BEFORE THE
PUBLIC SERVICE COMMISSION OF WISCONSIN

Application of Wisconsin Power and Light Company for Issuance of a Certificate of Public Convenience and Necessity for Construction and Placement in Operation of an Approximately 300 MW Coal-Fired Baseload Facility and an Application for Approval of Fixed Financial Parameters and Capital Cost Rate-Making Principles for the Baseload Facility Docket No. 6680-CE-170

DIRECT TESTIMONY OF MICHAEL J. VICKERMAN

ON BEHALF OF RENEW WISCONSIN

Q. Please state your name, occupation, and address.

A. My name is Michael J. Vickerman. I am Executive Director of RENEW Wisconsin, an organization whose directors and members support expanding the use of locally available renewable energy resources to meet the state's power needs. RENEW is located at 222 S. Hamilton St., Madison WI 53703.

Q. Please describe your professional qualifications?

A. Under my direction RENEW has advocated, and mobilized political support for, several pro-renewable policies adopted in the last 10 years, including the establishment of Wisconsin's Renewable Portfolio Standard and a public benefits fund dedicated in part to renewable energy sources. I have been involved with many issues relating to renewable electricity, ranging from broad policy mandates and customer-driven green pricing programs to such technical issues as

renewable energy credit trading and windpower permitting ordinances. I was RENEW's representative on the statewide Task Force on Energy Efficiency and Renewables, which Governor Doyle convened in September 2003, and served as co-chair of the Renewables Workgroup. In that capacity I developed and negotiated several renewable energy policy recommendations for consideration by the full Task Force. These were: (1) a successor Renewable Portfolio Standard (RPS) that would result in a 10% renewable energy content by 2015 and (2) a State of Wisconsin commitment to source 20% of the electricity it uses from renewable energy sources. Both recommendations were included in a consensus package of proposed policy changes that were subsequently incorporated into a bill (SB459) that passed the Legislature and was signed into law in March 2006 (2005 Act 141) .

I have written and defended testimony in several PSC proceedings in recent years, including We Energies' 2007 rate case (05-UR-1030, Madison Gas & Electric's 2007 rate case (3270-UR-115), Wisconsin Power & Light's application to build the Cedar Ridge wind energy installation (6680-CE-171), We Energies' application to build the Blue Sky Green Field wind energy installation (6630-CE-294), Forward Wind Energy's application to build a 200 MW wind energy installation (9300-CE-100), We Energies' 2005 rate case (05-UR-102), Wisconsin Public Service Corporation's 2005 and 2006 rate cases (6690-UR-117 and 6690-UR-118), and Wisconsin Power & Light's 2005 and 2006 rate cases (6680-UR-114 and 6680-UR-115).

RENEW has been providing services under contract to Focus on Energy's Renewable Energy program since its launch in March 2002. The services I provide to Focus on Energy include reviewing requests for financial incentives to underwrite the development of customer-sited renewable energy installations in Wisconsin. Over the course of its history, Focus on Energy has paid out more than $7.5 million in renewable energy grants and incentives.

Q. What is the purpose of your testimony?

A. In my testimony I will survey the windpower prospects under development by independent power producers (IPP's) in the parts of Wisconsin served by WPL. This information will include an estimate of their annual production (in the aggregate) as well as the current permitting and interconnection status for each prospect. The second half of my testimony outlines RENEW's concerns with WPL's proposal to co-fire biomass at Nelson Dewey 3.

Q. How many IPP-owned wind prospects are currently under development in territory served by WPL?

A. There are seven IPP-owned wind prospects under development. All range in generating capacity from 50 MW to 100 MW, totaling 609 MW altogether. Each prospect is profiled below, beginning on page 6.

Q. What is the development status of these prospects?

A. Two of the seven prospects—Darlington Wind Farm and Columbia Community Wind—are located in unzoned townships and don't require local

permits. Their developers have signed interconnection agreements with the Midwest Independent System Operator. They have accumulated at least four years of wind monitoring data at the project site. Construction of both projects could begin in 2009.

