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Public Service Commission of Wisconsin
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TO: John Shenot, Public Service Commission

FROM: University of Wisconsin Madison Energy Analysis & Policy Capstone Group

DATE: June 15, 2009

RE: Response to PSC Briefing Memorandum

Issue 1: Should the Commission expand the availability and use of ARTs in Wisconsin?

Two related issues which must be considered are (1)Do the overall costs of RPS obligations outweigh the benefits and (2.) How are the benefits of an ART and an RPS impacted by a carbon price. In our analysis, we found evidence from secondary literature which would suggest that mandatory feed-in tariffs would actually be economically beneficial under carbon-constrained economies (For example, see Germany Ministry of the Environment evaluation of their Renewable Energy Sources Act).[1] While we believe this issue is a political decision outside the scope of the Capstone analysis (which determined what the $$/kWh energy payments would have to be in order to yield total cost recovery of renewable installations), we strongly encourage the Commission to study the ratepayer impacts of an RPS and ART policy in scenarios where there is a federally-imposed carbon cap-and-trade regime.[2] We do not seek to have ARTs compete with the State's RPS. Instead, we wish to capture in-state renewable opportunities that are not likely to be encouraged by Wisconsin's RPS (See "Effectiveness through Risk Reduction" by Mitchell, Bauknecht, and Connor[3]).

Specifically, regarding "enforcement" and "uniformity," the Commission should of course respect the notion of unfair burden. The four technologies we chose to evaluate (PV,

[1] http://www.wind-works.org/FeedLaws/Germany/EEG%20Cost%20Calculations%20methodologies%20BMU.pdf
[2] See the UW Capstone Project "Advanced Renewable Tariffs for Wisconsin: Analysis and Case Study," submitted as Public Comment June 15, 2009.
[3] Mitchell, Bauknecht, and Connor, "Effectiveness through Risk Reduction: A Comparison of the Renewable Obligation in England and Wales and the Feed-In System in Germany," *Energy Policy*, Vol. 34, Issue 3, pp. 297-305.

small-scale wind, biomass, and biogas) are not likely to result in an "unreasonable" burden for any municipal, coop, or large utility regulated by the Commission in Wisconsin. However, the definition of "unreasonable" is a decision the Commission should make. Our opinion, though, is that it would be appropriate for the PSC to choose the technologies, and establish that those technologies ubiquitously receive ART payments.

We think it is important for all state residents to have access to an ART policy. However, since 90 percent of Wisconsin residents live within the jurisdiction of six utilities, due to regulatory constraints it may also be a reasonable policy choice to focus the ARTs on this 90 percent.

Issue 2: Should the Commission require uniformity in the ARTs offered by Wisconsin electric utilities?

Regarding the proposed alternatives, the Commission should consider that if utilities are offered a choice in establishing contract terms, a consistent methodology should be used to establish these contract terms. For example, as long as a 10-year contracts yield the same return on investment as a 20-year term, that makes little difference to the investor. With respect to "enforced uniformity," you can have flexible policy designs with the same underlying approach. In other words, regardless of how the policy is designed, the Global Warming Task Force recommendation that ART participants should earn returns on investment similar to those of Wisconsin IOUs needs to be consistent among all utilities and for all technologies.

Alternative One is most appropriate since it reflects the most successful, and widely used, ART policy mechanism. (We discuss pros and cons of 1A-1D in our report.) Alternative Two represents the fundamental flaw of existing ARTs. The term "adequate" is misleading and undefined. There is a big difference between the words "possibly" and "definitely" with respect

to a return on an investment. The outside observer can look at the numbers that currently exist and say "That's close enough." However, the bottom line is that the existing buyback and net metering programs are insufficient. The whole point of the Task Force recommendation and the German law and the Ontario Standard Offer program is to guarantee that an investor will earn a sufficient return on renewable energy systems.[4] So, without that "investment certainty", renewable energy will remain a niche product. With this in mind, the standard buyback rates and net metering cannot guarantee investment certainty, so policy must go beyond that if the Commission's goal is to significantly expand Wisconsin's renewable energy portfolio. Consider these open-ended policy questions about net metering and green pricing:

