BEFORE THE
PUBLIC SERVICE COMMISSION OF WISCONSIN

Application of Wisconsin Public Service Corporation
For Authority to Adjust Electric and Natural Gas Rates Docket 6690-UR-122

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 the Program and Policy Director of RENEW Wisconsin (RENEW). RENEW is a membership organization founded in 1991 that leads and represents businesses, organizations, and individuals who seek more clean renewable energy in Wisconsin. 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 13 years, including the adoption in 2009 of uniform permitting standards for wind projects (SB 185) as well as the establishment in 1999 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 (SB 459) that passed the Legislature and was signed into law in March 2006 (2005 Act 141)

RENEW Wisconsin also spearheaded the Wind for Wisconsin coalition, whose campaign to establish uniform siting standards for wind energy systems resulted in the passage of 2009 Act 40. I am a member of the Wind Siting Council, a stakeholder body convened by the Public Service Commission ("Commission") to provide input and advice to the agency in shaping a statewide wind siting rule as required under 2009 Act 40.

I have testified in several Commission proceedings in recent years, including We Energies' applications to build its Blue Sky Green Field wind energy installation (6630-CE-294), its Glacier Hills wind energy installation (6630-CE-302), and its Rothschild Biomass generation installation (6630-CE-305); Northern States Power-Wisconsin's application to convert its Bay Front 5 generator into a

dedicated biomass unit (4220-CE-169); Wisconsin Power & Light's application to build the Nelson Dewey 3 coal-fired power station (6680-CE-170) and its Cedar Ridge wind energy installation (6680-CE-171); Forward Wind Energy's application to build a 200 MW wind energy installation (9300-CE-100); Wisconsin Public Service Corporation's 2005, 2006, 2008, 2010, 2012 rate cases (6690-UR-117, 6690-UR-118, 6690-UR-119, and 6690-UR-120); Wisconsin Power & Light's 2005, 2006 and 2008 rate cases (6680-UR-114, 6680-UR-115 and 6680-UR-116); We Energies' 2005, 2007 and 2012 rate cases (05-UR-102, 05-UR-103 and 05-UR-106); and Madison Gas & Electric's 2010 rate case (3270-UR-117).

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to present information on the net metering tariff **(**Pg-4) proposed by Wisconsin Public Service Corporation (WPSC). My testimony first identifies specific elements of WPSC's proposed terms of service, which if approved, would unreasonably discriminate against WPSC customer-generators compared to those located in the service territory of other investor-owned utilities. My testimony will focus on the utility's current practice of calculating net generation and consumption, which subjects new customer-generators in WPSC territory to economic penalties that no new customer-generators elsewhere experience. Second, I will address two proposals in its pending filing that are designed to suppress customer use of solar PV systems for self-generation. These consist of reducing its net metering threshold from 100

kW to 20 kW and limiting availability of the net metering to energy-only customers. Third, I will describe the necessary analysis that would be required for WPSC to claim that net metering customers are not paying the costs they cause, i.e., that they are "subsidized," that WPSC has not done such an analysis and, based on analyses done in other states, that such an analysis would be expected to show that on the whole, solar PV net metering customers actually provide value to other customers and not vice versa. Fourth, , I will testify about what the avoided cost is for WPSC customers for net positive energy produced by net metering customers and supplied to WPSC, that is, electricity generation that exceeds the customer's usage over the netting period. My testimony contains recommendations for aligning WPSC's net metering tariff with the best practices offered by other utilities.

Q. What is RENEW's interest in this proceeding?

A. Net metering has been a high priority for our organization since our founding in 1991 and our intervention that year in Advance Plan 6, in which we advocated for requiring all regulated utilities to provide net metering service to its customers. We see net metering as an effective mechanism for leveraging cost-effective investments in small-scale renewables, providing increased generation of renewable energy as well as distribution and capacity benefits without a cost to ratepayers. To do this in the most efficient and non-discriminatory manner, each of the individual investor owned utilities' net metering offerings should be as similar as possible.

RENEW is a member of the Grow Solar Wisconsin team, one of 22 teams in the United States participating in the Rooftop Solar Challenge organized and supported by the U.S. Department of Energy (DOE). The Challenge is part of the DOE's SunShot Initiative, which seeks to make solar electricity cost-competitive without subsidies by the end of the decade. Net metering policy is a critically important aspect of Wisconsin's solar energy policy, since customers, not utilities, have driven the vast majority of grid-tied solar electric installations in this state. The criteria determining the model outlined in this testimony emerged from a 2011 report titled "***Freeing the Grid: Best Practices in State Net Metering Policies and Interconnection Procedures***," prepared for the National Renewable Energy Laboratory. The authors of that report also published a Wisconsin-specific analysis of net metering policies in October 2011. Though some of the net metering recommendations in ***Freeing the Grid*** are broad in nature and may require legislation, there are several issues that can be appropriately addressed in utility rate proceedings.

Q. How does WPSC's net metering service in Wisconsin compare with similar services offered by electric providers in the region?

A. WPSC's net metering service is highly restrictive compared with the practices of other investor-owned utilities (IOU's) in other states. Regarding individual system size eligibility, the maximum size permitted by Iowa's investor-owned utilities is 500 kW, while in Minnesota, which in May 2013, adopted an expanded net metering policy, the ceiling is one MW, and in Illinois, the ceiling is two MW. In

Minnesota, all output from qualifying systems up to 40 kilowatts is credited at the customer's retail energy rate. In Iowa, the practice of indefinite rollover effectively credits all kWh produced by qualifying systems at the retail rate. In Illinois, net excess kWh are rolled over within an annualized period. Credits not used during the 12- month period expire at the end of the term.

Michigan's net metering policy provides an interesting contrast, especially as applied to Upper Peninsula Power Company (UPPCO), WPSC's regulated affiliate in that state, which serves 52,000 customers there. As a result of legislation adopted in 2008, all investor-owned utilities in Michigan must now offer net metering under terms that are significantly more expansive than what is in place in Wisconsin. UPPCO's net metering tariffs consist of a full retail credit service up to 20 kW, a two-tiered service for generators between 20 kW and 150 kW, and a special service for biogas generators up to 550 kW. In contrast, WPSC has only one active net metering service, presently capped at 100 kW, which WPSC has proposed to reduce to 20 kW.

Q. What percentage of net metered generation do you think will be supplied by solar electric facilities for new net metering customers?

A. As the cost of solar modules and balance-of-system equipment continues to decline, the economic rationale for adding solar to one's house, business or farm in Wisconsin will continue to improve. Another factor in solar energy's favor is that its generation profile relative to seasonal load patterns fits better with a two-part net metering rate structure than wind does. For those reasons I believe solar

energy will constitute at least 90% of new net metered energy in Wisconsin Public Service territory. In fact, data obtained through 01-RENEW INT-08 confirm that solar constituted more than 90% of its net metered systems interconnected to the WPSC system in 2012 and 2013. During that time, and continuing today, the installed price of solar continues to decline. Therefore, this trend towards solar distributed generation will continue.

Therefore, it makes sense to analyze net metering practices with the assumption that solar energy will be the chief beneficiary of a rate structure based on "best practices," and that WPSC will derive benefits from net metering customers based on the value of solar PV generation, including its generation profile that corresponds with peak energy demand hours and months. Basing the net metering tariff on anything other than solar PV would focus on a small minority within the Pg-4 class to define the policies and costs for the majority.

