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PUBLIC SERVICE COMMISSION OF WISCONSIN

Memorandum

May 20, 2009

TO: The Commission

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Gas and Energy Division

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RE: Investigation on the Commission's Own Motion Regarding Advanced Renewable Tariff Development 5-EI-148

BRIEFING MEMORANDUM

STATEMENT OF THE PROCEEDING

Introduction

The Governor's Task Force on Global Warming issued a final report in July 2008 that included more than 60 policy recommendations, including a recommendation that the state of Wisconsin develop and implement an Advanced Renewable Tariff (ART) policy by 2009. The Task Force noted that if the Commission has authority to establish ARTs without legislation it could convene a proceeding to determine the production costs of various distributed renewable resources such as solar, wind, small hydro, landfill gas, biogas, and other biomass sources. The Task Force further recommended that the ART policy should encompass the following principles:

A. Tariffs should be set according to specific production costs of a particular generation technology.
B. The tariffs should include a rate of return comparable to the utilities' allowed return.
C. The tariffs should be fixed over a period of time that allows for full recovery of capital costs.

D. Renewable energy credits acquired through these tariffs can be rate-based or sold through a utility's voluntary renewable energy program.

E. When the fixed term of the tariff ends (capital costs of project have been recovered), the energy from these systems can be acquired through the utility's parallel generation tariff or through a negotiated purchased power agreement.

F. A utility may apply generation purchased under these tariffs toward its current RPS or any successor renewable energy obligation, unless the output is resold through a voluntary renewable energy program at retail.

In response to the Task Force's recommendation, the Commission issued a Notice of Investigation on January 15, 2009, opening docket 5-EI-148, *Investigation on the Commission's Own Motion Regarding Advanced Renewable Tariff Development*. The stated purpose of the investigation is to examine whether and how to expand the availability and use of ARTs in Wisconsin and promote greater uniformity in the ARTs offered by Wisconsin electric utilities.

The Notice of Investigation included detailed questions on 16 topics related to ARTs for which the Commission requested responses from interested parties. Written responses were received from more than 30 parties during the public comment period from January 15, 2009, through February 17, 2009. Most of these responses came from electric providers and their trade associations or from agricultural and biogas interests.

Terminology

The Commission has previously approved experimental renewable tariffs for some Wisconsin utilities on an individual case-by-case basis. Throughout the record in those decisions, the Commission, Commission staff, and parties have used a variety of terms to describe these tariffs. In some cases, different terms are used interchangeably to mean the same thing while in other cases these same terms can have very specific and significantly different meanings. It is normally not possible to understand these distinctions without considering the context in which a statement is made.

In order to be as clear as possible in this briefing memorandum, Commission staff will use the following terminology:

- **Net metering** is a billing practice that can be used when electricity is generated by a utility customer and delivered to the grid. The customer's meter is capable of running backwards and records the net amount of energy used minus energy generated. If the customer generates more electricity than it uses, the excess energy is valued at the customer's retail rate and credited to its account or the customer gets a check from the utility. In January 1982 the Commission approved a letter order in docket 05-ER-11 requiring that all regulated electric utilities provide net metering for customer owned generating systems rated at or below 20 kW installed capacity.
- **Standard buyback rates** are prices that Wisconsin utilities pay for electric energy from customer-owned generating systems greater than 20 kW installed capacity. These rates are also frequently referred to as parallel generation tariffs. The Public Utility Regulatory Policy Act of 1978 (PURPA) required state commissions to establish buyback rates for each utility based on the utility's "avoided cost." In a June 1983 order (combining dockets 05-ER-11, 05-ER-12, and 05-ER-13) the Commission established its policy for calculating avoided costs in rate cases. The Commission's method bases the buyback rates on each utility's on-peak and off-peak marginal energy costs. The annualized cost of peaking capacity is divided by the number of on-peak hours in a year and added to the on-peak marginal energy costs. The result is an on-peak kWh rate that includes compensation for the capacity value of the generation and an off-peak rate set at the marginal cost of energy.
- **Advanced renewable tariff** (ART) is a term used by many organizations, including the Governor's Task Force on Global Warming, to refer to a policy that provides an incentive for renewable customer-owned generation by guaranteeing the customer a price that is higher than the utility's standard buyback rate. The ARTs that have been adopted or proposed to date generally require utilities to enter into long-term power purchase agreements (e.g., 10 years) during which they will purchase all of the customer-generated renewable energy at favorable fixed rates. The rates typically vary based on the technology used to produce the renewable energy, with different tariffs applying to wind, solar, etc.

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

Background

ARTs are currently offered in Wisconsin by the five largest investor-owned utilities, one municipal utility, and one generation cooperative. Table 1 summarizes this information. Seven smaller investor-owned utilities and more than 80 municipal utilities do not offer any ARTs.

Table 1. ARTs Currently Offered by Wisconsin Electric Providers

Electric Provider	Reporting Class	Solar?	Biogas?	Wind?	Other?
Madison Gas and Electric Company	A	✓			
Northern States Power Company (Wisconsin)	A		✓	✓	
Wisconsin Electric Power Company	A	✓	✓	✓	
Wisconsin Power and Light Company	A	✓	✓	✓	✓
Wisconsin Public Service Corporation	A	✓			
River Falls Municipal Utility	AB	✓			
Dairyland Power Cooperative	Coop		✓	✓	

WPPI Energy is offering to buy customer-generated solar energy from member utilities at a rate specified in WPPI Energy's Schedule for Purchase of Solar Photovoltaic Energy, with the utility passing the full amount through to their customer. More than 40 municipal electric utilities in Wisconsin are WPPI members and are eligible to take advantage of this ART, but to date only River Falls Municipal Utility has requested and received Commission approval to do so.

The most fundamental issue in this docket is whether to expand the availability of ARTs in Wisconsin beyond the current offerings summarized above. Among the many specific questions included in the Notice of Investigation, Question 5c addresses this issue: "Should the Commission establish ARTs for all electric utilities regulated by the Commission, or alternatively for all investor-owned utilities or all Class A utilities? Why or why not?"