1. Net metering is a policy which essentially runs a kWh meter backwards because a PV system, for example, is generating electricity. This equates the value of that renewable electricity to displaced retail electricity sales. Is the retail price of electricity an appropriate method for valuing renewable electricity?
2. Green pricing programs essentially work such that retail customers pay extra for the utility to purchase renewable energy. Green pricing programs function as premiums on the retail electricity price. Thus, do green pricing programs extend the perception that renewable electricity is always going to be more expensive than its fossil fuel-based counterparts? If so, is this good policy?

Finally, Alternative Three represents the fundamental flaw of PURPA in the 1970s. What are your avoided cost assumptions? Using this methodology has proven to yield renewable energy payments which can drastically detract from market efficiencies. It also introduces uncertainty to the investor in regards to whether a renewable energy installation will be profitable.

[4] See Mitchell, Baucknecht, and Connor.

Uniformity should be addressed in program caps. We strongly recommend the Commission address the issue of ratepayer impact thresholds to determine program caps. In other words, what percentage of retail sales is acceptable to PSC in terms of differentiation in cost? However, we strongly suggest that the thresholds are considered within the context of a status quo with a carbon price added. Additionally, we encourage the Commission to address the relationship of installed capacity of various technologies and jobs.[5] In discussing program caps, we also strongly recommend that the Commission introduce periodic re-evaluations in order to respond to varying market and economic conditions. This allows for initially conservative program caps, but it also allows for periodically adjusted tariff rates to keep up with technological innovation.

A side note is that a primary benefit of an ART is that it drives technology innovation by encouraging the market penetration of those renewable technologies not likely to be brought to market. No energy resource to date has been able to capture a large market share without assistance from policy. That said, we recommend that the Commission refrain from speculative investments. We limited our analysis to PV, small-scale wind, biomass, and biogas because we made a clear determination that these four are not speculative and have significant benefits that represent currently missed opportunities (e.g., methane reduction, local generation, jobs).

Issue 3: If the Commission chooses to require uniformity in ART prices, what prices might be appropriate?

Table 1 shows the energy payments determined in our analysis. These energy payments are designed to provide 12.5% internal rate of return on equity for systems financed with 20%

[5] For example, see Blanco and Rodrigues, "Direct employment in the wind energy sector: An EU study," *Energy Policy*, Vol. 37, Issue 8, August 2009, pp. 2847-2857.

equity and the remaining 80% financed with debt borrowed at 8% interest and federal tax incentives. Some of the different assumptions we used are the following:

- 20-year versus 10-year Contract
    - 10-year contract length may be too short. This is particularly important for biomass and biogas systems which have high O&M cost per kWh. Because O&M costs grow with inflation, the profitability of small biomass and biogas systems will be highly sensitive to inflation. A 20 year inflation adjusted contract may be necessary to ensure profitability over the lifetime of these systems due to uncertainty regarding the rate of inflation. O&M cost per kWh for these systems is also highly sensitive to economies of scale so smaller biomass and biogas systems will be impacted more greatly by inflation.
- Other Incomes
    - Bedding recovery from biogas digesters and heating from biomass CHP systems were included in the analysis.
- Competitive versus Guaranteed Grants
    - Our assumptions excluded all competitive grants that are not guaranteed to the renewable power producers, such as Focus on Energy grants. We only considered grants that are guaranteed such as Federal grants and State tax exemptions. This assumption also ensures there are no concerns about systems receiving double subsidies, for example an ART which provides full cost recovery in addition to a Focus grant.
- Energy Payments Modeled off of “Best Case” Systems

- For each technology we established a reasonable best case system, which generally implied that the renewable power producer installs a somewhat cheaper than average system and operates it at a high, although technically feasible, capacity factor. For example, we assumed biodigester systems operate at 90% capacity factor, that wind turbines are only sited in class 3 wind areas and have towers ranging from 40 to 80 m high depending on the size class, and that solar panels are only installed in locations which have no shading and are facing directly South.