Assuming no significant hitches in the permitting process, the other five prospects in this survey could be constructed between 2010 and 2013. Four of them—EcoMagnolia, EcoMont, White Oak, and Arlington Prairie--require siting permits, either in the form of a Conditional Use Permit (CUP) from the local government with jurisdiction or a Certificate of Public Convenience and Necessity from the Commission if the project is larger than 100 MW. The seventh prospect, Invenergy's Summit Ridge prospect is now entangled in a consolidated lawsuit that involves three of the five townships in its development footprint. Of the seven prospects in play, Summit Ridge faces the greatest level of uncertainty going forward.

Q. Can you estimate the output from these prospects?

A. From a wind resource perspective, some of the prospects are well-characterized while others have less than a year's worth of monitoring data. Monitoring data collected by IPP's are proprietary in nature. Moreover, the physical attributes of the sites in question vary significantly. A few of the sites are relatively flat, while others feature more complex terrain. Another complicating factor is turbine selection. While a number of developers are working with a particular turbine manufacturer, others have access to more than one model.

Different wind turbines have different power curves. These variables introduce a high level of uncertainty in forecasting output at the individual project level. For those reasons, it makes more sense to estimate electricity production in the aggregate using a range of capacity factors instead of a single number. Based on my conversations with the developers working in southwest and south central Wisconsin, my estimate of overall net capacity factor of these projects ranges from 26% at the low end to 30% at the high end, with the mean being 28%. Therefore, if all seven projects are constructed and placed in service, their combined production each year should average about 1.5 gigawatt-hours.

Q. Do you have an estimate for the capacity costs of these projects?

A. Once again, the cost of acquiring the equipment and building the installation is likely to vary significantly from one project to the next, depending on the complexities presented at each site and whether the equipment is manufactured in the United States or overseas. Based on my conversations with the developers working in southwest and south central Wisconsin, my estimate of capacity costs for projects placed in service before 2011 ranges from $2,250 per installed kW (in 2008 dollars) at the low end to $2,500 per installed kW at the high end. These are conservative estimates. For comparison purposes, the total installed cost of We Energies' recently completed Blue Sky Green Field project amounted to $300 million, or $2,066 per installed kW. (http://wecnews.wisconsinenergy.com/news/newsrel/pages/newsrelease_122)

Q. What are the pathways that will lead these prospects to their construction and operation?

The projects could proceed to construction along one of three development tracks. First, the IPP's could build and own the project, whereby construction costs are financed through future revenues under a Power Purchase Agreement (PPA) with a utility. This has been the approach favored by Wisconsin utilities until recently. As of this moment, none of the developers has signed a PPA that commits project output to a particular utility. Second, the developer could build the project as a merchant generating unit, and sell the electricity into the wholesale market. This approach is becoming increasingly common in the portion of Illinois served by the PJM system operator, but it has not been attempted in Wisconsin. Third, the developer could sell the project itself to a utility, which then assumes construction and ownership responsibilities. WPL's Cedar Ridge project, currently under construction, was originally developed by Midwest Wind Energy, a Chicago-based IPP. Before selling the project to WPL, Midwest Wind had obtained the necessary permits, land leases and other agreements necessary to construct a 68 MW windpower installation near Fond du Lac.

Q. Please provide more details on these seven prospects.

A. **Darlington Wind Farm**

Developer: Horizon Wind Energy

Location of prospect: Town of Seymour, Lafayette County (near Darlington)

Local permit status: Lafayette County is unzoned. Horizon has secured development agreements with the county and town

Interconnection study status: Horizon has signed Large Generator Interconnection agreements with MISO and ATC.

Likely project capacity: 99 MW

Likely construction start date: On or before May 2010

Likely completion date: December 2010

Turbine type and availability: (unknown)

Horizon Wind Energy contact: Brian Lammers, Director of Development - Upper Midwest. Telephone: 612.219.8603; E-mail: brian.lammers@horizonwind.com

EcoMagnolia

Developer: EcoEnergyLLC

Location of prospect: Town of Magnolia, Rock County (near Brodhead)

Local permit status: Town of Magnolia has a wind ordinance.

Interconnection study status: Facility study underway

Likely project capacity: 100 MW

Likely construction start date: January 2010

Likely completion date: December 2010

Turbine type and availability: Acciona 1.5 MW

EcoEnergyLLC contact: Curt Bjurlin, Wisconsin Project Development Manager. Telephone: 815.266.6018; E-mail: cbjurlin@ecoenergyllc.com

EcoMont

Developer: EcoEnergyLLC

Location of prospect: Town of Belmont, Lafayette County (Near Belmont)

Local permit status: Town of Belmont has a wind ordinance.