Comments

The vast majority of comments registered general support for expanding the availability of ARTs, and some were more specific:

- Nearly all of the agricultural interests and biogas project developers that responded explicitly requested that the Commission establish ARTs for *all* Wisconsin electric utilities. (Refer to comments from Dairy Business Association, Storm Fisher, Clear Horizons, Green Valley Dairy, and Biomass Solution.) Some in that group would prefer to go even further to a policy that also applies to electric cooperatives not regulated by the Commission. These respondents essentially argue that every farm should have the same opportunities, no matter who provides their electric service.
- Forest County Potawatomi Community also recommends that all utilities offer ARTs.
- RENEW Wisconsin and Clean Wisconsin, in their joint comments, advocate for an order expanding ARTs to all utilities regulated by the Commission, but with an appropriate program level that does not disadvantage small utilities.

WPPI Energy and the Municipal Electric Utilities of Wisconsin (MEUW) cited some of the benefits of ARTs but did not say explicitly whether they favor expanding availability. Both organizations expressed concern about a "one size fits all" approach that would treat not-for-profit municipal utilities and other public power entities the same as large investor-owned utilities.

Dissenting opinions came from the Wisconsin Utilities Association (WUA), the joint comments of Wisconsin Cast Metals Association (WCMA) and Wisconsin Industrial Energy Group (WIEG), and Cooperative Network (formerly known as the Wisconsin Federation of Cooperatives):

- WUA states that "an ART is seen as a duplicative and less economical attractive measure over that of an RPS. The utilities therefore do not support implementation of both an ART and an RPS except when ARTs are voluntarily implemented by a utility."

- WCMA and WIEG in their joint comments state that "using ARTs to meet a future RPS cannot be justified economically... ARTs [carry] a premium on top of the already high premiums that accompany large renewable energy projects – a double hit for ratepayers... Industrial Customers have considerable concern about expanding ARTs at a time when Wisconsin can ill afford to incur unnecessary costs."
- Cooperative Network supports premium-prices for customer-owned renewable generation, but feels that the premium should come out of the State's General Fund rather than through tariffs, because that would put cooperatives and their customers on a more even footing with utilities.

Analysis

The Commission does not have authority to expand the availability of ARTs to electric cooperatives. Therefore, a true statewide ART policy is beyond the Commission's authority. The rest of this analysis only considers public utilities regulated by the Commission.

Some of the proponents of ARTs point to extensive evidence that ARTs accelerate the deployment of renewable generation projects by fundamentally changing the economic equation. They make a results-based argument: if Wisconsin wants or needs more renewable energy in a hurry, ARTs can be invaluable. In Europe, countries that use an ART policy to promote renewable energy have achieved greater installed capacity in less time than countries that rely on an RPS policy. ART proponents bolster these arguments by noting that Wisconsin may indeed need more renewable energy in a hurry, based on two other recommendations made by the Task Force. First, the Task Force recommended an increase to Wisconsin's RPS. Second, the Task Force recommended a federal or regional cap on greenhouse gas emissions. If either or both of these recommendations are implemented, Wisconsin may either need to reduce its energy use or increase renewable generation – or both.

The core argument against expanding ART offerings is economic. WUA, WCMA, and WIEG assert that ARTs have an undesirable impact on rates and ratepayers. This is consistent

with conventional wisdom. A straightforward assessment would lead to the conclusion that if utilities purchase renewable energy at prices higher than their avoided costs, their rates will rise. However, some of the advocates for expanding ARTs cite a variety of government research reports and peer-reviewed academic journal articles which conclude that ARTs are more cost-effective than RPS policies, that ARTs lead to decreases in wholesale spot market prices, and that ARTs have a net positive macro-economic impact. This debate focuses on the impact of ARTs on rates and local economic development, especially over the long term and in light of potential greenhouse gas regulations.

If the Commission decides that expanding the availability of ARTs is desirable, it must further consider whether to limit the scope of that expansion to utilities of a certain size or ownership structure (investor-owned versus municipal). Commission staff found nothing in the record or in the pertinent reference literature to justify the suggestion by WPPI and MEUW that tariffs should be different for investor-owned and municipal utilities. However, there may be good reasons to treat large utilities differently than other utilities regardless of ownership structure. To understand why, consider a hypothetical but realistic example where a single 500 kW biogas project signs an ART contract with its electric utility and produces 3,000 MWh of electricity per year. If the ART offers a price that is (for illustration purposes) $30/MWh higher than the utility's avoided costs, the utility will pay $90,000 more for purchased power per year than it might have in the absence of the ART. This sum of $90,000 might add 0.01 percent to the total operating expenses of a large utility like Wisconsin Public Service Corporation, but it might add 5 percent to the total operating expenses of a small utility like Pardeeville Electric Utility. And this is for a single customer on an ART contract.

The Commission could choose to either avoid or mitigate the varying cost impacts of ARTs on large and small utilities. The potential problem could be avoided altogether by limiting mandatory ARTs to large utilities only. Alternatively, the Commission could choose to expand ARTs to all utilities but mitigate the cost impacts by adopting utility-specific program caps based on the size of each utility (this issue is addressed in detail in Issue Five).

Commission Alternatives

Alternative One: Voluntary ARTs only (status quo). If utilities voluntarily request approval for ARTs, each such request will be considered by the Commission separately on its own merits.

Alternative Two: Order all investor-owned utilities regardless of size to offer ARTs consistent with Commission decisions about covered technologies, tariff design features, and program caps (analyzed later in this briefing memo). Municipal utilities would retain the right to request approval of ARTs on a case-by-case basis.

Alternative Three: Order all investor-owned utilities larger than a specified size (based on retail electricity sales) to offer ARTs consistent with Commission decisions about covered technologies, tariff design features, and program caps. Municipal utilities and smaller investor-owned utilities would retain the right to request approval of ARTs on a case-by-case basis.

Alternative Four: Order all investor-owned and municipal utilities larger than a specified size (based on retail electricity sales) to offer ARTs consistent with Commission decisions about covered technologies, tariff design features, and program caps. Smaller utilities would retain the right to request approval of ARTs on a case-by-case basis.