Our technology parameters, financial costs, and general assumptions can be found in our document: "Advanced Renewable Tariffs for Wisconsin Analysis and Case Study"

Table 1. 20-Year Contract Energy Payments Designed for a 12.5% Rate of Return

TECHNOLOGY	Cents/kWh	Project Size
Biomass	43.0	< 1 MW
	15.0	> 1 MW
Biogas	12.6	< 200 kW
	7.0	> 200kW
Solar PV	53.0	< 10 kW
	49.9	10 kW < 100 kW
	47.0	100 kW < 500 kW
	43.0	> 500 kW
Wind	23.2	< 20 kW
	14.6	20 kW < 100 kW
	12.7	100 kW < 1 MW
	8.9	> 1 MW

The concept of using "Adequate Incentives," as listed in Table 3 of the Briefing Memorandum, may be sufficient if the ART program cap is relatively small and if the ART only hopes to encourage development of smaller scale systems. Participation in an ART with an "Adequate Incentive" will ultimately be limited by how many individuals or businesses are willing to install a renewable energy system at a financial loss. Wisconsin utilities experience

with experimental tariffs has shown that an adequate incentive is, for the most part, only successful for solar photovoltaic systems. Businesses and investors will likely not be willing to invest in very expensive 100kW and larger systems if they are not able to earn a reasonable return on investment.

Issue Four: Should utilities recover the costs associated with ARTs through ordinary rates or through voluntary Green Pricing rates?

The benefits achieved by an ART policy are, for the most part, evenly distributed among Wisconsin Ratepayers, and therefore we recommend Commission Alternative's Two or Three. The discussion of Issue Four in the Briefing Memorandum only provides a cursory overview of the issues associated with cost recovery though. Two major concerns – (1) The potential disparity of costs between utilities due to the geographic distribution of renewable resources and (2) The impact of increased rates on sensitive ratepayers, specifically competitive industries – were not addressed.

If the program cap for the tariff is small, <1% of retail electricity sales, it may be acceptable to ignore both these issues because the overall impact on rates will be so small. However for the larger ART program cap, which we believe may be appropriate, the disparity of costs between utilities cannot be ignored. Both issues are summarized as follows:

Geographic Distribution of Resources

The location of renewable power systems participating in the ART will be limited by the location of the renewable resource. Biodigesters and biomass plants must be located by large dairy farms and biomass feedstocks respectively. Our wind tariff is designed to provide economic return to wind systems in class 3 wind areas, so wind turbine development will be

primarily limited to class 3 wind areas. The location of solar systems will be limited to South facing installations which experience no shade.

Due to the geographic distribution of these resources throughout the state, some utility service areas will have a high potential for certain technologies and others will have a much lower or even no potential for certain technologies. If a program cap is evenly distributed among utilities some utilities will therefore likely reach the program caps and others will not. As a result ratepayers in each utility service area will be responsible for a different portion of the total ART policy cost. Additionally, the program cap could be distributed based on a utilities renewable resource base or a state program cap, rather than utility specific program cap, could be applied.

We recommend the PSC-WI staff considers a method of cost distribution similar to Germany's "equalization mechanism," which prevents regional inequality by equalizing the renewable electricity volumes purchased and the corresponding fees among regions.

Impact on Sensitive Ratepayers

We recommend the PSC-WI staff examines the special equalization scheme for energy intensive companies which was established in Germany for the purpose of relieving the burden on particularly energy-intensive manufacturing companies and rail operators. The equalization scheme reduces the portion of Germany's feed-in tariffs paid by these companies by more than 90%.

Issue Five: Should the Commission limit the total program size for ARTs offered by utilities, and if so, on what basis should limits be established?

We recommend the Commission adopt alternative three, but at a substantially higher cap than the scenarios run by staff, and with the inclusion of a substantial provision for inflation-adjusted solid biomass ARTs.

Alternative Three: Each utility has a cap on the total installed capacity (in kilowatts or megawatts) that it has under ART contracts.

