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State of Wisconsin
Jim Doyle, Governor

Department of Agriculture, Trade and Consumer Protection
Rod Nilsestuen, Secretary

Public Service Commission of Wisconsin
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To the Wisconsin Public Service Commission: Regarding Docket (5-EI-148) on Advanced Renewable Tariff (ARTs) Development:

I highly recommend Wisconsin consider expanding the use of advanced renewable tariffs (ARTs). This action can be the catalyst for increasing renewable energy generation (especially for our robust agriculture sector); creating greater varieties of new and existing small businesses; bolstering our paper and pulp sectors; and for broadening the homeowners participation in Wisconsin. Creating an advanced renewable tariff at a rate that covers the cost of renewable energy generation at the farm and residential level will result, long-term, in hundreds of on-farm methane digesters, more large and small wind turbines, more solar panels on the sides of scores of barns and homes, and greater use of homegrown biomass for heat and energy in our state. A statewide advanced renewable tariff will also create a faster track for cellulosic ethanol development in Wisconsin.

Advanced renewable tariffs (ARTs) as policy tool provide multiple societal benefits to Wisconsin ratepayers:

- **Investment Dollars Locally:** Homegrown energy puts dollars into Wisconsin residents' pockets by providing them directly with the cash flow to obtain financing of renewable energy generation. We do not need to rely solely on out-of-state investors for renewable energy growth. Projects will be financed in Wisconsin.

- **Magnets for Capital:** Considering the large investments needed to establish a robust renewable energy system in Wisconsin, there will be a significant need to raise capital, which will be even harder during the current economic downturn in 2009. ARTs assure investors that a steady income stream will exist for renewable energy projects through a longer term tariff.

- **New Wisconsin Jobs and Economic Growth**: Much-needed new businesses and new jobs will be created in Wisconsin, especially during early stage development of biomass aggregation for heat or combined heating and power projects, as well as for expanded development of wind, solar and methane digesters. More funded projects will lead to new businesses and new jobs created in the business supply equipment and other parts of renewable energy infrastructure right here in Wisconsin.

- **Addressing climate change in Wisconsin:** Methane digesters have two positive climate effects. First, they generate renewable electricity from a waste stream and thereby reduce the need for existing coal generated electricity. Second, they capture and burn methane that would otherwise have been emitted to the atmosphere. Biomass to energy projects using a feedstock like switchgrass will increase carbon sinks for carbon sequestration.

- **Community-based Solutions & Local Ownership:** ARTs can enable greater cooperative ownership models or community ownership models for Wisconsin which can reduce the not in my backyard debates (aka: NIMBYism), diffuse market control by a handful of players, and create a more distributed, locally owned, and democratic energy system.

Not a New Policy Tool:

- **Global Success**: This policy option has transformed Germany, Denmark and other European countries into renewable energy powerhouses. Germany is now a world leader in renewables with 20,000 MW of wind and 55% of the world's solar energy production. As of 2007, feed-in tariffs had been adopted in 18 European Union countries, Brazil, Indonesia, Israel, Korea, Nicaragua, Norway, Sri Lanka, Switzerland and Turkey. Most of the laws in those countries require utilities to interconnect all eligible renewable generation, thereby guaranteeing that renewable electricity can "feed in" to the electric grid. Forty-five percent of Germany's wind turbines are locally owned thanks to buybacks, so we have plenty of global policy precedents to model policy for Wisconsin.

- In Germany, regional transmission authorities evenly distribute feed-in costs among national rate payers. Wisconsin should likewise distribute costs among all state rate payers.