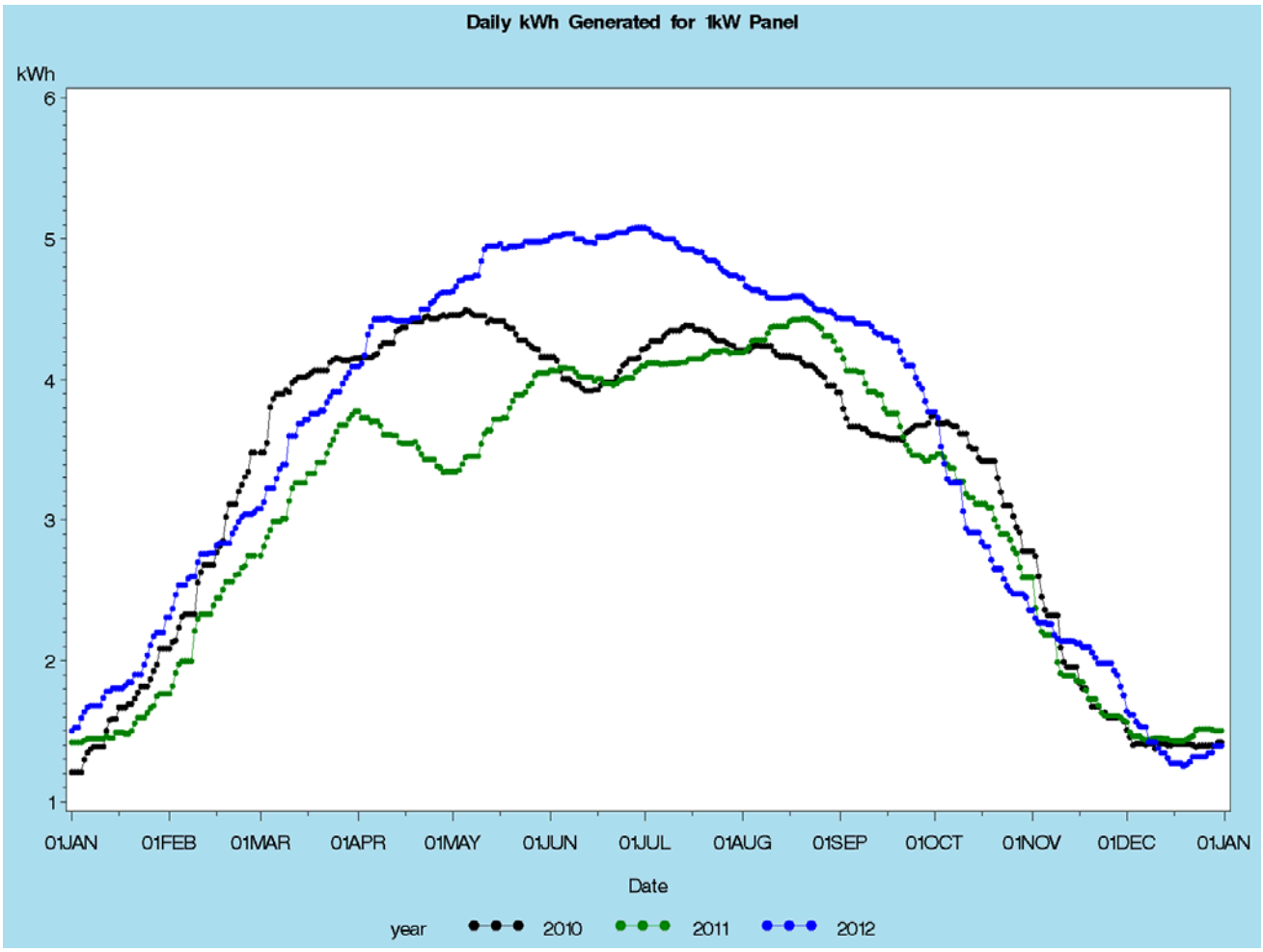
WPSC's MONTHLY NETTING RATHER THAN THE 12-MONTH NETTING USED BY ALL OTHER WISCONSIN IOUs

Q. Are there any deficiencies in WPSC's current net metering service?

A. Yes. WPSC's current tariff structure is problematic because it specifies both a two- tier structure and a monthly netting period. Under its tariff, customer generation up to the customer's consumption each month offsets the customer's purchases, or reduces WPSC's sales to that customer. Technically, this is reducing the total sales by WPSC to the customer, which in practical terms, credits customers at their retail rate for production up to their level of

consumption. Production above the level of consumption is purchased by WPSC at a rate that is intended to (but as described below, does not actually) represent WPSC's "avoided cost." However, instead of defining the net purchase or sale of energy over a 12-month netting period, as Wisconsin Electric Power (WEPCO) does, WPSC performs a true- up each month and credits the customer-generator for both the output that offsets consumption and any excess generation that occurred that month.

While the practice of monthly netting is appropriate in a tariff that credits all kilowatt-hours (kWh) produced above consumption at the retail rate, such as Wisconsin Power & Light's current net metering tariff, such monthly netting effectively penalizes customers for seasonal swings in both internal consumption and generation output when excess generation is credited at lower than the retail rate. In the case of solar generation, output peaks in the summer, as do utility loads, and declines in the winter. Attached as Ex.-RENEW-Vickerman-1 are solar PV generation profiles created by WPSC for solar PV in the company's service territory. Those profiles indicate that solar PV generates the most during the summer months:



However, the productivity of a solar electric system is nearly as great during certain shoulder season months (March, April, May, and September) as it is in mid-summer. Those are the months that tend to correspond with seasonally induced reductions in the customer's monthly electricity usage. National Renewable Energy Laboratory's PVWatts Calculator confirms these data from WPSC.

This seasonal mismatch between output and consumption in the shoulder months makes it likely that a customer will choose not to size his or her system to provide maximum benefit during the summer months when that self-generation's

effect of decreasing energy and capacity needs of the system are most beneficial to the system. When production cannot be carried over from month to month, customers size their system to avoid overproduction in shoulder months, which must be sold at a loss. But that means the systems are not sized to maximize production in summer months, when solar PV provides the most energy, capacity, and transmission value that inures to other customers, as will be addressed in further detail in my testimony.

Q. Can you explain how monthly netting versus annual netting drives customer decisions to undersize their solar electric systems?

A. Customer who consider installing solar PV systems and the companies who advise customers and install those systems are fairly sophisticated at determining the size and design that meets their financial goals based on "solar math." The retail utility's netting period drives an important portion of that solar math.

We can replicate the typical decision making process for customers by using the PVWatts Calculator on the National Renewable Energy laboratory's web site. In the table below, Column A lists the months in a year. Column B represents average monthly output from a 4 kW (DC) solar electric system. These numbers are derived from a PVWatts calculation of a 4 kW system located in Green Bay, which is designated as Ex.-RENEW-Vickerman-2. (Note that for the months of December, January and February, I have reduced kWh production by 10% to account for snow shading, thereby reducing that system's average annual output to 4,730 kWh.) The average annual output from a 4kW solar electric

system at that location should range between 4,500 to 4,900 kWh, making it a reasonable fit for a household using 5,000 kWh a year. However, when netted on a monthly basis, a significant portion of the value from such a system is lost to the customer who is forced to sell excess generation at a loss to WPSC during the months when generation exceeds consumption.

Column C illustrates the seasonal swings in monthly consumption at a household using 5,000 kWh/year. Column D shows the amount of solar-generated kWh in a month in which output typically exceeds consumption.

A (Month)	B (Output)	C (Consumption)	D (Excess)
January	307	450	--
February	350	450	--
March	485	350	135
April	468	300	168
May	495	350	145
June	463	500	--
July	492	600	--
August	436	550	--
September	387	350	37
October	376	300	76
November	238	350	--
December	233	450	--
Total	**4,730**	**5,000**	**561**

Under annual netting allowed by all other IOUs in Wisconsin, the entire 4,730 kWh produced by this reference solar electric system could be used by the customer, making the 4 kW system a reasonable investment. However, under

monthly netting used only by WPSC, the customer would only use 4,169 kWh, while being forced to sell 561 kWh, or 11.8%, to WPSC's at an "avoided cost" rate lower than solar PV's levelized cost. That is, at a loss for each kWh.