Rationale:

1. The most successful ARTs around the world, notably those in Germany, do not have program caps.

   These ARTs have achieved many public policy goals including reduction in carbon dioxide and other greenhouse gas emissions, load leveling, price stabilization, reduction in emissions of criteria pollutants/heavy metals/particulate matter, economic development, and job creation.

   However, Wisconsin has a different regulatory, market, and economic environment. Utilities and ratepayers need to have advance knowledge of some boundary to possible revenue requirement increases. Therefore, a program cap is needed, but it must be high enough to send a strong market signal to suppliers, developers, installers and other stakeholders in the renewable supply chain.

2. A total program cap including solar, wind, biogas, and biomass of **300 MWe** installed may be appropriate.

   The program cap for an ART would ideally be set to maximize the benefits for Wisconsin residents. Establishing a dollar estimate for the benefits from an ART Policy is very challenging though, so an alternative option is to set the cap conservatively and to increase the cap from that starting point. Advocates for renewable power and distributed generation,

Renew Wisconsin and Clean Wisconsin, have submitted comments to PSC-WI recommending an overall program cap of 3 percent of utility retail electricity sales. Utilizing our assumptions, this 3 percent of utility electric sales program cap extrapolates to 300MWe installed, as described in section 6 of our paper.The program cap for the one scenario PSC staff analyzed is substantially less than 3 percent. Using the PSC staff's estimated capacity factors, which are arguably on the low end for Wisconsin's renewable resources, the 80 MW program cap considered for the PSC ART scenario will produce less than 1% of Wisconsin's retail electricity sales

3. <u>The missing capacity is solid biomass. Solid biomass should be included as its own technology category, with a program cap for each utility.</u>

Biomass, with an ART as an investment incentive, has the second greatest economically feasible generation potential, next to wind, to meet public policy goals for small, customer-sited renewable generation options under the jurisdiction of PSC-WI. Wisconsin has a substantial feedstock supply. Biomass creates more in-state jobs. Biomass can have substantial environmental co-benefits such as erosion control by native grasses and improved forest health from utilization of logging residues. Biomass can contribute to non-coal baseload generation. However, solid biomass supply chains will not be established without strong regulatory support from the Commission or the WI Legislature.

While staff has pointed out the difficulty of accurately modeling the needed tariff levels in order to avoid over- or under-incenting development, this should be viewed from a cost benefit standpoint. Whereas a biomass tariff could potentially be set too high, leading to entrenched windfall profit to project owners for the life of the tariff, under any reasonable

scenario it will generate more clean distributed energy per-ART-dollar than solar electric systems.

A conservative approach would be to have a high solid biomass ART program cap paired with initially low-end tariff payments or tiered tariff payment levels. The program biomass tariff may also be customized to reflect overall social, environmental, and economic benefits.

Concluding Remarks

We would also wish to specifically and succinctly respond to three common arguments against renewable tariffs:

1. Renewable tariffs are more expensive than an RPS
    a. This is not necessarily true; in fact, the majority of the evidence concludes the contrary. We strongly urge policymakers to thoroughly address all costs and benefits, including, but not limited to: differences in required transmission infrastructure; differences in greenhouse gas reductions, particularly those in addition to CO_2; job creation; and spot market price stabilizations
2. Renewable tariffs cannot work complementary with an RPS;
    a. Renewable tariffs already work with RPS, as is the case in California, Florida, and Vermont. Also, ARTs are very flexible in their design. In our analysis, they were specifically designed to capture technologies not captured by the RPS.
3. The U.S. already tried renewable tariffs with PURPA, and that policy was unsuccessful.
    a. Literature supports this assertion, but PURPA was based on avoided cost assumptions, not the generation cost approach recommended by the Task Force and in place in Germany and many other countries. The determination of avoided

cost was left to individual states, and avoided cost rates were assumed to continually escalate. As avoided cost switched from oil to natural gas, thus reducing avoided cost values, renewable electricity sold by the renewable power producer became an increasing burden on ratepayers. Generation cost renewable tariffs is an entirely different policy calculation.