the project invites superlatives: the line, designed to operate at the maximum voltage allowable under state law (345,000 volts), would extend 250 miles along a 150-foot-wide corridor from the Weston Power Plant near Rothschild to the Arrowhead substation near Duluth, Minnesota. Whichever route is selected, the project would cut across numerous rivers and streams, wetlands and hiking trails, traversing thousands of parcels of privately and publicly owned land.

Yet, as significant as this project's footprint would be on the landscape, its impact on Wisconsin's resource mix would be even more profound. Currently, there is a shortage of generating capacity in eastern Wisconsin relative to demand. Utilities compensate for this shortfall by bringing in bulk power from the west and the south. Imports have increased significantly in recent years, and now account for 18% of the state's power consumption, or about 10 billion kilowatt-hours a year. That's very close to the output from Wisconsin's two nuclear power stations in a typical year. (Wisconsin Energy Statistics 1999, p. 53.)

According to the Draft Environmental Impact Statement (EIS) issued in May, Arrowhead-Weston would, in one fell swoop, add about 2,000 MW of import capacity to the state's transmission grid (page 61). To put that impact in perspective, Arrowhead-Weston could pull in more power from out of state than what could be generated by tripling the capacity of the Point Beach nuclear power plant. This is an unprecedented amount of new capacity that is riding on a single decision by the Public Service Commission.

What project applicants Wisconsin Public Service Corporation (WPS) and Minnesota Power Company (MP) have proposed is an all-transmission approach to strengthening the statewide grid. If approved, Arrowhead-Weston will be the largest and most expensive transmission project in state history. Even though technical hearings won't commence until January, it has already become the most controversial transmission project ever proposed. Mindful of the need to cover all of what the PSC deems to be the relevant issues in this case, Commission staff compiled an enormous amount of information, most of it relating to the physical impacts of the line itself, and stuffed it between the covers of a 500-page document.

For all of its volume, however, the draft EIS is curiously silent on several issues of concern to RENEW. One question not posed is: what would be the resource mix of the power that would flow over Arrowhead-Weston?

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Spare Lignite and Hydro Capacity

It is safe to assume that the extra transmission capacity will stimulate more bulk power shipments from low-cost Upper Midwest generators that have spare capacity. Heading that list are the lignite coal plants in North Dakota and Manitoba Hydro's generators in northern Manitoba, which were built specifically to serve, and profit from, markets outside their borders. North Dakota has three times the generating capacity required to serve its citizens, almost all of it fueled with North Dakota coal. About 40% of the power generated from hydropower installations in northern Manitoba flows south of the border, mostly to Minnesota. Incidentally, Minnesota Power has a contract with Manitoba Hydro to market the latter's hydropower in the Lower 48. Right now, all of Manitoba Hydro's U.S. exports flow west of the constrained interface that Arrowhead-Weston would bridge. With Arrowhead-Weston in place, virtually every eastern utility would have access to the power generated from the massively re-engineered water flows in northern Manitoba.

North Dakota lignite, a lower-grade form of coal, is cheap fuel, but that only partially explains why electricity exported from the Peace Garden State is so inexpensive. The Clean Air Act is responsible as well, in that it contains a loophole which exempts older coal plants from meeting the same environmental performance standards that all new fossil generating stations must meet. This exemption represents a huge subsidy to North Dakota generators, who take advantage of this unfair advantage by pricing their power to undercut competition from cleaner sources of electricity. Arrowhead-Weston would provide these generators with an enormous conduit through which their low-cost high-emission electricity can push locally available clean generation options out to the margins or off the map entirely.

If competing head-to-head with North Dakota lignite sounds unpromising, try underselling a Canadian provincial utility that charges its customers the lowest rates in North America while earning a handsome profit and

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plowing back nearly $100 million a year to the provincial treasury. That utility is Manitoba Hydro. Through a diversion scheme that reverses the flow of the Churchill River and redirects it into the Nelson River and its five generating stations, Manitoba Hydro produces the cheapest power on this continent, that is, if one factors out the environmental costs imposed on the northern Manitoba landscape and the social costs borne by the indigenous people there.

A Footprint the Size of Wisconsin

The environmental footprint of Manitoba Hydro's hydroelectric works spreads over 50,000 square miles, covering a Wisconsin-size swath of subarctic boreal forests, rivers and lakes southwest of Hudson Bay. Some of that land is now submerged; other areas have been essentially dewatered. Evidence of serious environmental damage abounds: shoreline erosion, lakeshores cluttered with dead timber, siltation in slackwater bodies, rising levels of methylmercury in the water and fish, and disturbances in native wildlife populations. In the center of this devastation dwell the Pimicikamak Cree. Once a self-sufficient people who needed no governmental assistance, the Pimicikamak Cree have become refugees in their own ancestral lands, an economically and culturally displaced community whose plight goes unacknowledged by the provincial government earning millions of dollars annually from hydropower sales.