WPSC's energy rate is currently about 13 cents/kWh and the average LMP (which WPSC proposes to use as the "avoided cost") is about 3.25 cents/kWh, for a difference of 9.75 cents/kWh. This amounts to a reduction in annual savings of nearly $55 in 2012, which effectively lengthens the payback period of this system by 10%. No other net metering customer in Wisconsin experiences the same economic disincentive that confronts prospective WPSC customer-generators.

This disincentive negatively affects non-net-metering customers in addition to the net metering customers. As will be discussed further later in my testimony, the load and energy reductions from solar PV self-generation cause system-wide cost savings that inure to the benefit of non-net metering customers because self-generation, and production of excess energy that is consumed on the distribution level by other customers, reduce WPSC's transmission costs by reducing the portion of ATC's costs that it is billed for, reduces system losses by producing during high-energy-flow periods, reduces energy requirements and therefore prices during high-priced daytime summer periods, shifts the load profile to lower cost energy prices if implemented in sufficient quantities, and provides a hedge against fuel costs. Those benefits to other customers occur in significant portion from solar PV generation during summer daytime hours. However, because the levelized cost of solar PV is still higher than the "avoided

cost" rate that WPSC currently pays for excess generation, every kWh produced by solar PV and purchased by WPSC rather than used to offset the customer's use represents a financial loss. Therefore, customers are incentivized to size their system to minimize monthly overproduction. Below are data from NREL's PV watts for the same system as above, but sized to only 3kW (Ex.-RENEW-Vickerman-3).

A (Month)	B (Output)	C (Consumption)	D (Excess)
January	230	450	--
February	263	450	--
March	364	350	--
April	351	300	--
May	371	350	--
June	347	500	--
July	369	600	--
August	327	550	--
September	290	350	--
October	282	300	--
November	179	350	--
December	175	450	--
Total	**3,548**	**5,000**	**--**

As can be seen here, a smaller system results in no excess generation during any month that would be produced at a loss to the customer-generator. This makes the most economic sense for the customer, but it also deprives the system and other customers of the cost-saving benefits that would have been provided by additional generation (especially during summer daylight hours).

Q. Among utilities that offer a two-tiered net metering rate, do any of them carry forward excess generation over a 12-month period?

A. The other utilities that presently offer net metering under a two-tiered rate are Northern States Power-Wisconsin (NSPW), Wisconsin Electric Power Company (WEPCO) and Madison Gas & Electric (MGE). Unlike WPSC, these three utilities true up a customer-generator's output over a 12-month period. The Commission approved NSPW's, WEPCO's and MGE's use of annualized true-up process in their most recent rate cases. Among utilities offering a two-tiered net metering service, WPSC is the sole outlier. As noted above, WPL provides buyback rates at the retail rate, effectively making the true-up period irrelevant. Therefore, WPSC is the sole outlier among the main IOUs in Wisconsin.

Q. What is the practical effect of WPSC's monthly true-up policy to prospective customer-generators and the solar marketplace in Wisconsin?

A. There are several detrimental effects stemming from WPSC's current treatment of excess generation. One immediate impact is to force installers and customer-generators to downsize solar electric systems to minimize instances where generation is credited at the avoided cost rate. While a household in Eau Claire or Madison would consider a 4 kW solar electric system to be a cost-effective option for offsetting an annual load of 5,000 kWh, a similar household in WPSC territory would need to downsize system capacity to ensure full retail crediting in the high output/low consumption months, as demonstrated above. The result of such

downsizing is to reduce annual production across all 12 months, including the summer months, when electricity consumption and wholesale electricity prices reach their highest levels in a given year. Being the sunniest months in the calendar year, June, July and August are also the months when solar electric systems are operating at their annual maximum, either contributing electricity to the grid or offsetting consumption on-site. WPSC's treatment of net excess generation discourages customers from investing in a renewable energy technology that contributes to system reliability and cost savings to other customers at times when grid-supplied energy is at its most expensive.

Moreover, on a simple fairness standpoint, WPSC's policy on net excess generation imposes a penalty on prospective system owners that customers in Eau Claire or Madison do not experience. As demonstrated in the example above, it encourages a 3 kW system instead of a 4 kW system that would have been selected in WEPCO, MGE, WPL, or NSP service territory. In addition to foregoing the larger size, the incremental economic activity that represents, and the system-wide benefits it would have provided, it also deprives the customer of the additional Focus on Energy benefits that he would have qualified for with a larger system. A large part of the rationale for establishing Focus on Energy as a statewide renewable energy program was to standardize incentive offers between one utility service territory and the next. That standardization results in a per-kW incentive regardless of retail utility. However, when WPSC's net metering policies provide a disincentive that the other utilities do not, the practical effect is that WPSC customers forego projects or install smaller projects than they would if

located in another utility's service territory and therefore qualify for fewer Focus on Energy funds. In other words, WPSC customers pay the same amounts to Focus, but get fewer benefits from Focus, due to WPSC's tariffs.

This discriminatory effect is further compounded by the fact that the cost of solar PV decreases somewhat on a $/watt basis as system size increases. Modules, which are the most scalable component of a solar electric installation, are not the only cost. Other cost categories include balance-of-system equipment, labor and permits. The labor requirements involved in securing permits from land use bodies and engineering departments, let alone preparing applications to interconnect with a utility or to receive Focus on Energy incentives, do not necessarily decrease proportionally to downsizing of a solar installation. The installation contractor must also be present during any acceptance testing performed by the local utility, regardless of system size. Therefore, a policy that has the effect of arbitrarily reducing optimal installation size relative to a customer's internal consumption not only causes the customer to forego some Focus funding, but also increases the unit costs of his or her system.

While WPSC's policy on net excess generation is not the only reason why solar installation activity in its territory has waned since it implemented monthly netting on April 1, 2011, it is a significant contributor to this slowdown. Again, this means the economic return from solar PV is worse for WPSC customers than for customers of other Wisconsin utilities. As a result, fewer WPSC customers take advantage of the limited Focus on Energy grants for solar PV. Customers of

other utilities are therefore effectively greater Focus on Energy benefits than are WPSC customers.

Q. Has WPSC justified the use of a monthly netting period, rather than the annual period used by all other Wisconsin investor owned utilities, based on any WPSC-specific factors?

A. No. Based on fundamental ideas of fairness and consistency in administrative decision making, one would expect that requests for disparate treatment by one Wisconsin IOU over other IOUs would be supported by some demonstration that the application IOU is somehow different in a relevant way justifying the different treatment. WPSC has not even attempted to do so here.

Q. What is your recommendation to the Commission regarding WPSC's treatment of net excess generation under its net metering tariff?

A. RENEW requests that the Commission take a step towards standardizing net metering policy in Wisconsin by ordering WPSC's net metering tariff to all annual netting; that is, to carry forward energy generated but not use in any month for a 12-month true-up period. This would make WPSC's netting period consistent with the current tariffs for NSPW, WEPCO and MGE and effectively equivalent to WPL. NSPW and WEPCO have fixed 12-month periods, while MGE uses a 12-month rolling average of customer consumption to determine the crediting of generator output each month. Both approaches, in RENEW's view,

are practical and reasonable. Annual netting should be also offered to all existing customer-generators who took service under the Pg-4 tariff after March 31, 2011.