- **Renewable Energy Jobs**: German investments in solar electric systems now total U.S./$5 billion, and nearly 35,000 are employed in its rapidly growing solar industry. German heavy industry has 70,000 jobs in the wind energy sector. In 2007, investments in new wind turbines totaled more than US$4.5 billion. Across all renewable energy technology sectors, direct and indirect employment in the German renewable energy industry reached 214,000 in 2006, according to a recent study by Germany's Ministry for the Environment (BMU). The study also found that the industry's total turnover neared €22 billion. These jobs increased 40% between 2004 and 2006 alone. Most of these new jobs are in the former East Germany, an area being significantly revitalized by their renewable energy economy. All levels of jobs are created including high-skilled positions in engineering, manufacturing, agriculture, and electronics.

- **Cow Power for Wisconsin**: - Germany has 8,000 jobs in the on-farm biogas industry. Manure-fired power plants generate nearly five billion kilowatt-hours per year of electricity, or about one percent of consumption, says the German Renewable Energy Association). Biogas is mostly methane, a powerful greenhouse gas that would otherwise be emitted to the atmosphere from dairies and swine farms.

- **Midwest Model**: Legislation for advanced renewable tariffs was introduced in Midwestern states of Minnesota, Michigan and Illinois and will likely be drafted again in 2009.

- **Difference with Renewable Portfolio Standard**: Advance renewable tariffs are often contrasted with the policy options called renewable portfolio standards (RPS). Wisconsin has a renewable portfolio standard that requires utilities to provide 10 percent of their energy from renewable sources by 2010. The RPS does not specify that 10 percent of renewable energy be from a homegrown renewable energy source. Some utilities in Wisconsin already offer buy-back programs, but these programs are not uniform across the state. The buy-back terms are often linked to voluntary green pricing programs of individual utilities instead of the entire rate base. These programs sometimes offer inadequate rates and have limits on the type and eligible size of the generator and the total capacity of the program. The benefits typically go to the larger scale projects and often to out-of-state projects and investors.

There is a growing body of research on Advanced Renewable Tariffs that study the German tariff system compared to Renewable Portfolio Standards and other policy tools. The key to success is a higher per unit payment combined with these tariff's longer term guaranteed rate of a minimum of 10-years and, even better at 15-years or ideally 20-years. These ARTs features provide greater investment security. As one studied notes: "The European Commission (2005) determined that feed-in tariffs were both more effective and efficient than tradable renewable energy credit systems, largely because feed-in tariffs provide greater investment security." (see Rickerson p.3)

Another important design element of ARTs is that the program should be statewide versus one single utility market rate case. Spreading the potential costs allows for less of an overall impact on the single individual ratepayer. Research findings show that this linkage with investor security and larger market spread can save ratepayers money, according to research: “Feed in tariffs marginally increase the cost of electricity to consumers as renewable electricity capacity expands. In most cases, the costs are shared by all ratepayers as a per kWh surcharge. In Germany, the massive expansion of renewable capacity has cost average ratepayers less than $2.00 per month.” (see Farrell p.4)

Other research has compared and contrasted models similar to the Wisconsin Renewable Portfolio Standard. The British system of trading credits and the Germany system of a feed-in tariff has been studied and this research gives favorable reviews to the tariff system noting: “Based on the initial experience with the ROC (Renewable Obligation Certificates) scheme, and making rather conservation assumptions about future trends, we suggest that the resource-adjusted cost to society of the feed in tariff is currently lower than the cost of the ROC, when averaged over the lifetime of the project,” (see Butler & Neuhoff p. 31). This same study also found that the German tariff system had a more positive impact on the development of related renewable energy business versus the British systems, stating: “…Our analysis revealed stronger competition among turbine producers and constructor under the feed in tariff than under either of the UK schemes.” (see Butler & Neuhoff p.31)

Variations of these ARTs have been proposed in other Midwest United States. During the last legislative session, bills were introduced in Minnesota, Illinois, and Michigan. There is an expectation that other nearby states will consider these tariffs as well. Analysis done by Paul Gipe, a leading U.S. expert in renewable wind and tariff methodology, for State of Michigan officials estimated that a comprehensive feed-in tariff program could result in 30,000 jobs. (see Gipe presentation at MAEN conference). As Wisconsin and the rest of the Midwest looks for ways to stimulate an economic recovery during the current recession, these tariffs will stimulate investment, new construction and likely new business that would build the renewable energy hardware, components and repair parts. Wisconsin’s metal fabrication sector is a strong and nimble industry that could quickly adapt to building these renewable energy equipment and components.