Alternative Five: Order all Wisconsin electric utilities to offer ARTs consistent with Commission decisions about covered technologies, tariff design features, and program caps.

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

Background

The ARTs that have previously been approved by the Commission vary from utility to utility in terms of both the technologies that are covered and the contract terms. The differences in terms of covered technologies were already summarized above in Table 1. The most significant variables in the contract terms have been contract duration, project caps, price, and program caps.

Several questions in the Notice of Investigation addressed whether the Commission should impose more uniformity in ARTs. For example, Question 10a asked, "Are there any specific technologies for which all utilities should be required to offer an ART?" Question 11b inquired, "Should project size limits be uniform across utilities?" And Question 12a asked, "Should utilities offer the same duration for all ART contracts regardless of the technology?"

Comments

As previously noted, WPPI Energy and MEUW expressed concern about a "one size fits all" approach that would treat municipal utilities and other public power entities the same as large investor-owned utilities. WCMA and WIEG argued in their joint comments that ARTs should adhere to traditional ratemaking principles, which means they should reflect avoided costs and thus would not be uniform across utilities. Most of the other parties were generally supportive of more uniformity in the ARTs offered by Wisconsin utilities.

Regarding Question 10a, some of the parties commented that all renewable technologies should be eligible for a tariff, while others favored the same list of technologies recommended by the Governor's Task Force (solar, wind, small hydro, landfill gas, biogas, and other biomass sources). All parties that expressed an opinion on Question 11b favored uniform size limitations across all utilities, if size limits are imposed. Most of the parties that responded to Question 12a felt that all ART contracts should have the same duration.

Analysis

The arguments in favor of uniformity tend to be straightforward and based more on the customer's perspective. Advocates for a uniform approach to ARTs argue that everyone across the state should have the same or nearly the same opportunities for producing renewable energy. Today, a homeowner who installs a solar photovoltaic (PV) panel can expect to earn anything from 30 cents/kWh to perhaps less than 10 cents/kWh, depending on where he or she lives and which utility is providing service. Depending on where the homeowner falls on that price spectrum, a project is either feasible or completely impractical. These kinds of disparities raise fundamental questions of fairness, even more so if one considers a hypothetical case of two competing small businesses served by different utilities. Although Wisconsin utilities have always varied in the rates and tariffs that they offer, this kind of variation is more pronounced than what has typically been the case.

There are two principle arguments against imposing uniformity in ART policy. First, if utilities are allowed to vary in their approach to ARTs they can tailor the tariff offerings to their specific circumstances. The value of a particular technology may vary from one utility to the next based on the utilities' needs (e.g. for baseload or for peak shaving), and if this is the case

then each utility may want to optimize its ART contract terms to encourage the technologies that best meet those needs. The second argument against imposing uniformity is that it would stifle the experimentation that can occur if utilities are allowed to design their own ART policies. Over time, the Commission can monitor the results of ARTs offered by utilities and determine which design features are most conducive to success.

Even if utilities are allowed to continue experimenting with different contract terms, the Commission may wish to impose some uniformity in the technologies that are covered by ARTs. For example, the Commission could order utilities to offer ARTs for each of the technologies listed in the Task Force recommendation, but allow each utility to decide what contract terms to offer.

Another possibility would be for the Commission to impose uniformity in the ARTs offered by large utilities but take a different approach with smaller utilities. This could mean that smaller utilities would cover a different list of technologies or that smaller utilities would have different contract terms, or both. For example, it may be appropriate to require smaller utilities to offer ARTs for solar PV but not for other technologies. Justification for this approach can be found in the fact that solar PV installations are possible in increments of as little as 1 kW installed capacity, while this is not currently realistic for other renewable technologies.

Commission Alternatives

Alternative One: No enforced uniformity (status quo). Allow each utility to choose which technologies to cover and what terms to put into ART contracts.

Alternative Two: All large utilities covered by the Commission's decision on Issue One must offer ARTs for the same list of renewable technologies but may determine for themselves what contract terms to offer.

2A) Small utilities covered by the Commission's decision on Issue One, if any, must offer ARTs for the same list of renewable technologies but may determine for themselves what contract terms to offer.

2B) Small utilities covered by the Commission's decision on Issue One, if any, must offer ARTs for solar PV systems only and may determine for themselves what contract terms to offer.

Alternative Three: All utilities covered by the Commission's decision on Issue One may choose which technologies to cover.

3A) All covered utilities shall use uniform ART contract terms.

3B) All covered large utilities shall use one set of uniform ART contract terms but all covered small utilities, if any, shall use a different set of uniform ART contract terms.

Alternative Four: All large utilities covered by the Commission's decision on Issue One must offer ARTs for the same list of renewable technologies and the terms of ART contracts shall be uniform across all large utilities.

4A) Small utilities covered by the Commission's decision on Issue One, if any, must offer ARTs for the same list of renewable technologies and the terms of ART contracts shall be uniform across all small utilities.

4B) Small utilities covered by the Commission's decision on Issue One, if any, must offer ARTs for solar PV systems only and the terms of ART contracts shall be uniform across all small utilities.

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

Background

The Notice of Investigation asked a variety of questions designed to help the Commission respond to the Task Force's recommendation. Questions 3 and 4 directly addressed the production costs for small, customer-owned renewable electricity projects. Questions 8, 10, 11, 12, 14, 15, and 16 sought input from stakeholders on the principles that should be applied by the Commission in designing ARTs and establishing appropriate prices.

Comments

Questions 3 and 4 (Cost of Producing Electricity from Renewable Resources): Cost and production data were provided by some parties in their responses. More information was provided for biogas than for any other technology. No information was provided for any technologies other than those listed in the Task Force recommendation.

Question 8 (Overall Tariff Structure): A fixed price approach was preferred over a fixed premium approach by nearly all parties.

Question 10 (Covered Renewable Energy Technologies): Nearly all parties that offered a specific answer to this question favored technology-specific tariffs.