The appropriation of all this land and water for power generation occurred without the Pimicikamak Cree's consent.

As far as provincial authorities are concerned, Manitoba Hydro is a veritable Aladdin's lamp of economic returns, yielding ever-increasing flows of cash with each rubbing. Manitoba Hydro's sales rose from 16 billion kWh in 1990 to 26 kWh in 1997, a jump of 60%. Exports to U.S. markets account for nearly all of the increase in sales. Having garnered a large power purchase commitment from Minneapolis-based Northern States Power last fall, Manitoba Hydro announced plans this summer to add another generator on the Nelson River.

It is difficult to find two more environmentally unsavory energy sources than the lignite of North Dakota and the tainted waters of northern Manitoba. It is also difficult to believe that Arrowhead-Weston won't have a stimulating effect on low-cost power production in Manitoba and North Dakota. If there is a real probability that this project will result in more air pollution and continued environmental injustice, then the environmental analysis should be broadened to include these specific impacts.

Projects in the Queue

Let's set aside the question of whether all this transfer capacity is needed by 2007 and look at alternative approaches to strengthening Wisconsin's grid. Approximately 2,600 MW of proposed new gas-fired generating plants are under agency review right now, much of it baseload capacity. Alliant Energy and Wisconsin Electric are looking to upgrade and expand their generating systems in such locations as Beloit, Oak Creek, and Port Washington, which could result in another 2,000 MW on-line by the end of the decade. During that same period we can expect to see significant growth in farm-based renewable energy systems like windpower and manure-to-methane projects, and contributions from new small hydro and landfill gas generation. Last, with the recent enactment of a statewide Public Benefits program, it is not unreasonable to expect energy efficiency and conservation measures to take a larger bite out of load growth than in years past.

Arrowhead-Weston is every bit the monument to excess, overkill and retrograde thinking that Koshkonong, Tyrone and Haven were some 25 years ago. It also represents the very antithesis of a sustainable energy future that RENEW promotes.

Only a short time ago the Commission's permitting pipeline was practically empty. Now it is teeming with new power generating proposals. Each project built in Wisconsin diminishes the amount of transfer capacity needed to meet local loads. So, too, do measures to lessen energy waste, which are often the least expensive ways to lighten the load. If these initiatives are already happening, doesn't it make sense to analyze how they can be integrated into a larger portfolio options that can deliver system reliability at a lower cost and with less environmental disruption than Arrowhead-Weston?

Here is what the draft EIS has to say on that matter.

"It is possible that alternative combinations of merchant power plant generation, assorted smaller transmission projects, real time pricing, and energy efficiency efforts could address many of the economic and reliability concerns that the proposed Arrowhead-Weston transmission project is intended to remedy. In the past Wisconsin has used a blend of generation, transmission, and energy efficiency programs to accommodate economic growth and electric system reliability needs. An appropriate combination for capacity needed for reliability reasons has not been analyzed." (page 79)

Well, you may ask, why not? The answer is on page 80.

"Due to recent changes in industry structure and laws governing regulatory oversight, there is no longer a mechanism that facilitates an integrated approach using generation, transmission, and energy-efficiency measures."

Isn't that convenient for Wisconsin Public Service and Minnesota Power. With the repeal of the Advance Plan two years ago, the PSC no longer has the in-house analytical capabilities for identifying and integrating lower-cost, lower-impact alternatives. All the agency can do, apparently, is to compare the projected cost of the applicants' all-transmission approach with four all-generation approaches: a 100% combustion turbine option, a 100% combined cycle option, a 100% whole tree biomass option and a 100% windpower option. Does this analysis have any bearing on the real world? Of course not! None of the alternatives can individually match the economies of scale of a high-capacity power line, and no one is suggesting otherwise. Nevertheless, PSC staff actually went through the exercise of computing the costs of displacing 1,470 MW of transfer capacity with 2,940 MW of wind generating capacity in Wisconsin (surprise, it's not cost-effective!). This is what happens when economics professors tell their students that "if you torture your models enough, they will confess to anything."