Q. What impact would that proposal have on WPSC's revenues?

A. On an individual system basis, switching from a monthly netting policy to a 12-month netting policy would result in a decrease in the kWh sold by WPSC to net metering customers and decrease the kWh purchased by WPSC at its "avoided cost" rate. I do not have enough information to estimate the impact from that change on net metered generation installed between April 1, 2011 and the present. However, I can provide a framework for estimating the impact on revenues from net metered systems that begin operation in 2014 and 2015. We can start by making several assumptions:

(1) solar will account for more than 90% of the kWh from new net metered generation sources added in 2014 and 2015;

(2) net annual additions of solar capacity in a calendar year will be 300 kW (WPSC's pro rata share of a 2 MW/year increase statewide);

(3) the percentage of output that will offset customer purchases, rather than being overproduction and purchased by WPSC at the "avoided cost rate," will range between 10% and 20%;

(4) the median start date for all net metered generation sources added in each of the next two years will be July 1st of the year the system was installed;

With those assumptions, we can perform the calculations for 2014. Three hundred kW of solar PV should produce 360,000 kWh annually in WPSC's

service territory. Dividing that total in half to account for the July 1st start date results in 180,000 kWh in the first year. Ten percent of that total is 18,000 kWh and 20% is 36,000 kWh, with the median (15%) being 24,000 kWh.

The cost of this adjustment can be estimated by multiplying the difference between the lower-tier number and the retail rate. If that difference is 5 cents/kWh, then the adjustment would cost $12,000 in 2014. If that difference is 10 cents/kWh, then the adjustment would cost $24,000 in 2014.

Performing the same calculation for systems installed in 2015 and adding a full year's impact from solar systems interconnected in 2014 results in a cumulative impact ranging from $36,000 to $72,000.

Given the fact that WPSC's revenues from electricity amount to $961,050,283, the rate impact from changing the true-up period from one month to an annualized period, representing at most 0.0075% of revenues, can only be characterized as *de minimis*. Moreover, the benefits to the system provided by solar PV encouraged by this policy change, which thus benefit other ratepayers, should more than make up this nominal revenue change. These benefits, which will be discussed later in my testimony, include energy purchases and generation, utility generation capacity impacts, avoided losses, reduced transmission and distribution investment needs, reduced Wisconsin RPS compliance costs , fuel price hedging, avoided transmission costs, and market price suppression.

Q. Has WPSC provided <u>any</u> basis that can justify changing its current 100 kW capacity limit for net metering to 20 kW?

A. No. At most, WPSC is continuing to raise the same objections that it raised in 6690-UR-120, when the Commission increased the net metering limit to 100 kW. While the company obviously did not agree with the Commission's decision in 6690-UR-120 to set the capacity size at 100 kW, its continuing disagreement does not constitute a new change in circumstances that would justify the cap size reduction.

Q. Does the Commission's decision in WEPCO's most recent rate case, 5-UR-106, provide a new precedent that can be applied to justify WPSC's request to decrease the size from the current 100 kW to 20 kW?

A. No. The Commission's decision in 05-UR-106 was to maintain the 20 kW cap that had previously been in place in WEPCO's net metering tariff through the 2013 and 2014 period. If anything, this supports a policy of maintaining size caps which, here, means maintaining WPSC's 100 kW cap.

RESTRICTING NET METERING TO ENERGY-ONLY CUSTOMERS

Q. WPSC proposes to restrict availability of its net metering tariff to energy-only customers. What is RENEW's position on that proposed change?

A. RENEW opposes the proposed change on two grounds. First, WPSC provides no documentation or evidence to support its assertion that the net metering tariff "is intended for small customers who should only qualify for energy only rate schedules." There is no discussion in the Advance Plan 6 Findings of Fact and Order (05-EP-6) that provides any basis for restricting access to net metering

based on customer size or other criteria related to rate structures. Indeed, in the 20 years that RENEW has participated in utility rate cases, this is the first in which the utility has proposed limiting availability of net metering to small customers only.

Second, this proposal, coupled with WPSC's proposal to reduce ceiling on net metered systems from 100 to 20 kW, would effectively prevent any demand charge customer from using solar energy to reduce its energy and demand charges. These proposals, taken together, would treat a large slice of institutional customers—schools, manufacturers, large agricultural operations—as independent power producers, even though these systems are sized to supply a portion of the electricity consumed on-site by the system owner.

Q. Has WPSC supported its request to limit net metering to energy-only rate classes, and excluding customers on demand rates?

A. No. WPSC's purported basis for this restriction is a derivative of the company's unsupported request to change the net metering system capacity size from 100kW to 20kW. In response to discovery WPSC asserts that the basis for the request to limit the tariff to energy-only classes is because at 20kW, the maximum production would be 14,880 kWh/month, which is too small to qualify for a demand rate category. This is faulty for at least two reasons. First, it assumes that the Commission will accept its proposal to revert to a 20 kW system cap. But WPSC has made no case of changed circumstances sufficient to justify such a change. Second, it confuses monthly energy production and use with

instantaneous energy production and use. WPSC's reasoning is that if the Commission agrees to limit system size to 20kW, a larger customer on a demand rate would not be able to satisfy all of its monthly energy consumption with the monthly production from a 20kW system. Thus, WPSC reasons, these customers can use renewable energy behind the meter to reduce energy use but do not need the bi-directional netting provided by a net metering tariff.

But, of course, just because a larger customer's monthly energy use each month exceeds the monthly production from a 20 kW (or even a 100 kW system with a capacity factor of solar PV), does not mean that the customer's instantaneous use during every second during the month equals the instantaneous production. Monthly energy use by large customers represents a relatively steady usage over 720 hours, whereas solar PV generation represents generation primarily during the 8-hour "solar window" of 9 am to 5 pm, or 240 hour per month, with a disproportionate amount of that energy being generated between 10 am and 3 pm, or 150 hours per month. To make the case that demand billed customers do not need net metering, WPSC would need to show that those customers' loads during the "solar window" hours do not exceed production from the maximum sized net metering system (whether 20 or 100 kW). It has not done so.

Q. Are there any other problems with WPSC's proposal to exclude larger customers from the net metering tariff?

A. Yes. It belies WPSC's arguments against net metering in general. WPSC argues in this case that net metering should be curtailed because customers who self-generate avoid certain "fixed charges," by which WPSC means primarily demand-related costs based on its responses to discovery in this case. But, if that were true, WPSC should then welcome participation in net metering by demand billed customers because, even under WPSC's theory, few if any "fixed charges" are included in the energy charge for demand-billed customers and therefore the reduced energy sales due to net metering avoids fewer "fixed costs" by demand billed customers than by energy-only rate customers.

Q. Can you provide a specific example of how these proposed restrictions would diminish cost-effective uses of solar energy by larger customers?

A. Yes. Let's look at the example of Ace Manufacturing Industries (AMI). Located in Howard, AMI is a machine shop with 75,000 square feet of manufacturing space and more than 100 employees. It is a demand-metered operation, but is not enrolled in WPSC's Response Rewards program. AMI's roof space can accommodate a 100 kW (AC) photovoltaic system, which would produce about 140,000 kWh/year, potentially supplying more than 5% of the company's annual energy consumption (2,500,000 kWh/year). The demand charge component of AMI's electrical service averages about 480 kilowatts. Under WPSC's current net metering service, the output from a 100 kW PV system would be less than what the company consumes in each month of the year, thereby ensuring that <u>every kWh produced would be credited at the customer's energy rate under WPSC's</u>

current tariff. Moreover, the system would enable to AMI to reduce its demand rating by up to 10%.

Without a net metering tariff that would enable the customer to fully internalize the value of a 100 kW PV system, AMI's only economically reasonable alternative would be to downsize the system to 20 kW or below because it cannot instantaneously use 100% of the energy produced by a 100 kW system during every hour, despite being able to use 100% of the energy produced if spread over the month. As noted before, reducing system capacity does not lower the cost of the installation in a proportional manner. A 20 kW PV system will always be costlier on a per kWh basis than a 100 kW system. So, without net metering AMI would need to install a smaller system and pay more per kW for that system.