Question 11 (Project Size Limitations): Two respondents wanted no limits on the size of eligible projects. RENEW Wisconsin and Clean Wisconsin expressed a preference for a 15 MW

project cap for most technologies but 1 MW for solar PV projects. Other respondents did not suggest a specific size limitation.

Question 12 (Contract Duration): There was significant variation in the parties' opinions about the optimum contract duration, ranging from 10 to 20 years.

Question 14 (Renewable/Environmental Attributes): There are strong differences of opinion on this question. Utilities argue that they are paying a premium price to the customer and part of the justification for that premium is that they are buying all of the attributes. Other respondents, particularly those from the agricultural sector, disagree. (Some of those parties draw a distinction between renewable energy credits and other attributes, particularly carbon credits or offsets.) On principle, all sides seem to be able to agree that ownership of attributes should be very clearly defined and the tariff price should reflect whether the customer is selling the attributes to the utility.

Question 15 (Basis for Setting Tariff Price): This was a complicated multi-part question.

- On the most fundamental issue, nearly all of the parties favored fixed price ARTs (e.g., 10 cents/kWh) over fixed premium ARTs (e.g., 4 cents above the locational marginal price). In general, most of the parties that suggested a basis for setting prices agreed with the Task Force recommendation that prices should be based on the revenues customers will need to recover costs and earn a modest return on investments. There was little specificity and no uniformity, however, on what would represent an appropriate return.
- The opinion most consistently expressed was that ART pricing should be kept as simple as possible in order to promote a better understanding of the tariffs among customers and to reduce administrative complexity for utilities. For that reason, most of the parties were against creating sub-categories within a given technology based on design (e.g., vertical axis versus horizontal axis wind turbines), location (e.g., offshore versus terrestrial wind), or fuel source (e.g. animal manure versus food processing wastes or bio-crops), unless the policy is intended to encourage renewable system installations in each sub-category. There was also little interest in offering multiple options for contract duration and almost no interest in structuring ART prices to include a form of capacity payment.

- Despite the general preference for simplicity, the parties did offer significant support for a few design features that would introduce some complexity to the ART policy. For example, most of the parties were in favor of designing the tariffs so that prices decline as project size increases, in recognition of economies of scale and the desire to manage overall program costs.
- The parties disagreed over whether utilities should offer ARTs with a single, fixed price or ARTs with different prices for on-peak and off-peak generation. The arguments in favor of a single price tend to reflect the fact that a single price is simpler, easier to administer, and makes it easier to estimate future revenues. The arguments in favor of peak/off-peak pricing tend to reflect the fact that this approach creates an incentive for customers to generate electricity when demand is highest and schedule maintenance during off-peak hours. Several parties noted that solar PV systems generate most of their electricity during peak hours, so the approach for solar PV could be different than for other technologies.
- The Notice of Investigation asked two questions about whether and how to adjust ART prices over time. One of these questions was intended to get at whether the price in each individual ART contract should be fixed for the duration of the contract or adjusted over time based on inflation. The other question was intended to solicit opinions on whether the Commission should state that as a matter of policy the prices for new ART contracts (but not existing contracts) will decline over time as renewable technologies mature - a concept some call degression. Some respondents may not have grasped the distinction between these two questions, and that makes it difficult to interpret the responses. In general, it appears that most of the parties (with WUA a notable exception) favor inflation-based adjustments to ART prices within each contract. Most respondents favor periodic reviews of ART prices for new contracts rather than establishing a price degression in advance.

Question 16 (Other): None of the parties that responded to this question raised specific new points about ART design. Most of the parties ignored this question or used it to "wrap up" their comments.

Analysis

Commission staff began by using information in the record, information available in reference documents mentioned in the record, and other information it compiled to analyze the hypothetical production costs of each of the technologies named in the Task Force recommendation. It must be emphasized that this was a simplified analysis based on spreadsheet

calculations only. The sole purpose of the analysis was to develop preliminary values that can be used to inform the policy choices before the Commission. The following assumptions and principles guided this analysis:

- The tariffs should be fixed over a 10-year period of time.
- The price should allow for full recovery of capital costs plus a rate of return comparable to the utilities' allowed return over the fixed term of the contract.
- For each technology, different prices should be determined in four project size categories based on the categories defined in the Commission's existing interconnection rules for distributed generation facilities, Wis. Admin. Code ch. PSC 119. Category 1 projects are 20 kW or less. Category 2 projects are greater than 20 kW but no more than 200 kW. Category 3 projects are greater than 200 kW but no more than 1 MW. Category 4 projects are larger than 1 MW but no more than 5 MW.
- The customer will take full advantage of state and federal financial incentives where available.
- The utility would take ownership of all renewable and environmental attributes.

The results of this analysis are summarized in Table 2. Details are available in Appendix A.

Table 2. Hypothetical Production Costs for 10-Year Contracts (cents/kWh)

Technology	Category 1 (≤20 kW)	Category 2 (20-200 kW)	Category 3 (200 kW-1 MW)	Category 4 (1-5 MW)
Solar PV	60.6	60.0	Not analyzed[1]	Not analyzed
Wind	38.3	34.1	23.3	23.3
Biogas	Not analyzed	10.8	11.1[2]	9.8 (1-2 MW) 8.8 (2-5 MW)
Biomass (solid)	Not analyzed	Not analyzed	Not analyzed	21.6
Landfill Gas	Not analyzed	Not analyzed	Not analyzed	4.8
Hydro	Not analyzed	Not analyzed	4.1	Not analyzed

[1] Some categories were not analyzed for some technologies because applications of that size are not realistic or because there was a lack of information needed for the analysis.

[2] Despite economies of scale, the hypothetical cost in Category 2 for biogas is lower than the cost in Category 3 because financial incentives for the larger systems are limited.