Wisconsin citizens deserve a more serious scrutiny of alternative approaches than what is provided in the draft EIS. In discussing merchant power plants, the draft EIS on page 53 states that "reliance on just one form of supply to meet growing demand creates its own risks." Couldn't the same be said of a 345 kV transmission line? Doesn't that argue for an analysis of real-world alternatives that captures both the level of generation construction activity already underway and recent policy commitments to energy efficiency and renewables? How could the Arrowhead-Weston hearing record be considered complete without such an examination?

Remember the Nukes

Twenty years ago, Wisconsin faced a historic choice: to build or not to build a second round of nuclear generating units. For

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environmental, economic and safety reasons, many Wisconsin citizens voiced their objections to additional investments in nuclear power and mobilized themselves to defeat these proposals. Their opposition prompted the Legislature to establish a process for reviewing large-scale capacity additions in an integrated fashion, enabling regulators to conduct a more qualitative and thorough assessment of the proposals, based on need and the availability of alternative approaches. It was this process, known as integrated resource planning, that prevented the construction of additional nuclear dinosaurs in Wisconsin.

We have come full circle since the mid-1970's. With the demise of integrated resource planning two years ago, the dinosaurs are coming back. Arrowhead-Weston is every bit the monument to excess, overkill and retrograde thinking that Koshkonong, Tyrone and Haven were some 25 years ago. It also represents the very antithesis of a sustainable energy future that RENEW promotes. For this reason, RENEW's Board of Directors felt compelled to adopt a resolution, communicating the organization's opposition to this particular project. The text of the resolution appears below.

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RENEW Wisconsin Resolution on Arrowhead-Weston

WHEREAS the proposed Arrowhead-Weston 345 kV transmission line would facilitate the importation of cheap, environmentally destructive power from the Upper Midwest and Manitoba into Wisconsin, potentially displacing local clean energy sources;

WHEREAS Arrowhead-Weston's proponents assume, without foundation, that load growth in Wisconsin will outstrip planned generation additions in the next five years; and

WHEREAS the Public Service Commission has not analyzed alternative reliability measures that integrate (1) Public Benefits-funded energy efficiency measures, (2) real-time pricing, (3) policy- and market-driven renewable power sources, (4) distributed generation sources, (5) planned additions to conventional generation capacity, and (6) upgrades to existing transmission facilities (which can be planned and executed with shorter lead times, less controversy, fewer ratepayer dollars and greater public support).

BE IT RESOLVED, THEREFORE, that RENEW Wisconsin opposes the construction of the Arrowhead-Weston transmission line proposed by Wisconsin Public Service Corp. and Minnesota Power. BE IT FURTHER RESOLVED that RENEW's position on Arrowhead-Weston will be communicated to its members and the general public through newsletter articles, web site postings, and statements and testimony presented before the Public Service Commission

Adopted by the Board of Directors of RENEW Wisconsin on August 15, 2000.

Public Hearings on Arrowhead-Weston Transmission Project

➢ **Rhinelander**	Nov. 28	9 AM and 7 PM	Holiday Inn	668 West Kemp
➢ **Tomahawk**	Nov. 29	9 AM and 7 PM	Tomahawk Elementary School Auditorium	1048 East Kings Road
➢ **Abbotsford**	Nov. 30	9:30 AM and 7 PM	Abbotsford Armory	1000 East Elm Street
➢ **Wausau**	Dec. 1	9 AM and 7 PM	Ramada Conference Center	201 North 17th Avenue
➢ **Superior**	Dec. 4	9 AM and 7 PM	The Billings Park Club	3093 North 18th
➢ **Superior**	Dec. 5	9 AM	The Billings Park Club	3093 North 18th
➢ **Hayward**	Dec. 6	9 AM and 7 PM	Lac Courte Oreilles Convention Center	13767 West County Road B
➢ **Ladysmith**	Dec. 7	9 AM and 7 PM	Veterans Memorial Association	608 Summit Avenue
➢ **Ladysmith**	Dec. 8	9 AM	Veterans Memorial Association	608 Summit Avenue
➢ **Madison**	Jan. 3, 2001	9 AM	Public Service Commission	610 North Whitney Way

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RENEW Wisconsin is a nonprofit organization advocating the adoption of clean energy strategies to power Wisconsin businesses and households in an environmentally responsible manner. Through a combination of public policy and private sector initiatives, RENEW aims to increase the use of clean, self-renewing energy resources to generate electricity or displace fossil-generated electricity. Creating a vigorous market for clean energy in Wisconsin will improve electric reliability, reduce pollution and redirect energy dollars into local economies.