Interconnection study status: Interconnection request filed

Likely project capacity: 100 MW

Likely construction start date: January 2010

Likely completion date: December 2010

Turbine type and availability: Acciona 1.5 MW

EcoEnergyLLC contact: Curt Bjurlin, Wisconsin Project Development Manager.

Telephone: 815.266.6018; E-mail: cbjurlin@ecoenergyllc.com

Columbia Community Windpower LLC

Developer: Iberdrola Renewable Energies USA

Location of prospect: Towns of Scott and Randolph, Columbia County (near Friesland)

Permit status: Townships are unzoned; no land use permit needed

Interconnection study status: Iberdrola has signed a Large Generator Interconnection Agreement with the Midwest Independent System Operator

Likely project capacity: 80 MW

Likely construction start date: Second half of 2009

Likely completion date: December 2010

Turbine type and availability: Gamesa G-87 (2 MW). Turbine delivery expected to begin in the second half of 2009.

Project development status: This prospect is officially designated a Qualifying Facility. Negotiations over a Power Purchase Agreement with Alliant – Wisconsin Power & Light are ongoing.

Additional points of consideration: Iberdrola typically self-finances their projects.

Iberdrola Contact: Jeffrey Reinkemeyer, Midwest Development Director.

Telephone: 262.593.2764; E-mail: jreinkemeyer@iberdrolausa.com.

Summit Ridge Energy LLC

Developer: Invenergy Wind Energy, LLC

Location of prospect: Towns of Jefferson, Ridgeville, Sheldon, Wells, Wilton, Monroe County

Permit status: Jefferson and Sheldon townships are unzoned. Ridgeville, Wells, and Wilton are under county zoning. In 2007 Monroe County issued a CUP to Invenergy. Towns of Wilton and Ridgeville subsequently vetoed the County's CUP; Wells did not. Lawsuits were filed challenging all three local decisions. These actions were consolidated into one lawsuit, which is now before Monroe County Circuit Court. A decision is expected in the next two months.

Likely project capacity: 80 MW

Interconnection study status: Unknown

Likely construction start date: Unknown

Likely completion date: Unknown

Turbine type and availability: GE sle (1.5 MW)

Additional points of consideration: The outlook for this prospect hinges entirely on the outcome of the litigation.

Invenergy Wind Energy Contact: Bill Blackmore. Telephone: 641.919.1118; E-mail: bblackmore@natel.com

White Oak, LLC

Developer: Wind Capital Group

Location of prospect: Towns of Smelser, Hazel Green, and Paris, Grant County (near Cuba City)

Local permit status: Smelser and Hazel Green are unzoned; Paris is under county zoning. Grant County has review and approval authority over any CUP application filed in Paris. Application for Conditional Use Permit not yet filed.

Interconnection study status: Completed feasibility study

Likely project capacity: 100 MW

Likely construction start date: January 2010

Likely completion date: December 2010

Turbine type and availability: unknown

Wind Capital Group contact: Tom Green. Telephone: 608.370.2426; E-mail: tgreen@windcapitalgroup.com.

Arlington Prairie, LLC

Developer: Wind Capital Group

Location of prospect: Towns of Arlington and Leeds, Columbia County

Local permit status: Both townships are under county zoning. Application for Conditional Use Permit not yet filed.

Interconnection study status: Interconnection request filed

Likely project capacity: 50 MW

Likely construction start date: January 2011

Likely completion date: December 2011

Turbine type and availability: unknown

Wind Capital Group contact: Tom Green. Telephone: 608.370.2426; E-mail: tgreen@windcapitalgroup.com.

Q. Turning to biomass, what issues are raised by WPL's proposal to use biomass as a generator fuel for Nelson Dewey 3 (NED3)?

A. RENEW's reservations about WPL's stated plans to co-fire biomass at NED3 flow from the specifics of the proposal. RENEW strongly supports using biomass for space and process heating. RENEW also supports generating electricity from dedicated biomass facilities that are considerably smaller than a new baseload facility.