Biogas – the Wisconsin Opportunity Fuel

Wisconsin’s rural communities, and particularly agriculture, are well positioned to use these tariffs for a variety of renewable energy opportunities including methane digesters, biomass for heat and heat and power; solar panels on the sides of barns and homes and wind turbines.

As of February 2008, Wisconsin had 18 operating methane digesters and 10 more in progress. According to Focus on Energy, those current operations alone provide the equivalent energy to power 5,543 homes and displace 27,606 tons of coal. The Chicago Climate Exchange also recognizes methane digesters as an opportunity to reduce harmful greenhouse gases and does provide credits for participants.

The PSC is probably aware of the study done by Alliant Energy, “Anaerobic Digesters and Methane Production,” from January 2005. The study using data available at the time found Wisconsin had 187 herds in the 500 to 999 cow range (and associated megawatts) and 55 herds with greater than 1,000 cows (and associated megawatts). Separate analysis by Focus on Energy looked at a broader range of agriculture operations in the dairy sector including operations with 200 to 500 head estimating that dairy operations could potentially generate 138 (MWh/year). As technology improves, some believe even mid-size to small-size dairy operations could utilize methane digesters if the investment was made more affordable. Certainly, the larger operations could be a first target for methane digesters in Wisconsin and would benefit from the financial stability of a more attractive tariff and long-term rate under the ARTs. The Alliant study also notes the additional community benefits to agriculture land owner and society of having methane digesters including:

odor control, reducing water quality problems and managing nutrients, energy utilization (which includes selling gas for electricity and heat utilization on the farm operation), and the availability of co-products such as bedding and compost, reduced pathogen load, fly control, and reduction of weed seeds, thereby reducing herbicide applications. (see p.4 Alliant study).

Regional Methane Digester Opportunities in Wisconsin:

This Alliant Energy study also points out barriers including low buyback rates, large capital outlays and insufficient financial incentives and length of contracts. One interesting suggestion in the study is the concept of regional digesters to take advantage of economies of scale. Currently, Dane County and Brown County are investing some research dollars and resources on the concept of regional methane digesters. By advancing ARTs, the PSC would be providing additional state public policy benefits through increasing investments in methane digesters. More local governments, communities, and individual farmers would likely have the confidence to invest in the technology and provide the added societal benefits previously discussed.

Agriculture and Food Processing are a $51 billion economic sector in the state of Wisconsin, providing 12% of our jobs. Dairy and food processing constitute 2 of Wisconsin's top 5 manufacturing sectors. Wisconsin's food industry and many related businesses could eventually benefit from methane digester technology development. Food processing wastes are another energy source for methane digesters and these substrates are available in large quantities, according to Focus on Energy research.

Wisconsin Biomass Opportunity:

Wisconsin has a tremendous opportunity for renewable energy production from biomass. We have a strong legacy of business innovation in forestry and agriculture and an existing infrastructure for using biomass, both as commodities and as co-products. One key step to success is building up a market to grow, harvest, aggregate, and deliver biomass to the end user. State government can be a leader by using biomass as a substitute for coal at its energy generation facilities. A strategic approach might be to foster smaller scale biomass-to-energy projects as a method to create a biomass growing and processing business chain. Today, there may not be adequate private market signals to land owners for growing an energy crop or gathering forest waste, slash and converting energy generation burners for biomass. Encouraging projects such as the pelletization of biomass for heat or combined heat and power could be a starting point in many regions of Wisconsin.

Another important starting point is wood and agriculture waste to energy projects. Removing corn stover from existing production sites or the wood residue and slash from harvesting forests would require less capital investments from current land owners and may provide impetus for growing energy crops.