Investments in solar energy help manufacturers like AMI control a portion of their energy costs and compete with other manufacturers in a global marketplace. Denying customers like AMI access to net metering service takes away that tool, one that similar manufacturers in other jurisdictions might avail themselves to lower their own production costs and acquire a competitive edge over AMI. Additionally, net metering is important to marketing. As the owner of AMI recently communicated to me, there are numerous Wisconsin customers who value sustainability in the manufacturing process. Without the ability to cost-effectively install a meaningful PV system, it is nearly impossible for companies like AMI to credibly market themselves as sustainable manufacturers. It is difficult for a Wisconsin company to market its strides towards sustainability if it

is limited to a 20 kW array, representing a mere 1% of its power consumption: large customers seeking to show sustainability as part of their marketing and branding must be able to offset more than a nominal percentage of energy use.

Q. What is your response to WPSC's assertion that net-metering demand-charge customers such as AMI imposes burdens on the billings department?

A. Such an assertion is not a reasonable justification for restricting net metering only to smaller customers. The planned solar system, which qualifies for net metering under WPSC's current tariff, restrictive as it is, is sized to maximize demand reduction and energy savings to the customer. To deny customers like AMI access to this energy-saving strategy based on weak assertions of nominal administrative burden would constitute, in our view, a discriminatory practice.

ASSERTIONS OF BURDENS TO NON NET-METERING CUSTOMERS OR SUBSIDIZATION.

Q. WPSC contends that net metering customers are "subsidized" by other customers, is that true?

A. No. A "subsidy" occurs when the cost to serve a class of customers (or, in the case of net metering, a sub-class) is higher than the total of the rates and other charges paid plus the other benefits conferred by that class of customers. To show that the net metering customers, as a sub-class, impose a higher cost of service compared to the sum of their payments plus benefits conferred by them

WPSC would need to run a detailed cost of service analysis specific to net metering customers as a subclass. They have not done so.

WPSC's cost of service study paints with the widest brush for class categories, especially residential and small commercial. WPSC's study assumes equal cost-causation per unit of energy consumption across the entire category. While that is certainly not the case, and WPSC would not credibly claim that every customer's cost causation per unit of energy consumption within a class is actually identical, that is the fundamental but unacknowledged assumption underlying claims of cost-shifting from net metering customers to others within the class.

Q. What would an analysis of the costs caused by and benefits provided by net metering solar PV customers show?

A. A study, which would need to be utility-specific, requires more resources than RENEW has for such a study. However, we know that based on the studies done in other states and by various organizations, there is a value provided by distributed generation resources to other customers in general, and by solar PV in summer peaking regions, specifically. One in particular we would highlight for the Commission's consideration is a report from the Vermont Public Service Department dated January 15, 2013, and titled "Evaluation of Net Metering in Vermont Conducted Pursuant to Act 125 of 2012." Ex.-RENEW-Vickerman-4. To our knowledge, this is the only study that looked to the cost versus benefits to the system as a whole from net metering. Another study that quantifies the

benefits of solar for New Jersey and Pennsylvania is provided as Ex.-RENEW-Vickerman-5. And the Rocky Mountain Institute recently provided a summary of other studies of the value of solar PV distributed generation for the system, utility, and customers, which is provided as Ex.-RENEW-Vickerman-6.

Q. Can you describe the conclusions in those studies?

A. Yes. In general, the "cost" of net metering on non-net metering customers is the decreased sales and, therefore, insignificant increase in the percentage of long term investments that must be spread among the remaining sales. The benefits from net metering on other (non-net metering customers), which is completely omitted from WPSC's discussion, is comprised of eight categories:

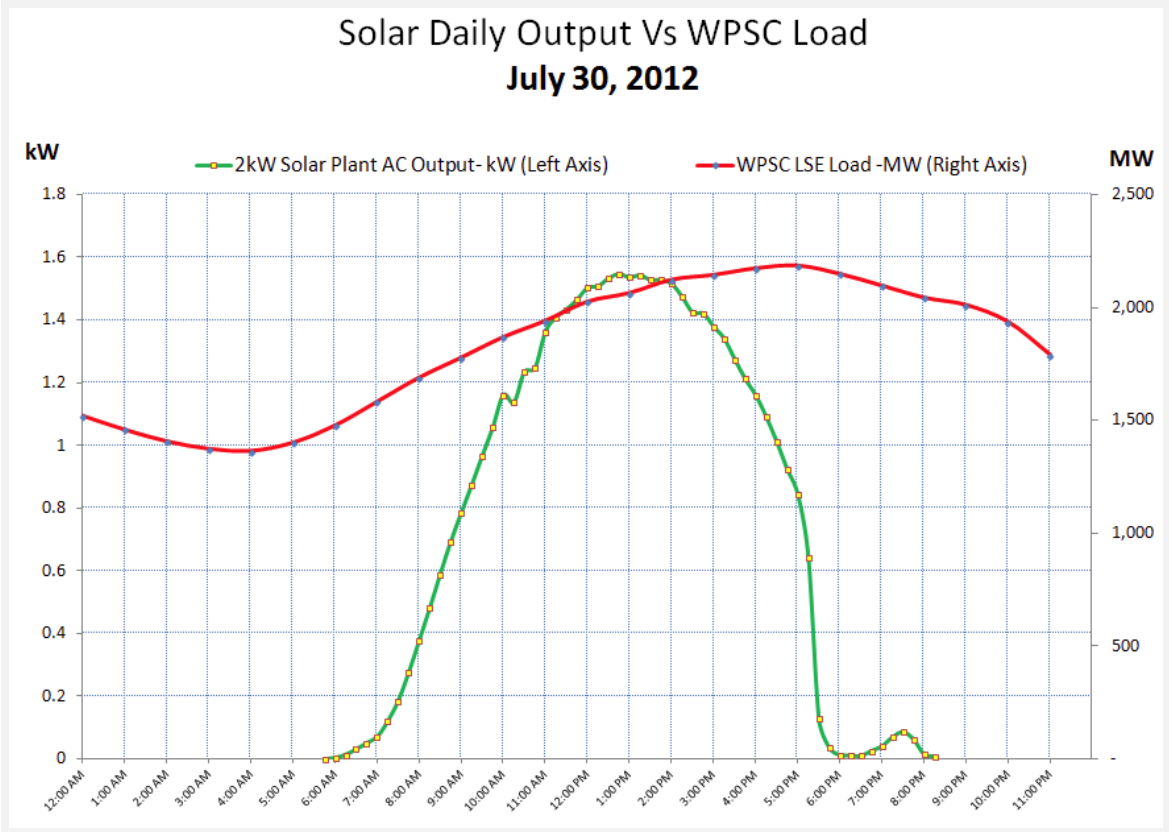
- **Energy Purchases or Generation.** Customer-owned generation reduces the amount of energy that the retail utility must purchase or generate for sale to the customer. This value can be calculated based on calculating the hourly output of the PV generation each hour of the year and the value of energy for each corresponding hour.

- **Utility Generation Capacity Impacts.** Customer-owned generation, especially solar PV which produces during all hours of sunlight without any additional variable input costs or decisions, has an impact on the retail utility's capacity needs. Because customer generation is produced and either used by the customer or delivered to the distribution grid and consumed by a neighbor nearby to the

generation, it shows up on the system as a whole as reduced demand. Because utilities in Wisconsin still plan on a utility specific basis, the value of customer-owned generation will depend on its effective capacity during the WPSC system peaks and WPSC's incremental capacity costs. Because WPSC has recently announced plans to add more company-owned generation, capacity value will likely depend on the cost and timing of those additions.