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Greening Wisconsin's Farms With Biogas

By Katie Nekola

Earlier this summer, Microgy Cogeneration Systems and Wisconsin Electric Power Corporation (WEPCO) announced a first-of-its-kind contract. Under a long-term Power Purchase Agreement, WEPCO has signed on to buy all of the electricity produced by Microgy's cogeneration plant at Schmidt's Ponderosa Dairy in Bonduel, Wisconsin.

Up to 1,100 kWh of green power will be generated from biogas produced by up to 1,200 cows, using Microgy's advanced anaerobic digester.

Dan Eastman, former PSC Commissioner and Microgy's senior vice president for business development, is enthusiastic about the technology's ability to assume an increasingly large role in providing reliable energy for the state. The following interview with Mr. Eastman took place in Madison this July.

Q. A lot of people are getting interested in the idea of using biowaste to produce electricity. Can you tell me how it works?

A. Microgy uses state-of-the-art Danish technology, which has a proven track record. There are currently 15 systems operating successfully over an 11-year period. Denmark is incredibly environmentally responsible, and plans to derive 50% of its generation from renewables in 20 years. Essentially, the technology converts animal waste to methane biogas, which is used to run the cogeneration system. The electricity produced is then sold to the utility under the green power tariff.

Q. What are the advantages of this technology?

A. This integrated manure waste management system is efficient, reliable, and cost-effective. The closed system prevents outgassing into the air, so it eliminates the odor problem from swine and dairy operations. It also reduces pollution from agricultural runoff to a very significant degree so there's less nitrogen flowing into surface water. The DNR has been supportive. Every farmer in the state wants one; it takes care of so many of their waste disposal headaches and permitting problems.

Q. Are you able to offer this power at a price that's acceptable to the utilities?

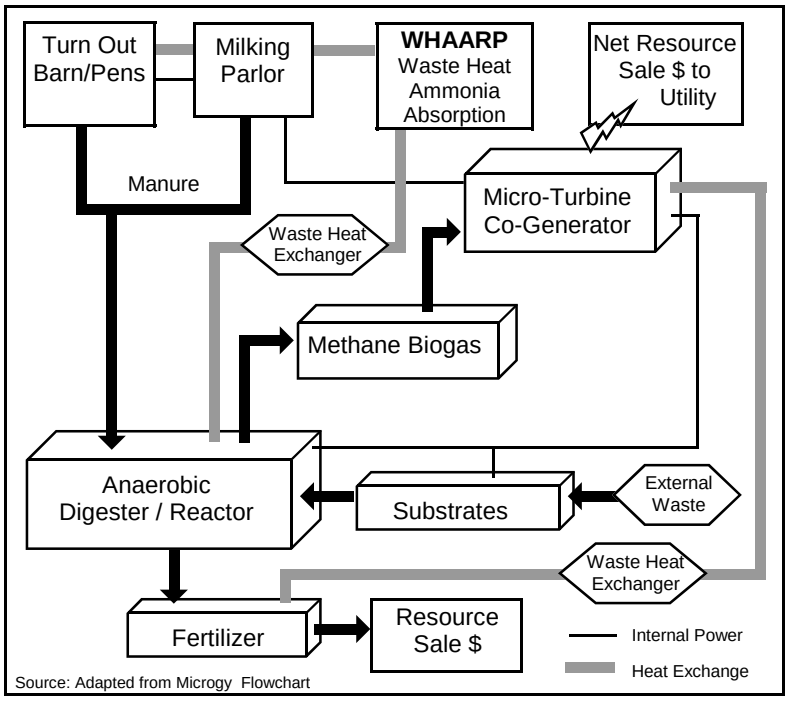
A. Under Wisconsin Electric's green power tariff, for example, the utility can charge up to 2 cents more per kWh for green power, which brings the price into the 5.5 to 6 cents range. Interestingly, the Danish government is willing to pay ten cents per kWh for renewables, and even California and Colorado pay 6.5 cents readily because power costs are higher in the West. Wisconsin could learn from these other states. We are competitive with other technologies in Wisconsin.

Dan Eastman

Q. What's the cost to the farmer to install this system?

A. That's the great thing. There is no capital cost to the farmers. Microgy rents the land from the farmer and bears the cost of installing the cogeneration system and other necessary structures. The farmer remains a customer of the coop, paying the green rate if available. In some cases, the rent paid to family farmers and the waste disposal solution could make a big difference in their ability to stay in business.

Integrated BioWaste Energy System



Source: Adapted from Microgy Flowchart

The sale of green energy pays for the entire system cost.