One reservation we have this proposal is the idea of marrying a low-grade biomass fuel to a very expensive new power station with a capacity cost of about $4,000/kW. There are less expensive avenues for acquiring renewable energy, such as windpower, that have lower capital costs and zero fuel costs. There are also less expensive venues for burning biomass for electricity, such as the soon-

to-be-retrofitted E. J. Stoneman plant or Xcel's Bay Front 3 unit. Unlike building a new 300 MW coal plant, retrofitting those power stations to burn biomass fuel won't require a capital investment in excess of $1 billion. It is a far more efficient use of ratepayer dollars to wed biomass fuel with smaller power stations (<50 MW) than with a larger and very expensive brand-new power plant. With smaller power plants, it is possible to configure them as dedicated biomass generating units. This is not possible with a 300 MW facility.

RENEW's second reservation is triggered by the configuration of NED3. WPL's selection of a circulating fluidized bed combustion boiler creates an opportunity to co-fire biomass energy sources at NED3. WPL's plans, however, call for the biomass fuel to supplement the coal being fed into the boiler, which could easily be fueled with 100% coal. There is nothing about the boiler design that is dedicated specifically to biomass generation. Coal is the mainstay in this configuration, while biomass is simply an opportunity fuel to be used when available. The possibility of being unable to acquire enough biomass fuel for co-firing will not in any way hinder the operation of NED3, because there will always be enough coal on hand to operate the plant at its full rated capacity. Also, because the biomass portion of the plant's output can vary, depending on how much biomass fuel is available, there is no possible way to predict how many renewable kilowatt-hours will be produced at the plant. Depending on NED's variable biomass output to help satisfy in-state renewable energy requirements introduces a level of risk that can be avoided by relying on other renewable generation strategies.

Our third reservation stems from WPL's need to lock up significant supplies of fuel sources of wood and energy at a lower cost than what the same resources would fetch in other markets, especially the biomass thermal market. As a general proposition, burning biomass in an electricity-only facility is a low-value use for a resource that can deliver substantially more energy to an end-user in the form of space and process heat. If biomass is burned at NED3, two-thirds of the energy value of the fuel, be it wood, agricultural residues, or switchgrass, is discharged into the atmosphere. In contrast, a modern wood-fired heating system serving a forest products company can convert 65% of the energy embedded in the fuelwood to useful heat. The higher the conversion factor of a particular energy application, the greater the energy return, which generally translates into a higher economic return. Thermal market participants are well-positioned to pay top dollar for the fuel they use, because they receive an energy return that is double what the same fuel yields when burned in a biomass electric facility. Because NED3 will, if approved, have a low thermal efficiency, WPL would be at a disadvantage if forced to match the prevailing biomass fuel price set by thermal market participants in order to secure upwards of 300,000 tons of biomass a year.

Q. In general, does biomass yield as much energy as coal does on a volumetric basis?

A. No, it does not. Raw biomass resources generally have a higher moisture content than coal, resulting in a higher heat rate. On average, a ton of biomass has two-thirds the energy value of a ton of coal. What that means is that even if WPL

were to secure enough biomass material to supply, on a sustained basis, 20% of the volume of fuel fed into NED3, the percentage of electricity actually generated from biomass would be in the neighborhood of 13%. Therefore, the 300,000 tons of biomass that WPL intends to burn at NED3 each year would offset only 200,000 tons of coal. Input percentages don't matter when calculating emissions reductions and renewable kilowatt-hours produced—output percentages do.

Q. Does this disparity in energy value make biomass more expensive to transport?

A. It can. The cost of biomass energy is more sensitive to transportation distances than the cost of coal, all other things being equal. This disparity could be especially problematic if biomass resources are delivered to NED3 by truck and diesel fuel prices continue their upward trajectory. Just in the last 12 months, diesel fuel prices have increased by about $1.80 per gallon, rising from $2.80 to $4.60, according to the Energy Information Administration. The possibility that transportation costs will increase the cost of fueling NED3 with biomass cannot be disregarded, given recent price trends. This possibility, in my opinion, requires more analysis than what has been performed to date.