Various studies, including the one by Xcel and the one conducted in Vermont, show that projecting the capacity value from solar is possible, especially for summer peaking utilities where solar irradiation and cooling demand are fairly tightly correlated. To do this analysis, real time correlations between solar PV output and WPSC system demand can be matched and a ratio between the solar system capacity size (i.e., how many kW the system is rated for) and its capacity value can be determined. For example, the Xcel study concluded that in Colorado, solar PV had equivalent capacity values of 53 to 76%, depending on its location and orientation. The Vermont study paired actual system load data with solar PV production data for matching days and hours and concluded that solar PV provides 49.5% capacity value for fixed and 59.5% value for tracking in Vermont. While these studies are obviously specific to states other than Wisconsin, they demonstrate the ability to calculate a capacity value of solar, in addition to the avoided energy value.

A study of multiple states provides a series of data, depending on the solar modules' orientation and solar's penetration as a percentage of load. For Wisconsin, with a solar penetration up to 2%, a south-facing solar array at 30



degrees tilt provides 47% of its nameplate capacity at peak. If that array is oriented southwest at 30 degrees tilt, it provides 51% of its nameplate capacity at peak. Those data are shown in Table 2 in Ex.RENEW-Vickerman-7.

In fact, an example of the capacity value from solar is available in the one data point WPSC used in response to discovery in this case. To show that solar production can begin to drop off before system load does, WPSC produced a comparison of solar generation and load:

It is unclear from WPSC's example whether it used actual solar production from July 30, 2012, or if generic average data was used. And it is also not clear what system design, orientation, and tilt were assumed. Plus, this is provided for a single day only. For these reasons, WPSC's example has little

value to extrapolate solar capacity value in general, but it does highlight that even in an example hand-picked by WPSC to show that solar production can peak prior to system peak on one particular day, the solar production during the WPSC system peak on that day was not zero. That is, while solar was not contributing 100% of its rated value, it does have capacity value as it was contributing around 40-45% of its rated value at system peak. Moreover, it demonstrates that capacity value can be determined for distributed solar PV.

- **Avoided Losses.** Distributed resources generate energy at or near the point of use, reducing energy flow on transmission and distribution lines. Because losses are directly related to energy flow, reduced loading through distributed generation during hours of high flow has much higher savings compared to average system losses. Because solar PV correlates well with peaks on certain feeders and on transmission, it avoids more system losses than generic, average, per-kWh losses expressed across all hours would indicate.

  In response to discovery, WPSC identified peaks on different substations in 2008-2012. Notably, each substation can have different peaks, which can also be different than the system peak. While some of those peaks are later in the day, after solar PV from fixed orientation systems has peaked, many of the peaks occur in the period from noon to 4:00 pm, when solar generation is high. Again, because losses depend on flow, reducing loading during the peak hours has a disproportionate value in reducing losses compared to the annualized calculation of losses. To determine the value provided by solar PV distributed generation,

losses would need to be calculated hourly with power flow studies and correlated to solar PV generation profiles. WPSC has not done this analysis.

- **Reduced Distribution and Transmission Investment Needs.** Cumulatively, increasing distributed generation can reduce the grid energy requirements and the loads on local distribution feeders and transmission lines, reducing overall costs for all customers. The specific impacts depend on the individual feeder lines where distributed generation is located and the correlation between solar generation profiles and load profiles. While WPSC has not done this analysis, which it would need to do to determine the actual cost-causation versus benefits provided by net metering customers, as noted above, solar PV generation can be expected to reduce loading during many of the peak hours on the distribution system.

- **Fuel Price Hedging.** Electricity generation from net metering customers provides a fuel price hedge-like value because it provides energy at a known value that is not affected by fuel prices. This value remains for the entire expected life of a system, which for solar PV is 20 years or more. Most utilities hedge against fuel price uncertainty at a cost to ratepayers. Increased solar PV generation decreases the required hedge and therefore the cost.

- **Reduced RPS Compliance Costs.** Even where the utility is not obtaining the RECs from customer generation, that generation reduces retail sales and,

therefore, the denominator when determining compliance with renewable portfolio standards that are based on percentages of retail sales.

- **Avoided Transmission Costs.** WPSC's transmission costs, which are passed along to ratepayers, depend on ATC's costs as well as WPSC's proportionate share of ATC's 12CP. Distributed generation, especially solar, can reduce both. First, it can reduce overall system loading and, therefore, the need to build new transmission infrastructure and costs. Second, and more immediate, every MW of load that is subtracted from WPSC's distribution system during the 12 peak monthly hours comprising ATC's 12CP saves transmission costs for all WPSC customers for the year. Because distributed generation shows up in this calculation as avoided load, net metering customers reduce the total transmission costs for WPSC and therefore the transmission costs for each WPSC customer. This specific benefit can be calculated by pairing solar PV generation profiles with ATC's 12CP hours. WPSC has not done this analysis.

- **Market Price Suppression.** Reductions in overall load through distributed generation shifts the relationship between the supply curve and demand curve for energy and capacity. Net metering shows up as load reductions on the system, meaning that it can shift overall loading on the generation loading ladder, reducing overall costs for all customers. The actual value depends on the amount of distributed generation built and projections of the dispatch order in future years. WPSC has also not looked at this benefit from net metering customers.

Q. WPSC contends that net metering customers do not pay the full amount of the costs they cause, resulting in increased rates for non-net-metering customers and a "cross subsidization." Is that correct?

A. No. As will be described further in my testimony, WPSC's assertion is premised on several mistaken assumptions. However, first it is important to put WPSC's complaints—even if they were correct—into perspective. That is, even if net metering customers caused all of the costs that WPSC assumes, and provided no benefits to other customers, which WPSC conveniently ignores, the rate impact is negligible.

I estimate that doubling the amount of all net metering customers on WPSC's system from 2005 to 2013 with solar PV would result in a decrease in sales of approximately 3,000 MWh annually. Even if those sales represented a shift of $0.09/kWh of fixed costs shifted to other customers, as WPSC purports, this represents $270,000, or a $0.000025/kWh increase spread across WPSC's projected sales. Rounding conventions used in the rest of the Commission's ratemaking has a larger impact on rates than this. Not only is this impact insignificant on an absolute basis, but it pales in comparison to real cross subsidizations elsewhere in Wisconsin rates. For example, the cross-subsidization of Milwaukee steam customers from WEPCO electricity customers (0.016% of electricity rates) is approximately 100 times more than any cross-subsidization of net metering customers, even if all of WPSC's assumptions are credited.

In any event, WPSC has not done the minimum analysis necessary to show a cross-subsidization and, if it were to do such an analysis, it would almost certainly show that net metering customers provide benefits to other customers at least equal to any costs imposed.

Q. Can you estimate how much generating capacity is served by WPSC's net metering tariff?

A. Working from a spreadsheet derived from WPSC's response to 01-RENEW INT-8 (Ex.-RENEW-Vickerman-8), renewable energy capacity taking service under WPSC's net metering tariff increased by 2.54 MW from 2005 to 2013. When added to our estimate of pre-existing net metered renewable electricity generation, WPSC may have as much as 2.7 MW of installed capacity under this tariff and its predecessors. This corresponds to 0.1% of the generating capacity presently committed to serving WPSC customers.

Q. Can you estimate how much electricity is produced by these generating units?

A. Annual capacity factors for small wind and fixed-mount solar electric systems typically range from 10% to 15%, though with newer PV systems on trackers, the capacity factor could exceed 20%. Thus, if we assume an annual capacity factor of 13%, the estimated output from the systems listed in 01-RENEW INT-8 in a full year of operation would be 3,047,760 kilowatt-hours (kWh), or a little over

3,000 MWh. This represents a tiny fraction (~0.02%) of the projected 10.7 million MWh sold by WPSC.

Q. WPSC points to Ex. Hoffman Malueg-1, Schedule 2 page 1, lines 1-50, as the basis for its assertion that net metering customers are not paying the full cost of service to them. Why is that misleading?