Q. What is the potential for obtaining significant amounts of energy from animal waste in this state?

A. If every farm in this state were equipped with the anaerobic digester system, we could see up to 550 megawatts produced, depending on certain variables.

Q. What variables?

A. For starters, the wholesale price of power, and of course the size of the herd, which determines how much waste can be generated. We are looking at fairly large dairy and swine operations. Also, when farmers use the system to dispose of other agricultural waste, such as whey, fats, and so forth, it dramatically increases the capacity for generation and makes the whole enterprise much more cost-effective.

Q. You said earlier that Microgy has a proven track record. Are these plants operational in other places?

A. The Laguna Irrigation District in California is negotiating to buy all of its power from surrounding farms which use this anaerobic digester cogeneration technology. Microgy's headquarters is in Colorado, where there is a lot of political support for the idea. They like the fact that the plants simultaneously produce electricity, hot water, and low temperature refrigeration, and they like the reliability of locally produced power.

Q. This is certainly dispersed generation.

A. That's the only thing that makes sense, especially in this economy. We need to get rid of the antiquated way we think about generation and transmission, which was tailored to an economy based on heavy industry. The kinds of power fluctuations you get with long transmission lines and depend-

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ence on a few large power plants don't make such a big difference to the kind of machinery used in heavy industry. But they make a critical difference in an economy which relies on highly sensitive computer technology.

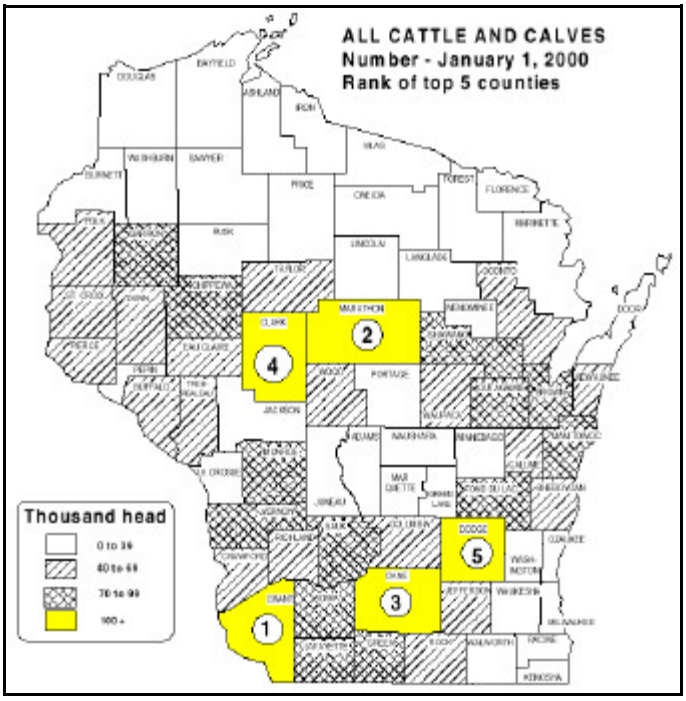
We should be the Silicon Valley of the Upper Midwest in terms of providing a localized, high-tech power grid for the new digitally-based economy.

Q. So you're not in favor of huge transmission lines?

A. It's old technology, vulnerable to all sorts of problems. We can address our reliability needs much better with renewable technologies and other distributed generation located close to the load. Once you build a biowaste generation system to the size of a farm operation, it's completely sustainable and completely reliable. Because it runs all the time, it's a constant source of electricity. Microgy has identified 56 farms in Wisconsin with the potential to use this technology. All we need is to get the utilities working with us.

Q. Any other prospects for contracts?

A. We are talking with Alliant Energy right now, and they're looking at a 20-year contract.



Source: U.S. Dept. of Agriculture, Counties No.1 - No.5 have 100,000+ cattle

Q. What are the obstacles to getting these up and running?

A. Primarily the price of power. We need to get the price down to compete with landfills, which of course also generate methane gas. But here we are in the Dairy State; we need to support ideas like this which empower farmers. It takes a shift in the traditional way of thinking about how electricity is produced and sold and who controls that. In essence, the farm is functioning as an independent power producer, selling generation to the utility. It takes a shift in the way we think about the whole system, too. When you consider the savings to the farmer in waste disposal problems, and the reduction in air and water pollution from large farm operations, factor in externalities, the cost is not too high.