Q. What is the status of wood fuel as an energy source in Wisconsin?

A. While the use of biomass resources for energy is on the rise in Wisconsin, the principal driver of that growth has been the desire on the part of commercial and industrial customers to displace fossil heating sources, e.g., natural gas, fuel

oil, and liquid propane, with less expensive wood fuels. This can be confirmed by looking at biomass projects funded by Focus on Energy's renewable energy program, which was launched in 2002. Since that time, virtually every biomass project that received financial support from Focus on Energy has been a thermal energy installation, producing space and/or process heat instead of electricity. Indeed, there has been almost no change in nonutility biomass electric generating capacity since Focus on Energy's inception.

Q. Why have customers been more eager to invest in thermal applications of biomass energy than electric applications?

A. The main difference between the thermal markets and the electric market is the rapid increase in fossil heating costs. Wholesale natural gas prices, for example, have increased fourfold since 2001. As natural gas and other fossil heating sources became progressively more expensive, high-use customers began searching for alternatives. The transition to wood heating was aided by Focus on Energy financial incentives, which lessened the capital expense of a brand new biomass heating system. More than a dozen Wisconsin businesses, ranging from small forest products companies to large paper mills, have switched from fossil heat to wood heat with Focus on Energy support. Those customers that have completed the installations are now reaping the benefits of lower heating bills. Focus on Energy expects the demand for wood as a heating fuel to increase next year.

Q. Have prices for wood fuels remained stable in the last year?

A. No, they have not. Prices have gone up over the last 12 months. Part of this increase is attributable to a substantial slowdown in new residential construction, which has depressed demand for saw timber and finished wood products like furniture. With fewer logs being processed by the forest products industry, there has been a reduction in the volume of by-products--sawdust, shavings, and bark--that can be used for energy production. This reduction in the supply of residues happens to coincide with increasing numbers of wood heating systems being installed in Wisconsin. Higher transportation costs are also contributing to the upward price pressure. Indeed, it is the convergence of these dynamics that leads wood products professionals to believe that the cost of a delivered ton of wood fuel going forward will likely exceed $50, which appears to be significantly higher than what WPL estimates.

Q. What other cost estimates for wood fuel have you considered?

A. A June 2008 report titled "Growing Wisconsin Energy: A Native Grass Pellet Bio-Heat Road Map for Wisconsin" contains a table comparing the cost of different heating sources, including wood chips. In that report, the cost of wood chips was estimated at $50/ton. This report was prepared by Agrecol Corporation and funded by Wisconsin Department of Agriculture, Trade and Consumer Protection. It can be downloaded at http://www.agrecol.com/images/news/_AgrecolADDReport.pdf.

Table 1.1 succinctly demonstrates the economic attractiveness of using wood for heat. When priced at $50/ ton, wood chips with a 40% moisture content is estimated to cost $7.77 per MMBtu, while natural gas burned in at a 90% efficient heating system is estimated to cost $12.22 per MMBtu.

Q. What inferences can you draw from the Agrecol report that would have a bearing on the price of woody biomass going forward?

A. It is evident from the report that woody biomass has a bright future as a source of heating. Wood's attractiveness relative to fossil heating sources should spur continued demand growth. This trend will intensify if natural gas prices keep going up. As Table 1.1 indicates, there already is a large marginal difference in the economics of heating with wood chips versus heating with natural gas heating. Even if its prices were to increase 40% this year, woody biomass would still be cheaper than natural gas, the least expensive fossil heating option available. Should natural gas prices increase, due to shrinking exports out of Canada, then the price of woody biomass would have even more headroom to move higher without sacrificing its competitive advantage.

Q. Are there other competitive forces that could drive the cost of wood higher?

A. Yes. DTE Energy Services recently announced plans to operate a nearby power plant as a dedicated biomass electric facility. DTE bought the former E.J. Stoneman station earlier in 2008 and is now seeking regulatory approval to retrofit the facility so that it can be powered exclusively with woody biomass. Output from Stoneman would be sold to Dairyland Power Cooperative. Rated at

40 MW, Stoneman is expected to begin operating in 2010, three years before NED3 would be placed service. If both are built, the two power plants would each year require more than 500,000 tons of biomass, most of it wood.