Table 2 provides a preliminary indication of what the ART prices might need to be if the basis for setting the price is to provide investment security for developers of small renewable energy projects. This is the basis recommended by the Governor's Task Force. In other words, at the prices noted in Table 2 a very large number of utility customers might be able to install renewable technologies with no financial risk whatsoever, and the near certainty of profit. However, the utility's other customers or shareholders would pay a significant price (at least in the short term) for that financial security. This is because the values in Table 2 exceed the current parallel generation tariffs offered by Wisconsin utilities, which are based on the utility's avoided costs. Those standard buyback rates currently range from about 4.9 cents/kWh to about 6.5 cents/kWh (expressed as a weighted average of peak and off-peak rates).

With these considerations in mind, Commission staff analyzed a variety of scenarios for each of the first four technologies in Table 2 to determine how sensitive the cost calculations are to the underlying assumptions. Once again, this was a simplified analysis based on spreadsheet calculations only, performed to inform the policy choices before the Commission. Details of these sensitivity analyses are included in Appendix A.

One of the purposes of the sensitivity analyses was to ascertain whether the Commission could justify ART prices lower than the values in Table 2 that would reduce the overall cost of the program to ratepayers, while still providing an adequate incentive for distributed renewable generation. Table 3 is a compilation of prices for each technology and each size category that might, in the opinion of Commission staff based on its preliminary analysis, provide an adequate incentive. A rationale for each of the indicated prices is offered after Table 3 and in Appendix A.

Table 3. Possible "Adequate Incentive" ART Prices for 10-Year Contracts (cents/kWh)

Technology	Category 1 (≤20 kW)	Category 2 (20-200 kW)	Category 3 (200 kW-1 MW)	Category 4 (1-5 MW)
Solar PV	30.0	25.0	Standard[3]	Standard
Wind	Net metering[4]	12.0	10.5	9.2
Biogas	Net metering	10.7	10.5	9.3 (1-2 MW) 8.4 (2-5 MW)
Biomass (solid)	Net metering	10.0	10.0	10.0
Landfill Gas	Net metering	Standard	Standard	Standard
Hydro	Net metering	Standard	Standard	Standard
Other renewables	Net metering	Standard	Standard	Standard

Rationale for Prices in Table 3:

1. Solar PV –

a. The values in Table 3 are much lower than the hypothetical prices in Table 2 but are at least as high as the standard buyback rates currently being offered by Wisconsin utilities.

b. The indicated prices for solar PV projects are based on the results of previous tariffs. Wisconsin Electric Power Company (WEPCO) and Madison Gas and Electric Company have succeeded in attracting strong customer participation by offering 22.5 cents/kWh and 25 cents/kWh, respectively. Initial program caps were reached much more quickly than either utility expected, then each utility raised its program cap (with Commission approval), then the new caps were reached once again. The highest tariff in Wisconsin, 30 cents/kWh, is currently offered by WPPI Energy to customers of its municipal utility members.

c. Although the costs of solar PV exceed 30 cents/kWh under every scenario considered in the sensitivity analysis, the success of existing ART programs cannot be ignored and forms the primary basis for the indicated prices. Commission staff is optimistic that the modest increase in price that is indicated would sustain and increase customer participation across Wisconsin.

d. An ART is not proposed for Category 3 or 4 because there are no such installations in Wisconsin, very few in the entire United States, and no data on which to base a price.

2. Wind –

a. Wisconsin already has hundreds of MW of installed wind capacity, which cannot be said of other renewable resources (except hydro). Some of the arguments in favor of

[3] Rather than establishing an ART in this category, customers should negotiate a power purchase agreement with their utility, wheel the power, or accept a standard parallel generation rate based on the utilities' avoided costs.
[4] Rather than offering an ART in this category, customers should take advantage of Wisconsin's current net metering policy for projects 20 kW or less.

ARTs are less compelling for wind for that reason, while the arguments for keeping ART prices close to what it costs utilities to develop wind projects become stronger. Commission staff developed cost estimates for utility scale wind projects at 9.2 cents/kWh. For these reasons, and because ART prices would need to be quite high for Category 1 wind turbines to recover costs even under ideal circumstances, an ART is not suggested for Category 1.

b. The indicated prices for Categories 2 through 4 are much lower than the hypothetical prices in Table 2 but higher than the prices currently being offered by Wisconsin utilities. The available information shows a very wide range in construction costs per kW of installed capacity. The hypothetical costs in Table 2 are generally based on average values within each Category, but the range of actual values for installed costs makes it evident that cost recovery and profit will be possible in some circumstances at much lower prices.

c. The indicated price in Category 2 is based on WEPCO's current ART, which is essentially an expansion of its net metering tariff for wind projects up to 100 kW. For most residential and farm customers, this is equivalent to 11.8 cents/kWh. Because WEPCO's tariff has attracted limited participation (two customers), the indicated price is slightly higher. Based on sensitivity analyses, if a customer has a good site (high capacity factor) and keeps construction costs near the low end of the range cited in the record a return on investment is possible at the indicated price.

d. The primary basis for Category 4 is Wisconsin Power and Light Company's (WP&L) current ART which offers 9.2 cents/kWh for wind projects up to 1 MW. The WP&L ART is new and it is too early to tell if this price will attract customer participation, but the sensitivity analysis indicates that under ideal circumstances a customer in a good site might be able to earn a very small return on investment at this price.

e. The indicated Category 3 price is set roughly halfway between the prices for Category 2 and Category 4.

3. Biogas –

a. The indicated prices are slightly lower than the hypothetical prices in Table 2 but higher than the prices currently being offered by Wisconsin utilities. (Category 4 was split to prevent creating a situation where the indicated prices would be less than what WP&L currently offers a customer in the 1-2 MW range.)

b. The indicated prices are set at levels such that the customer's return on investment will be strongly dependent on the capacity factor achieved. If the customer achieves a capacity factor at the low end of the range for digesters currently operating in Wisconsin (65 percent), the customer will probably recover costs but not earn a profit. A customer who achieves an average capacity factor (80 percent) will make a profit but less than a typical utility rate of return. A customer who achieves a very high capacity factor (90 percent) could make a profit slightly higher than a typical utility rate of return, but nothing that would be considered a windfall.