A. For several reasons. First, it assumes that WPSC has correctly attributed costs to energy and demand categories and that there is no connection between a reduction in energy use and a reduction in demand. From Ex. Hoffman Malueg-1, Schedule 2, page 1, lines 1-50 it appears that by "energy," what the company means is primarily the incremental cost of fuel used in existing generating units. The company appears to include all other costs in "demand." This assumes that from now until the end of time, if WPSC never sells another kWh, the only costs it avoids are fuel costs and to a small extent, some other variable costs of generation. Under this theory, even if energy use fell off to nothing, the company would still build, maintain, or make capital improvements to existing plants, have the same staff, and otherwise continue to run its utility in exactly the same way in order to provide capacity used. This does not represent a realistic projection. There are almost certainly costs of energy, especially on a levelized basis across the 20-plus year equipment life of customer owned generation, that are included in the costs WPSC allocated to "demand" and that are avoided by reduced energy requirements. This is all to say that just because WPSC allocated costs to the "demand" column in its spreadsheet does not mean that those costs are not

actually avoided by distributed generation over the long term life of distributed generating systems.

Second, WPSC's theory assumes that all customers within the class impose the exact same costs proportionate to their energy use. That is, WPSC's claims of avoided "fixed costs" by net metering customers assumes that those customers impose the exact same costs on the system as non net-metering customers, but because those fixed costs are allocated by kWh, by purchasing fewer kWhs from WPSC when using self-generated kWhs, net metering customers are still causing the exact same costs for WPSC but not paying for them. WPSC provides no evidence to support the assumption of identical cost-causation. In fact, the evidence suggests otherwise. As noted in the studies discussed above, customers with solar PV are producing some energy behind the meter during peak periods. In fact, they are may be producing more than enough to offset their use during peak periods and are pushing energy into the distribution system that will be used by their neighbors, taking additional strain off of the system, decreasing capacity costs, transmission costs, and losses. Instead of causing the same costs to the utility, these net metering customers are more likely causing negative costs. In any event, WPSC provides no evidence that the average customer costs across hundreds of thousands of customers, purportedly represented by line 50 in Ex. WPSC-Hoffman Malueg-1, Schedule 2, actually represents the costs of net metering customers as a subclass.

And, even if WPSC could show that net metering customers cause more costs per kWhs of energy sales compared to the average customer in the class,

there is no reason to pick on net metering customers. There is no evidence that any divergence of net metering customers from the class-wide average cost-per-kWh-sold (if any) is disproportionate to the wide difference inherent in any category as broad and diverse as WPSC's customer classes. A customer without air conditioning or who is away for work Monday through Friday each week has a smaller cost causation than the customer class average, but pays the same cost per kWh. And a customer with a huge cooling load, an arc welder, or machinery with short bursts of high demand can impose high costs compared to the customer class average but does not pay more per kWh. This is the nature of broad categories, and WPSC has not presented any evidence supporting its contention that net metering customers are outside the range of normal within the class.

"AVOIDED COSTS" FOR EXCESS GENERATION

Q. WPSC Proposes to use the average LMP prices for any excess generation by net metering customers. Is this reasonable?

A. No. The average LMP fails to represent avoided costs from net metering customer generation for several reasons.

First, the LMP represents only the short-term marginal cost of energy from the next available existing generation unit in the central United States, plus congestion charges and losses. But WPSC does not rely on the short-term energy market. Rather, it makes long term capital-intensive investments with levelized costs higher than the LMP and expects customers to pay for WPSC's investments rather than merely the LMP. In fact, it recently proposed a new combined cycle

generating plant that will certainly cost more on a levelized basis than the current average LMPs. Short-term LMPs are to the electricity costs for a rate-based, regulated utility like WPSC as apples are to orangutans.

Customer-owned generation that qualifies for net metering will be primarily solar, which will generate anytime there is sufficient sunlight for the next twenty years or more. This can displace or delay future WPSC investments, reducing levelized costs. Unlike customer-owned diesel generator sets seeking to sell energy when cost effective but which would not be dispatched otherwise and could be shipped to a different location without notice, net metering customers' investments in solar PV will be in place for twenty years or more and will produce energy whenever there is sunlight, regardless of the short term energy prices. Those customers are equivalent to parallel generators seeking long term energy-sale contracts with WPSC and should therefore also get the benefit of a levelized avoided cost.

Notably, when WPSC calculates the avoided cost of other variable, renewable energy sources for possible power purchase agreements, it uses dispatch modeling and determines a levelized cost savings that is not merely the average LMP projections. See for example, WPSC's descriptions of avoided cost analyses in 02-RENEW/INT-23, which is provided in relevant part as Ex.-RENEW-Vickerman-9. It would be appropriate to require WPSC to work with RENEW to revise WPSC's prior RTSIM model for a solar project to update it for current inputs and increments of distributed solar to calculate an appropriate avoided cost rate.

Second, because the vast majority of future net metering customers will be solar PV, and solar PV produces more during the summer months and only during daylight hours, it is literally impossible for those customers to be selling equal amounts of power on a continuous 8760 hours/year basis, which is what the annual average LMP represents.

Including nighttime hours to determine the value of energy that can only be produced during daylight is baseless. Even if short-term marginal energy costs are used as "avoided costs," only daylight hours can be used.

Further, energy production is significantly higher in the summer than winter. In the graph above, provided by WPSC, it can be seen that energy production in April through September is about four times greater than October through March. Moreover, sales to WPSC only occur when customer generation exceeds customer consumption. In the winter, energy production is unlikely to exceed customer consumption, resulting in zero sales to WPSC in those months. We have analyzed the data from WPSC's current net metering customers. Of 254 customers between 2005 and 2013, only 80 made net sales of electricity to WPSC during any month. Of those, the vast majority of sales were made during summer months. A graph depicting these data is provided as Ex.-RENEW-Vickerman-10. What this demonstrates is that, in addition to only be provided during daylight hours, the vast bulk of electricity actually sold to WPSC as excess generating by net metering customers is during summer months. Determining an avoided cost based on the average of all 8760 LMPs during a year, instead of the primarily

summer and shoulder season daytime LMPs provides a price much lower than the avoided costs during the hours electricity is actually being sold to WPSC.

With the data already available, even if short term LMPs are used, a reasonable energy value can be determined by using only hours 9 am to 5 pm to determine each month's average LMP, and then weighting each month based on the percentage of total sales in that month to annual sales as shown in Ex.-RENEW-Vickerman-10.

Third, as was done in WEPCO's most recent rate case (05-UR-106), the Commission should provide a credit for transmission. However, since solar PV can only provide energy sales to WPSC during daytime hours, any $/kW transmission credit can only be collected if divided by daylight hours. Dividing by 8760 hours means it is impossible for solar PV owners to collect more than 50% of the credit that is due to them. And based on capacity factors for solar, and the fact that net metering customers consume most of the electricity they produce, they can only collect a tiny fraction of the transmission credit if divided among all hours.

Fourth, if the LMP is used for marginal energy costs, a capacity credit should be added. This has been the Commission's established practice since the early 1980s, when 75% of rated capacity multiplied by an equivalent peaker combustion turbine was assumed in the parallel generation rate. While RENEW would support continuing that policy, we also would not dispute that the data for solar PV production profiles and WPSC's current peak hours supports a credit in

the range of 50% of rated capacity. Either way, the capacity credit is appropriate and should be included.

Q. Of the net metered generating systems installed between 2005 and 2013, what percentage is powered generate with solar?

A. Between 2005 and mid-2013, 239 generating systems began producing renewable electricity under WPSC's net metering service. Of that total, 202 of these systems are solar PV-powered. The preponderance of PV systems relative to wind energy has become more pronounced in the last 18 months, due in part to WPSC's monthly netting practice. For the foreseeable future at least, I expect that solar PV will comprise more than 90% of new net metered installations interconnected to WPSC.