Q. How might this affect the price and availability of woody biomass sources for NED3?

A. In addition to supplying NED3, wood fuel suppliers in the area have the option of supplying product to the former E. J. Stoneman station or to various thermal market participants. Of course, there will be an economic incentive for suppliers to sell their product to the highest bidder. In this market environment, it is important to recognize that the thermal market participants will have greater latitude to bid prices higher than would power plant operators. This is because natural gas is the price-setter in the thermal biomass market, while coal is the price benchmark for electric applications.

The Stoneman plant will be fueled exclusively with woody biomass. That means if supplies of woody biomass are not sufficient to fuel the plant in an efficient manner, the plant would have to shut down until adequate supplies are available. To ensure an adequate supply, DTE Energy Services will have to offer a price that is attractive enough to prevent those woody biomass sources from finding their way into higher-value thermal applications. The cost of acquiring fuel for Stoneman could in turn affect WPL's ability to control NED's fuel acquisition costs and ensure adequate supplies. Indeed, should a situation arise whereby WPL and DTE find themselves competing with each other to ensure

adequate supplies of woody biomass sources for their respective plants, DTE would have more motivation to outbid WPL than the other way around. That is because WPL will have the luxury of being able to fuel NED3 with more coal, an option DTE doesn't have at Stoneman.

Given the bifurcated market structure between thermal and electric applications, and the recent announcement of a dedicated biomass power station operating practically next door to NED3, the risk that the biomass fuel could become prohibitively expensive to use at NED3 cannot be dismissed. It is worth stating that, unlike Stoneman, NED3 is not dedicated to the combustion of biomass. In the event biomass supplies do not materialize as hoped for or should prove too expensive to justify as generation fuel, WPL would operate Nelson Dewey 3 as a 300 MW coal plant.

Q. In addition to woody biomass, WPL plans to co-fire switchgrass at NED3. What are your views on the viability of switchgrass?

A. Compared with woody biomass, the knowledge base surrounding switchgrass as a generator fuel is very thin. There are no operating power plants in the United States that co-fire switchgrass on a regular basis. Until now, no U.S. utility has ever proposed to incorporate switchgrass into the regular fuel mix of a particular generating unit. Because there aren't any markets for switchgrass right now, very few landowners are growing it. Because of the dearth of local experience growing this particular feedstock, estimates of per-acre production on a sustained basis amount to rough guesses. The expectation going forward is that

southwest Wisconsin farmers would plant switchgrass on Conservation Reserve Program land and sell their annual harvests to third-party brokers or aggregators. However, one can be certain that farmers would carefully weigh that option along with other potential uses of that land, including leaving it as is. If farmers have reason to believe that their land and their labor can earn a higher return by planting another crop, they are not likely to go into the switchgrass-growing business. The same conclusion can be drawn if farmers have reason to believe that their production costs will not be covered by the prices set by third-party brokers or aggregators. Indeed, it has yet to be demonstrated that switchgrass, which to date has been grown largely for recreational or educational purposes, can make the leap into commercial production any time soon. It is highly uncertain that one company alone can transform switchgrass into a commercially viable generator fuel. Given the considerable unknowns that surround switchgrass, WPL's plans to rely on switchgrass for a portion of NED3's fuel is a speculative venture that may not come together if the plant is approved.

Q. Is there enough information on the record to make a finding on the price and availability of biomass sources proposed for use at NED3?

Not at this time. There is most definitely a need for additional analysis to more fully evaluate the competitive market forces that are certain to influence the cost and availability of biomass fuel that WPL proposes to feed into NED3. The record to date is very thin on the cost components and price drivers for biomass fuel, which are strongly influenced by existing market conditions (e.g., high

natural gas prices, high diesel fuel prices, a depressed housing market, etc.). The direct testimony provided by WPL does not reference the Stoneman proposal, which is a significant gap in the record. More discussion on the record is needed to ascertain whether there is enough biomass fuel to supply two power stations in such close proximity to each other, and, if so, how high must the price be to maximize biomass output at both plants. Without such information the Commission will be handicapped in its ability to determine whether the ratepayers should bear the risk of using potentially high cost sources of biomass fuel at NED3 when there are likely to be lower-cost RPS compliance strategies available to WPL.

Q. Does this complete your direct testimony?

A. Yes, it does.