Biomass

Biomass is any organic material made from plants or animals. Biomass resources from agriculture are currently used for food and fiber and solid wood from forestry, and now more commonly biomass is converted to energy. Biomass feedstocks include agriculture residues, straw, corn stover and cobs; forest harvest residues such as bole wood, tops, branches, cull logs, dead trees, and underbrush including invasive species as well as sawdust and mill scraps; food processing residues, bagasse, stillage; fiber processing residues, black liquor; animal waste, manure; urban wood waste and landfill waste methane gas; and dedicated growing of energy crops such as switchgrass, miscanthus or hybrid poplar trees.

Biomass can generate income for Wisconsin farm and forest land owners and enter the marketplace as an energy feedstock through the following examples: conversion to liquid fuels as cellulosic biofuel; combustion to generate heat, steam, or electricity; and gasification to synthetic gases to produce diesel fuel, methane gas, and methanol.

For Wisconsin, the Oak Ridge National Laboratory (ORNL) estimates that at $50 per ton, we could have 6.1 million switchgrass tons, another 5.1 million tons of agriculture residue, another 1.8 tons mill wastes, another 1.1 million tons of forest residues and urban waste at more than 639,000 tons. While more detailed work needs to be done for Wisconsin to ground truth these estimates, the projections show enough potential biomass to achieve the state goal of 25 X 25 for energy.

Unlike solar and wind energy, which have well-developed supply chains, biomass energy will require the development of a new supply chain. It will be necessary to link biomass growers, transporters, and processors. This will require several groups to make potentially large investments in productive assets including refineries, harvesting equipment, etc. Investors will hesitate until they are confident their investments will yield adequate returns.

Because of the assurances needed by biomass suppliers, aggregators and end users, they will need to establish detailed agreements in advance. They cannot trade at arms length in spot markets. Detailed agreements means transaction costs: lawyers, supply contracts, insurance, detailed understanding of partners' businesses, etc. Transaction costs like these are not trivial and can make or break an industry. This is why it is critical for Wisconsin to have Advance Renewable Tariffs to build our infrastructure for biomass to energy development. The tariff will provide investment security, increase supplier and user confidence, and promote broadly based ownerships models in this renewable energy pathway.

Create the Building Blocks For a New Economy in Wisconsin:

We can start to build the growing, harvesting, collecting, storage and delivery infrastructure that will be needed for switchgrass or woody biomass. Smaller scale biomass to energy projects are a key starting point for Wisconsin. Therefore, we should look to enhance the Fuel for Schools program, convert more state burners to biomass burners, encourage ethanol plants to shift to biomass for power, and enhance the use of Combined Heat and Power. That can encourage the small wood lot owners to develop something like biomass supply cooperatives or for farmers to grow switchgrass and work with our strong existing network of farm supply cooperatives to aggregate and deliver switchgrass for energy.

This infrastructure is critical if Wisconsin is to make the next step to cellulosic ethanol. Once we build that infrastructure, the big step to an integrated cellulosic biorefinery that makes biofuels and, likely additional bioproducts or co-products, and is also heated or maybe fully run on biopower, will be much more achievable. That integrated cellulosic biorefinery is when Wisconsin will have a robust carbon reducing and truly an energy independent bioeconomy. We can start to build that system today with the utilization of Advanced Renewable Tariffs (ARTs).

Respectfully Submitted:

Secretary Rod Nilsestuen, Wisconsin Department of Agriculture, Trade and Consumer Protection

Additional Background: Methane Digester Biogas Opportunity for Wisconsin:

Wisconsin has roughly 3.4 million cows (dairy, beef). A single cow can generate up to 109 cubic feet of biogas per day. [1] Biogas contains up to 600 Btu per cubic foot, so a single cow yields up to 65,400 Btu per day. When burned, up to 35 percent of this energy can be recovered as electricity, a yield of 6.7 KWh per day of electricity. All Wisconsin cows could therefore generate 22,800 MWh of electricity per day or 8.3 million MWh of electricity per year.