Q. How does your estimate of net metered output compare with WPSC electricity sales in 2012?

A. WPSC's reported electricity sales in 2012 totaled 10,596,146 megawatt-hours, or 10,596,146,000 kWh. RENEW's estimate of annual net metered output from currently installed systems (3,047,760 kWh) constitutes 0.028% of total WPSC electricity sales. At such a low rate of penetration, any impacts to rates would be scarcely discernible.

Q. Is WPSC experiencing significant growth of net metered customers and output?

A. As indicated in the table below, there was a brief spurt in net metered generation capacity beginning in 2010. This spurt peaked in 2011, with more than 1 MW of new capacity coming on line. Installation activity slowed markedly in 2012 and through the first five months of 2013. WPSC's results do not materially differ from the reports filed by other Wisconsin electric providers in an ongoing docket (05-GF-233), regarding RENEW Wisconsin's petition to revise PSC 119 rules for the interconnection of distributed renewable generating systems.

WPSC Net metering installations
No. of installations/kW capacity by year and type

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Cumulative Capacity	119	185	303	741	1,773	2,006	2,119
Annual addition	119	66	118	438	1,032	323	113
Wind	4/55	2/15	7/85	4/37	12/396	2/30	--
Solar	16/64	11/46	5/33	56/401	72/636	37/293	5/113
Other		1/5					

Q. Is this trend at WPSC indicative of a national trend?

A. We are not aware of substantial declines in customer-sited renewable generation occurring in other states, though relatively few states monitor net metering activity closely. One that does is Vermont. As is indicated in the table below, total installed capacity of net metered generation systems in Vermont topped the 20 MW mark in 2012. Nearly six MW of net metered generation were installed in 2012, which is the second highest annual total recorded in the 2007-2012 time frame. Comparisons between Vermont and WPSC are apt. The territory served by WPSC and its Michigan affiliate (11,000 square miles) is slightly larger than the

entire state of Vermont (9,623 square miles). The largest city is WPSC territory, Green Bay, is very close in latitude (44.513) to the largest city in Vermont, Burlington, which is at latitude 44.475. If anything, Vermont's solar irradiation profile is not as good as Wisconsin Public Service's. Yet, due to fair treatment of solar PV, Vermont's economy is benefitting from a robust solar growth while Wisconsin's is falling off.

VT Net metering applications
kW capacity by year and type

	2007	2008	2009	2010	2011	2012
Cumulative Capacity	1,797	2,835	5,305	11,391	14,376	20,910
Annual increase	494	1,037	2,452	6,076	2,984	5,817
Methane	0	19	39	127	0	69
Wind	143	144	492	179	223	137
Solar	351	874	1,921	5,780	2,761	5,611

According to the Solar Energy Industries Association, solar generation capacity in the United States increased by 76% in 2012 over 2011 levels, spurred by a 27% drop in the average price of a completed PV system. However, of the 3,313 MW of PV capacity added in 2012, less than 3 MW were installed in the Badger State, and an even smaller amount will be installed in 2013. The additional restrictions to utility net metering service being proposed by WPSC would only exacerbate this disturbing trend.

Q. Focusing on net metered systems subject to interconnection agreements signed after March 31, 2011, that is, since the 100 kW system size and two-

tiered net metering rate structure from the last rate case order, are new net metering customers oversizing their PV systems?

A. Based on Ex.-RENEW-Vickerman-8, it's difficult to know for certain whether net metered systems installed on or after April 2011 are subject to the current Pg-4 rate or were grandfathered under its predecessor. Moreover, there is only one full year of data available with which to analyze the performance of 2011 installations placed in service in the second half of that year. These limitations notwithstanding, with these systems coming online after the 100 kW size increase and the two-tiered rate structure, there were fewer and less consequential occurrences of annual output exceeding annual consumption than with systems of earlier vintage. It's also worth noting that 2012 was an unusually sunny year in Wisconsin, with output exceeding previous year's levels by 10% at most locations. Therefore, a more typical year would show even lower annual production, thus fewer customers under Pg-4 producing in excess of consumption.

This confirms that providing a buy-back rate based on avoided costs, which is lower than the levelized cost of solar PV, provides sufficient disincentive to oversizing a generating system without the further paperwork hurdle of requiring that the system be sized to the load. Such a requirement provides no value and only adds administrative burden and conflict, since the standard is too vague and impossible to determine when a system is designed and installed once, lasting for more than 20 years, while load fluctuates over time.

CONSISTENCY BETWEEN INVESTOR-OWNED UTILITIES' NET METERING TARIFFS

Q. Has the Commission ever adopted a net metering policy applicable to all regulated utilities?

A. Yes. In its Advance Plan 6 Order (05-EP-6) issued 20 years ago, the Commission required regulated utilities to offer net metering for renewable energy systems up to 20 kilowatts. The September 1992 order states that "the utilities shall reestablish net energy billing in their next rate cases, where it is not offered now, for customer-owned renewable energy resource generators under 20 kW." (1992 Order, Conclusion of Law 4.4 at P. 115). In setting forth this requirement, the Commission noted that "[n]et energy billing will tend to promote small-scale renewable energy resources." (P. 24)

Q. What other recommendations do you have regarding WPSC's current net metering service?

A. RENEW requests the insertion of a sentence in the tariff sheet that states: "Customer shall retain all renewable credits and other attributes associated with the energy provided to the Company pursuant to this tariff." The purpose of this language is to disclose to the customer that he or she retains possession of all renewable credits and attributes associated with the renewable energy provided to the utility. This language already appears in NSPW's and MGE's net metering tariff sheets.

Q. Do you have anything to add on the subject of solar energy in Wisconsin?

A. Yes. Customers have been the principal drivers of solar electric systems installed in Wisconsin. From 2006 to 2010, utilities like WPSC accommodated growing customer interest in solar by offering special buyback rates for qualifying installations, and in some cases, additional up-front incentives that were administered through Focus on Energy. By February 2012, however, Wisconsin IOU's had discontinued all their solar-specific incentives. This leaves net metering as one of the only viable mechanisms in Wisconsin for advancing solar energy, a preferred energy resource under the state's energy policy hierarchy (Wis. Stats. § 1.12(4)). The net metering services now offered by NSPW and MGE should be used as the current reference for aligning terms and conditions specified in utility net metering service. That said, those tariffs have problems in how they calculate avoided costs for the reasons described above.

Q. To summarize, what is your recommendation with respect to WPSC's current net metering service for existing customer-generators taking service after March 31, 2011 as well as new customer-generators?

A. RENEW asks the Commission to require WPSC to carry forward excess generation over a 12 month-period and allow WPSC to choose whether it wishes to employ a rolling 12-month average to determine the net, as MGE does, or to calculate the net at the end of a fixed 12-month period, as NSPW does.

Q. What is your recommendation with respect to WPSC's proposed changes to its net metering service?

A. RENEW asks the Commission to reject the utility's proposals to (1) limit net metering to energy-only customers and (2) lower the maximum eligible system size from 100 kW to 20 kW.

Q. Do you have any other recommendations for the Commission?

A. Yes. RENEW asks the Commission to investigate and quantify the benefits that solar energy customer-generators in WPSC territory provide to their utility and therefore to non-net metered WPSC customers. The study released by the Vermont Public Service Department is a reasonable template for identifying the multiple services provided to all ratepayers from net metering. It also provides a reasonable basis to establish avoided cost for so-called "surplus" kWh produced by customer-generators. The current use of short term LMPs captures only the energy and some transmission savings from net metering customer generation, while ignoring capacity-based savings and reduced need for infrastructure upgrades.

Q. Does this complete your direct testimony?

A. Yes.