4. **Biomass (solid) –**
    a. There is a real scarcity of information available in the docket or elsewhere on small, biomass boiler/turbine systems. We have no data whatsoever on systems smaller than 3.1 MW. Biomass tariffs in other countries tend to be the most complicated and confusing of all ARTs. It is often difficult to tell whether the tariff covers biogas, biomass, or both. In many instances there is a base biomass tariff and a "bonus" depending on the source of the fuel (digester gas, energy crops, wood waste, etc.). In the final analysis, these tariffs appear to end up at values ranging from below 10 cents/kWh to above 20 cents/kWh. Considering all of the above, the risk of setting the price wrong in this technology category is higher than in other categories and a cautious approach is warranted.
    b. The indicated price is based in part on WP&L's current ART which offers 9.2 cents/kWh for biomass systems up to 2 MW (as a weighted average of peak and off-peak rates). The limited information available on biomass systems suggests that this price is probably unlikely to offer any customer full cost recovery, let alone a profit, but by offering a similar price we would at least be expanding what is currently available while minimizing the risk of setting the price too high.

5. **Landfill Gas and Hydro –** The hypothetical production costs for these technologies appear to be less than the standard buyback rates currently offered by Wisconsin utilities. Since project developers would stand to profit under the standard buyback rates, there seems to be little rationale for offering ARTs for landfill gas and hydro technologies.

6. **Other renewable resources –** There is no information in the docket upon which to base an ART for any technologies other than those listed above.

NOTE: If the Commission believes that it is preferable to have utilities offer different peak and off-peak prices for any technology, the "blended" prices in Tables 2 and 3 can be easily adjusted accordingly.

A third alternative is to add a fixed premium for renewable energy technologies to the utilities' standard buyback rates. This alternative was not analyzed in any detail by Commission staff because only one party expressed a preference for this approach while several parties argued that this approach simply will not work. The primary argument against a fixed premium approach is that price variability makes it harder for project developers to secure financing from lenders because revenues cannot be accurately predicted. The main argument in support of this approach is that it reflects the concept that electricity from renewable resources has a value above the value of electricity from conventional resources.

Commission Alternatives

Alternative One: Utilities shall offer prices similar to those in Table 2 that are designed primarily to provide "investment certainty."

1A) Contracts include different base prices for peak and off-peak production and automatic inflation-based price adjustments.

1B) Contracts include different prices for peak and off-peak production that are fixed for the duration of the contract.

1C) Contracts include a single "blended" base price and automatic inflation-based price adjustments.

1D) Contracts include a single "blended" price that is fixed for the duration of the contract.

Alternative Two: Utilities shall offer prices similar to those in Table 3 that are designed primarily to provide an "adequate incentive" for new renewable energy installations.

2A) Contracts include different base prices for peak and off-peak production and automatic inflation-based price adjustments.

2B) Contracts include different prices for peak and off-peak production that are fixed for the duration of the contract.

2C) Contracts include a single "blended" base price and automatic inflation-based price adjustments.

2D) Contracts include a single "blended" price that is fixed for the duration of the contract.

Alternative Three: Utilities shall offer fixed premium price (avoided costs or locational marginal price plus a fixed premium) for all renewables. The premium could be universal or could vary with technology to reflect differences in the costs and maturity of different technologies.

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

Background

Wisconsin utilities have thus far been able to choose whether to recover the added costs of ART purchases through ordinary rates paid by all customers or through higher Green Pricing rates paid voluntarily by customers who want to purchase renewable energy. If the utility chooses the former method of cost recovery, it can credit the purchased energy toward its RPS compliance obligations, but if the utility chooses the latter method it cannot. To date, utilities have opted to make wind and biogas ARTs rate-based, meaning the costs are recovered from all customers through ordinary rates and the purchases count toward the RPS. On the other hand, every utility except one has thus far opted to use Green Pricing to recover the costs of solar PV ARTs.

Question 13 in the Notice of Investigation addressed the issue of cost recovery.

Comments

WIEG and WCMA recommended that ART costs and benefits should go entirely to customers who voluntarily participate in Green Pricing programs. WUA supported the current cost recovery approach: if generation from ART customers is being used for RPS compliance, the costs should fall on all ratepayers; if not, the costs should fall on Green Pricing customers. WUA also proposed that each utility should be allowed to choose the cost recovery method that

makes the most sense for its circumstances. RENEW and Clean Wisconsin took a different but equally nuanced position. In general, they favor sharing ART costs among all ratepayers, but their bottom line is that any customer who is not paying for the costs of ARTs in rates should not be eligible to receive an ART as a generator. RENEW and Clean Wisconsin also indicated that they could accept a policy that allows the utilities to choose from a small set of options for cost recovery. All other parties that expressed an opinion on this question felt that ART costs should be spread across all ratepayers.

Analysis

Some utilities do not currently offer Green Pricing programs. A strong argument can be made that this docket, which only addresses ARTs, is not the correct forum for the Commission to address whether all utilities should offer Green Pricing programs. Therefore, Commission staff is not presenting as an alternative that all ART costs for all utilities should be recovered through Green Pricing rates. That is not currently a feasible alternative.

The one alternative that can be applied uniformly to all utilities is to recover all ART costs through ordinary rates charged to all customers. The main advantage of this approach, other than its simplicity, is that it spreads the program costs as widely as possible and thus has the smallest impact on rates. In addition, some of the parties have argued that the environmental and other benefits of distributed renewable generation are shared by all ratepayers, so the costs should also be shared.

Another viable approach is to allow each utility to decide the best way to recover ART program costs, as was done in previous ART decisions by the Commission. A uniform method of cost recovery may not be needed to promote renewable energy generation, because the

customer who signs an ART contract gets the same contract regardless of how the utility recovers the costs. This approach also eliminates the complications that might come from trying to apply a uniform solution to utilities that do offer Green Pricing programs and those that do not offer such programs.