How much carbon would be offset by this generation?

In 2005, Wisconsin derived 67.4 percent of its electricity from coal and 1.2 percent from petroleum.[2] Assuming that the digester power would offset electricity generated with the same fuel profile, digesting all cows' manure would yield 5.6 million MWh of electricity per year.

The average CO_2 emission rates in the United States from coal-fired electricity generation is 2,249 lbs/MWh.[3] Therefore, the coal offset by digesters would reduce CO_2 emissions by 12.6 billion pounds, or 5.7 MMT per year.[4] This is 4.6 percent of the 123.1 MMT of CO_2 equivalents emitted in Wisconsin per year.

According to Alliant Energy's 2006 study,[5] the 242 Wisconsin herds of over 500 head could generate 39 MW of electricity through manure digesters. Assuming those hypothetical units operated at 80% capacity collectively, that would generate 273,312 MWh of electricity per year.[6] [7]

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[1] Larry Krom, Focus on Energy Renewable Energy Program. "Biogas Production on Wisconsin Farms," 2nd Annual Bio-Conversion Conference, Madison, Wisconsin.

[2] U.S. Energy Information Administration Wisconsin energy profile. Available at http://www.eia.doe.gov/cneaf/electricity/st_profiles/wisconsin.html.

[3] U.S. Environmental Protection Agency, Air Emissions. Available at http://www.epa.gov/solar/emissions.htm.

[4] There are 2,200 pounds in a metric ton.

[5] Alliant Energy. Anaerobic digesters and methane production in the agricultural sector of states served by Alliant Energy. Technical report, Alliant Energy, 2006.

[6] 273,312 = 0.8 × 39 MW × 24 hours per day × 365 days per year.

[6] For comparison, applying the method of parts a and b, but using low end productivity estimates, we estimate annual electricity generation from herds over 500 head at 287,700 MWh per year.

[7] For comparison, applying the method of parts a and b, but using low end productivity estimates, we estimate annual electricity generation from herds over 500 head at 287,700 MWh per year.

References

Alliant Energy, Anaerobic Digesters and Methane Production. A study in the agricultural sector of states served by Alliant Energy. January 2005.

Butler, Lucy and Neuhoff, Karsten. *Comparison of Feed in Tariff, Quota and Auction Mechanisms to Support Wind Power Development.* CMI Working Paper 70. The Cambridge-MIT Institute and Massachusetts Institute of Technology. December 21st, 2004.

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Rickerson, Wilson and Grace, Robert C. The Debate over Fixed Price Incentives for Renewable Electricity in Europe and the United States: Fallout and Future Directions. The Heinrich Boll Foundation. February, 2007.

Rickerson, Wilson; Bennhold, Florian and Bradbury. *Feed-in Tariffs and Renewable Energy in the USA – a Policy Update.* North Carolina Solar Center. Heinrich Boll Foundation. World Future Council. May 2008.

Gipe, Paul. **Renewable Energy Tariff Design**
Three part presentations, Midwest Ag Energy Network: 3rd Annual Midwest Ag Energy Summit, December 15-16, 2008, Rosemont, Illinois. Abstract: The philosophy behind and the design of successful feed-in tariffs and why they have catapulted Germany, France and Spain to world leadership in renewable energy development.

PRESENTATIONS:
#1) Renewable tariffs, program details
http://www.midwestagenergy.net/summit/ThirdSummitPresentations/Renewable_Energy_Tariff_Design_Part_2-01.pdf
#2) Price calculations:
http://www.midwestagenergy.net/summit/ThirdSummitPresentations/Renewable_Energy_Tariff_Design_Part_2-02.pdf
#3) Getting renewable tariffs:
http://www.midwestagenergy.net/summit/ThirdSummitPresentations/Renewable_Energy_Tariff_Design_Part_2-01.pdf