Microgy's website is:
http://www. microgy.com

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State Solar Initiative Kicks Into Second Gear

Emphasizing innovative design and high visibility, the Energy Center of Wisconsin's WisconSUN™ initiative awarded $30,000 in co-funding to seven different solar energy projects. This cycle of awards was the second issued by WisconSUN (an acronym for Wisconsin Solar Use Network). Since its inception in 1998, the initiative has awarded $70,000 in co-funding to 11 solar projects in Wisconsin. A third grant cycle is scheduled for the spring of 2001.

This year's awards are divided between five photovoltaic (PV) systems that convert sunlight directly into electricity, and two active systems that trap solar energy for water and space heating. Of the five solar-electric installations receiving financial support from WisconSUN, two involve building-integrated applications. They are:

- The Oneida Nation's new community building, in Oneida. This 2 kW installation is the first in Wisconsin to feature on-site lamination of PV modules onto standing seam roofing; and
- A private home near Plymouth. PV panels will replace a portion of the roof and provide shade over windows. This 2.3 kW installation will assist the homeowner's advocacy work for a local nonprofit organization that promotes sustainable living.

The three other PV projects receiving funding are:

- Labor Temple Hall in Madison. An IBEW master electrician will install an 0.8 kW system on a double-axis tracking system in front of the building. Visible from a busy city thoroughfare, the system will be used primarily for training, with the goal of swelling the ranks of qualified installers in southeast Wisconsin;
- The Midwest Renewable Energy Association's headquarters in Custer. Over 2 kW of PV capacity will be mounted on a freestanding structure with single-axis tracking panels. This system will complement MREA' educational and training efforts; and
- Lake Michigan Wind and Sun in Sturgeon Bay. This project will compare the operating performance of amorphous, crystalline, and polycrystalline PV modules on two separate tracking systems, which will be metered individually. The energy from a passive double-axis tracking system will be compared with a motor-driven tracking system. About 2 kW of PV capacity is involved in this project.

Other recipients of co-funding include:

- Dane County, which is installing a solar water heating system at its new Heritage Center and Campgrounds at Lake Farm Park; and
- University of Wisconsin Arboretum in Madison. The award will support the refurbishing of the McKay Center's solar air heating system, which has lost 25% of its operating efficiency over the years. Such measures as new glazing and recaulking will enable the 22-year-old system to supply 44% of the building's heating requirements.

Solarwise for Schools

In other solar news, Wisconsin Public Service (WPS) recently added three more high schools--Denmark, Laona, and Oshkosh Lourdes--to its roster of SolarWise for

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Renewable Biofuels - Wisconsin's Untapped Resource

By Shelly Laffin

In 1908, Henry Ford designed his Model T to run on alcohol, proclaiming it the fuel of the future. That future has taken a long time to arrive. Ethanol—blended fuels currently represent more than 12% of the U.S. motor gasoline sales. The term "biofuel" applies to fuels derived from biomass such as forest residue, agricultural crops, and waste materials. Those fuels can be used to generate electricity or for transportation. Bioethanol and biodiesel are the most common transportation biofuels. Others are biomethanol and pyrolysis oils.

Industry Overview

Congress established federal support for ethanol in 1979. U.S. production has increased from a little over 10 million gallons in 1979 to a current annual capacity of 1.8 billion gallons. The U.S. ethanol industry is a growing sector of the agricultural economy, however, the industry capacity is also concentrated in the hands of a few large corporations. ADM alone controls approximately 40% of the market. Farmer-owned cooperatives are entering the ethanol market at a rapid pace. More than 20 farmer-owned cooperatives and firms have constructed ethanol plants in the past 10 years. Today about one-third of all U.S. ethanol production comes from farmer-owned facilities.

Reformulation Saga

Demand for ethanol is growing at a rate of approximately 12% a year. This growth is basically driven by the use of ethanol as an anti-knock additive and oxygen enhancer in gasoline.

The oil industry has repeatedly rejected the use of ethanol. After World War I, lead became the industry's preferred choice to raise octane and prevent knocking in engines. The health risks of lead exposure prompted the federal government to ban leaded gasoline in highway vehicles in the 1970's.

The oil industry's response was to increase the percentage of light aromatics in gasoline to as much as 40% by the late 1980's. The light aromatics included carcinogenic chemicals such as benzene, toluene, and xylene. With the Clean Air Act of 1990, the allowable proportion of aromatics in gasoline was reduced. Oil companies were also required to reduce carbon monoxide emissions by adding oxygen. Rather than utilizing ethanol as an oxygenate, the petroleum industry introduced MTBE, a fossil fuel-derived product.