Finally, a hybrid approach is also possible. On a per unit basis, electricity from solar PV systems costs utilities significantly more to purchase under ART contracts than electricity from any other renewable technology. Some would argue that this significantly higher cost can only be justified if voluntary Green Pricing customers are willing to pay for it. Based on that line of reasoning, the Commission could consider a hybrid approach where ART costs for solar PV purchases are recovered through Green Pricing rates (where available) and all other ART costs are recovered through ordinary rates.

Commission Alternatives

Alternative One: Status quo. Each utility is allowed to propose its own cost recovery methods.

Alternative Two: All ART costs must be recovered from all customers through ordinary rates. Utilities may use the purchases for RPS compliance purposes.

Alternative Three: ART costs associated with solar PV purchases must be recovered through Green Pricing rates, if the utility offers a Green Pricing program and the customer selling the electricity participates in the Green Pricing program. The utility may not use these purchases for RPS compliance. In all other circumstances, ART costs are recovered from all customers through ordinary rates and may be used by the utility for RPS compliance.

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?

Background

All of the ARTs previously approved by the Commission have included a cap on the total size of the program. These caps have been expressed in a variety of ways, based on the number of customers that may participate, the total installed capacity of the participating customers' systems, or the total amount of energy that the utility will purchase from all participating customers. Some utilities have adopted different caps for each covered technology, while other utilities have adopted a single cap for all covered technologies. In all cases, these program caps were established as a way to allow utilities to experiment with ARTs without subjecting their customers or shareholders to undue risk from the higher costs of ARTs. The caps create an upper limit on the total cost of the ART purchases.

Question 9 in the Notice of Investigation addressed the issue of program size limitations.

Comments

On the question of program size limitations, the parties varied in their responses. Some felt that programs should be unlimited, as in some European countries. Others favored caps on program size based on a percentage of utility sales, impact on rates, or a limited signup period.

Analysis

As noted previously, there is some debate over whether ARTs add to the long-term cost of meeting energy demands. But if the Commission assumes or concludes that ARTs do add to utility and ratepayer costs, then the best way to control those costs is to cap the size of the ART programs. An unlimited ART program offering would open the door to unpredictable rate increases, as would a program that is time-limited but not size-limited.

One approach is to allow the utilities to continue to decide for themselves the appropriate size of their ART programs. This approach allows the utilities to make decisions taking into consideration their RPS compliance strategy, customer demand for Green Pricing programs, and other information of which the Commission may not be fully aware. The disadvantage is that this approach would not lead to uniformity among the utility programs and would allow utilities to severely restrict what they offer.

Of the three types of program caps that have been previously approved, capping the number of customers is the easiest to administer, but as a practical matter neither the utility nor the Commission would know in advance how much capacity will be installed, how much electricity will be generated, or how much it will cost. If all of the customers have large systems, program costs could end up higher than desired. If all of the customers have small systems, the amount of renewable electricity generated could be very small.

Program caps that are based on the installed capacity of customer systems are not quite as simple but are still relatively easy to administer. The utility can easily keep track of installed capacity and will know when its ART program is fully subscribed. The utility will not know exactly how much electricity will be generated under its ART contracts, thus it will not know exactly what the program will cost, but it will be able to make reasonable estimates based on assumed capacity factors.

If program caps are based on how much electricity will be purchased, it gets more difficult for the utility to determine when its program is fully subscribed. In other words, the utility will not know for sure how much electricity will be generated next year by customers on existing ART contracts, and that will complicate its decisions about whether to sign new ART

contracts. However, this type of cap makes it very easy for the utility and the Commission to estimate and control the potential costs of the ART program.

Commission staff analyzed the potential ratepayer impacts of one scenario in which a uniform ART policy is implemented for investor-owned utilities, with program caps based on installed capacity. In this hypothetical scenario, Commission staff made the following assumptions:

- The ART policy applies to solar PV, biogas, and wind systems.
- The average prices paid to ART customers are 25 cents/kWh for solar PV, and 10 cents/kWh for biogas or wind.
- The average capacity factors for each technology are 10 percent for solar PV, 80 percent for biogas, and 20 percent for wind.
- The total installed capacity that each investor-owned utility can place under ART contracts is capped for each technology as follows:[5]

Utility	**Solar PV**	**Biogas**	**Wind**
Wisconsin Electric Power Company	3000 kW	30.0 MW	2000 kW
Wisconsin Power and Light Company	1250 kW	12.5 MW	825 kW
Wisconsin Public Service Corporation	1250 kW	12.5 MW	825 kW
Northern States Power Company-Wisconsin	700 kW	7.0 MW	500 kW
Madison Gas and Electric Company	400 kW	4.0 MW	250 kW
Consolidated Water Power Company	150 kW	1.5 MW	100 kW
Superior Water, Light and Power Company	75 kW	750 kW	50 kW
Northwestern Wisconsin Electric Company	20 kW	200 kW	n/a
Dahlberg Light and Power Company	12 kW	120 kW	n/a
North Central Power Company	3.6 kW	36 kW	n/a
Pioneer Power and Light Company	2.0 kW	n/a	n/a
Westfield Electric Company	1.6 kW	n/a	n/a

[5] Commission staff elected to analyze a scenario in which the state's largest utility, WEPCO, would triple its current ART program caps for solar PV and biogas and roughly maintain its current ART program cap for wind which is actually based on the number of customers, rather than installed capacity. For all other investor-owned utilities, Commission staff calculated program caps that are roughly proportional to the WEPCO caps based on each utility's annual retail electricity sales (in kilowatt-hours). The analysis also assumes that ARTs will not be offered by a utility for biogas or wind systems in Category 1. Therefore, if the relevant capacity cap for any utility would be less than or equal to 20 kW, an ART is not offered for that technology. In these cases the cap is listed as "n/a."

Commission staff estimated that the incremental impact of this hypothetical ART policy would be to increase the current revenue requirements of each listed utility by 0.3 to 0.5 percent, depending on the utility.

Commission Alternatives

Alternative One: Status quo. Each utility is allowed to propose its own program caps.

Alternative Two: Each utility offers ARTs without any program caps.

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

Alternative Four: Each utility has a cap on the total amount of electricity (in megawatt-hours) that it purchases under ART contracts.