MTBE has created a national water quality crisis, releasing a rich mix of carcinogenic chemicals which move rapidly through soil, contaminating groundwater. The American Chemical Society estimates that one-third of U.S. community water wells may be contaminated with MTBE. The cost to small communities may include drilling a pattern of test wells to track pollution plumes, continuous pumping near contamination sites, and replacement of community water wells. In Wisconsin, the village of Spring Green is a prime example of a small community dealing with the costs of MTBE contamination.

Photo – L & S Associates

Fermentation Tanks with Distillation Column in Right Foreground, Spring Green Ethanol

The EPA has directed a 5 year phase-out of MTBE. Since MTBE has had a virtual market monopoly in severely polluted areas, the course of federal requirements will have a profound effect on ethanol markets and the development of any future transportation fuels.

Ethanol producers would like to retain the oxygenate standard. The oil industry would prefer a performance standard, which would allow them to reformulate gasoline to meet the standard. Environmental interests do not agree on a single solution. The tendency has been for water interest groups to favor ethanol with an oxygenate standard, and air quality groups to favor a strict performance standard.

Renewable Fuel Standard

A third option is to get rid of the oxygenate standard and implement a renewable fuel standard. Senators Tom Daschle (D-SD) and Richard Lugar (R-IN) have introduced a bill (S. 2503) which would do just that. Under their plan, oil companies would be able to develop their own fuel formulations, as long as strict federal standards were met. They would also be required, on a national level, to derive a certain percentage of their fuel from renewable resources. One advantage of this approach is that the demand for ethanol and other biofuels will be dramatically increased. Another advantage is that a renewable fuel standard could be applied to other nonliquid transportation fuels, or energy forms, such as hydrogen and electricity. It would ensure that a percentage of the transportation use of those energy forms is obtained from renewable resources. The renewable fuel percentage has yet to be worked out. If the oil industry fights the measure, it may take a long time to work its way through Congress.

Initiatives and Policy Drivers

Federal initiatives and policy drivers encouraging biofuels include:

- environmental policy
  - phasing out MTBE,
- agricultural policy
  - proposed rule to use Commodity Credit Corp. funds
  - Section 769 of Ag, Rural Development and Related Agencies Act to use Conservation Reserve Lands
  - Agriculture Risk Reduction Act (Biomass Research & Development)
- Executive Order 13134 (1999) to triple the quantity of plant matter used for nonfood and nonfeed purposes
- joint government / industry Bioenergy Vision Statement sets goals out to year 2020
- incentives for biomass power plants, $0.017 per KWh (kilowatt-hour) federal tax credit
- fuel tax incentive of $0.53 per gallon continues until 2007
- general increases in biomass production to meet markets for biomass-derived products

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Wisconsin Policy Drivers

Wisconsin is one of the states participating in the U.S. Department of Energy's Regional Biomass Energy Program, as part of the Great Lakes Region. Wisconsin has been far less aggressive in supporting biomass initiatives than such neighboring states as Iowa and Minnesota. Wisconsin is only recently taking some tentative steps toward recognizing that biofuels and bioproducts will assume increasing importance in the state's economy. Based on a biomass feedstock assessment performed by Bryan & Bryan, Inc., Wisconsin has the potential to produce over 900 million gallons of ethanol annually. This is enough to fulfill about 40% of Wisconsin's transportation fuel needs.

On September 25, 2000 a Wisconsin Ethanol Workshop was held in Madison. The focus was on encouraging ethanol plants and market opportunities in Wisconsin. Hosts included the Wisconsin Dept. of Administration, Department of Agriculture, Trade and Consumer Protection, UW-Milwaukee Center for Alternative Fuels and U.S. Dept. of Energy – Office of Fuels Development's Great Lakes Regional Biomass Program.

Wisconsin Act 55 provides a $0.20 per gallon ethanol producers incentive; limitations include 15 million gallons annually, effective July 1, 2001 through June 30, 2006. Although primarily written for one company, subsequent rules and amendments to this act will probably allow it to benefit other producers. Primary drivers for ethanol in Wisconsin are MTBE phase-out and higher oil prices.

Ethanol in Wisconsin

Wisconsin currently has one operating ethanol plant (Plover), one in final production run "shake-down" tests (Spring Green), and two slated for construction (Monroe and La Crosse). Badger State Ethanol's plant in Monroe is expected to have a 4 million gallon annual production capacity and be up and running in 2002. Ethanol production plans in La Crosse, as an adjunct to brewing beer, are on hold until details of the ownership of the former Heileman Brewery are worked out.

The Spring Green Ethanol plant is unusual because of its small size (700,000 gallon per year capacity). Another unique aspect is its purposeful design synergies with its farm location and local feedstocks.

The Spring Green plant will produce ethanol from a whey waste stream currently being produced by local cheese plants. The valuable proteins and other saleable components have already been removed from the whey. If not used to produce ethanol, the whey waste would normally be spread on fields. The annual waste whey available will be approximately 300,000 gallons. Because of its low cost, around 6 cents per gallon delivered to the ethanol facility, the owner, Dan Fetherston, feels he can have at least a 30 cent advantage over facilities using corn alone as a feedstock. Corn and corn products will also be used at the Spring Green plant, primarily to assist the fermentation process.

Photo – L & S Associates

Distillation Column, Spring Green Ethanol

Environmental Benefits of Biofuels

- ethanol from biomass produces 96% less CO_2 than gasoline
- ethanol use results in an overall lower weighted risk factor for air toxics which are known or probable human carcinogens including benzene, formaldehyde, acetaldehyde, and 1.3-butadiene
- biodiesel in a 20% blend with petroleum reduces visible smoke and odor, particulate matter, CO, total hydrocarbons, and SO_2.
- high value co-products increase sustainability, add economic and environmental value, and displace oil-based products

Wisconsin Ethanol Feedstock Potential

Feedstock	Potential, mmgy (million gallons / yr)
Corn	300+
Corn Field Residue	80 – 250+
Wood Residue	15 – 20 +
Pulp/Paper Mill Wastes	30 – 45+
Municipal Solid Waste (paper waste)	60 – 100+
Recycled Papers	40 – 80+
Cheese Whey	50
Vegetable Processing Waste	20

Source: Angela Graf, Bryan & Bryan Inc.

Steps in Ethanol Production

- *All agricultural crops and residues contain 6-carbon sugars or compounds of these sugars.*
- *To produce ethanol from grain, starch in the grain is exposed, usually by grinding and mixing with water to form a mash. The starches in the grain will be broken down into simple sugars.*
- *The mash is heated and enzymes are added to separate the fermentable sugars.*
- *When using combinations of feedstocks, adjustments in enzymes and heating may be required.*
- *During fermentation, yeast is added to convert the sugars to ethanol and carbon dioxide. The resulting mixture, called "beer', is comprised of about 10% ethanol and 90% water.*
- *Boiling in a distillation column separates out most of the water.*
- *The ethanol requires an additional purifying and dehydrating procedure, using a molecular sieve, to create fuel-grade ethanol.*
- *Finally, gasoline is added in small quantities to the ethanol, in order to render it undrinkable.*

Sources: U.S. Dept. of Energy, Energy Information Administration, Institute for Local Self-Reliance, Spring Green Ethanol, Renewable Fuels Association, and Bryan & Bryan, Inc.

Sustainable Bioproduct Uses

Fuels:
- Ethanol
- Renewable Diesel
- Methanol
- Hydrogen

Electricity

Heat

Food and Feed

Chemicals:
- Plastics
- Solvents
- Pharmaceuticals
- Chemical Intermediates
- Phenolics
- Adhesives
- Furfural
- Fatty Acids
- Acetic Acid
- Carbon black
- Paints
- Dyes, Pigments, and ink
- Detergents

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(Continued from page 5)

Schools participants. Each of these schools is now equipped with a 2 kW PV system on its roof. Electricity from these newest systems will help the schools reduce their consumption of system power, about three-quarters of which is generated by burning coal.

Launched in 1996, SolarWise for Schools has installed PV arrays at the rate of three schools per year, resulting in a total of 60 kW of installed PV capacity on 12 high schools served by WPS.

"Our goal is to install solar-electric systems on all 63 high schools in WPS's service territory," said Chip Bircher, who manages the Solarwise for Schools program for WPS.

More a donation program than a standard utility green pricing offering, Solarwise for Schools has attracted about 4,000 self-selecting contributors, who pay a modest premium each month to support these installations. In addition to receiving these arrays, participating high schools receive a curriculum package that includes a three week course on renewable energy. By the end of the education module, students are expected to analyze and make sense of the performance data from these installations.

The selection of Oshkosh Lourdes marks the first private high school to receive an array through this program.

"We appreciate receiving the solar-electric system and curriculum through the SolarWise for Schools program," said Bill Behring, a Lourdes High School teacher. "It will add several unique facets to our science program."

For more information about the SolarWise program, contact Chip Bircher of Wisconsin Public Service Corp.

Phone: (920) 433-5518.
E-mail: cbirche@wpsr.com.

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