Issue Six: What are the next steps the Commission should take on ART policy?

Background

The Notice of Investigation did not specifically ask respondents to suggest how the Commission should proceed on this matter.

Commission staff analyzed a number of hypothetical scenarios and sensitivity cases in order to provide the Commission and the parties with a sense of how ART prices might vary based on different assumptions and a sense of the impacts that an ART policy might have on utility rates. However, these preliminary analyses were performed without any insight as to the final design and policy preferences of the Commission. Furthermore, none of the parties have had a chance to review or react to any of the analyses completed by Commission staff.

Comments

Very few of the parties proposed next steps that the Commission should undertake. It appears that many of the parties were unclear whether the Notice of Investigation would directly result in new tariffs or whether it was the beginning of a multi-step process. In their joint comments, RENEW Wisconsin and Clean Wisconsin suggested that the logical next step would be for the Commission to model the impacts of implementing an ART policy on rates and technology deployment.

Analysis

After the Commission has expressed its preferences on Issues One through Five, it should be a relatively simple matter to establish appropriate ART prices and the to complete a more thorough analysis and modeling of the potential cost and rate impacts. The main questions to resolve are who should do the analysis, and should public comment on that analysis be allowed before any final tariffs are approved by the Commission.

Commission staff could complete the necessary analysis in-house and seek public comment before asking the Commission for a final decision.

Another possibility is to more directly involve outside experts and stakeholders in the decision on ART prices. The Wisconsin Distributed Resources Collaborative (WIDRC) has been helpful to the Commission in past dockets concerning ARTs and interconnection standards for distributed generation. WIDRC already has a tariff team and could be helpful here as well. The U.S. Department of Energy's National Renewable Energy Laboratory (NREL) also has a free technical assistance program for state commissions and staff expertise on ARTs. One potential advantage of using WIDRC is that the collaborative has a track record of bringing

together utilities and renewable resource project developers to make compromises and tough decisions. As for disadvantages, this approach might take longer than a Commission staff analysis and might present new challenges in terms of accountability, open government, and managing confidential information.

Commission Alternatives

Alternative One: Take no further action related to ART policy.

Alternative Two: Direct Commission staff to develop detailed ART tariff sheets based on the Commission's decisions on Issues One through Five and seek public comment before bringing a final tariff proposal back to the Commission for approval.

Alternative Three: Direct Commission staff to develop detailed ART tariff sheets based on the Commission's decisions on Issues One through Five and bring a final tariff proposal back to the Commission for approval.

Alternative Four: Ask a third party like WIDRC or NREL to recommend ART prices based on the Commission's decisions on Issues One through Five, and direct Commission staff to develop tariff sheets based on those recommendations.

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Appendix A
Production Costs and Potential ART Prices

Category 1 Solar Scenario

2.4 kW residential PV system

Assumptions:

- Capacity factor = 15 percent[1]
- Construction costs = $9000/kW[2]
- O&M costs = $30/kW/year[3]
- Focus on Energy Cash Back Reward = $1.50*annual production in kWh (maximum 25 percent of install cost or $35,000)
- Federal Renewable Energy Tax Credit = 30 percent of installation costs (assumes customer is able to take full advantage of tax credit)
- "Interest" rate[4] = 12 percent on 10-year loan

Price = 60.59 cents/kWh

Sensitivity Runs:

- 6 percent interest rate (cost recovery only) = 47.0 cents/kWh
- 15 year loan and tariff = 50.7 cents/kWh
- 15 year loan and tariff, cost recovery only = 36.2 cents/kWh

Category 2 Solar Scenario

30 kW commercial/industrial PV system

Assumptions:

- Same as above, except:
- Construction costs = $8000/kW[5]
- Focus on Energy Cash Back Reward = $1.00*annual production in kWh (maximum 25 percent of install cost or $50,000)[6]

Price = 60.01 cents/kWh

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[1] The only comments in the docket for solar systems came from RENEW. RENEW suggests capacity factors of 14.5 percent for small systems and 13 percent for larger systems. Commission staff reviewed actual operating data for Wisconsin systems owned by utilities and suggested 10-15 percent was more realistic. A value of 15 percent was used in order to determine prices for solar systems in good locations for capturing solar energy.

[2] RENEW suggested $9050/kW for small systems as the average from 2008 Focus on Energy data.

[3] RENEW suggests $300/kW for an inverter replacement every 10 years, which was simplified as $30/kW/year. Nobody else offered comments on the record. RENEW cites Focus on Energy data.

[4] The rate cited here is a single number that accounts for both the interest the customer will pay on a bank loan and the "interest" or return that the customer earns on their investment.

[5] RENEW suggested $7950/kW for larger systems as the average from 2008 Focus on Energy data citing economies of scale.

[6] At this scale Focus solar grants are competitive and pay less per kWh. The scenario assumes the customer gets a grant.

Sensitivity Runs:

- 6 percent interest rate (cost recovery only) = 46.6 cents/kWh
- 15 year loan and tariff = 50.2 cents/kWh
- 15 year loan and tariff, cost recovery only = 35.9 cents/kWh

POTENTIAL SOLAR TARIFF PRICES:

Category 1: 30.0 cents/kWh for 10 years
Category 2: 25.0 cents/kWh for 10 years
Category 3: Standard buyback rate or PPA
Category 4: Standard buyback rate or PPA

Rationale:

- The indicated prices are equal to or higher than the prices currently being offered by Wisconsin utilities.
- Although this analysis suggests that customers will not recover all costs over the 10 year term of a contract, the existing programs offered by Wisconsin utilities have attracted robust customer interest. There are good reasons to believe that there is unmet customer demand for solar PV even at 25 cents/kWh, but it is probably too early to tell – especially given the economic recession. In any event, the arguments for raising the price are less persuasive so long as customer interest remains strong.

Category 1 Wind Scenario

10 kW turbine

Assumptions:

- Capacity factor = 20 percent[7]
- Construction costs = $4952/kW[8]
- O&M costs = 1 percent of system cost[9]
- Customer receives competitive Focus on Energy grant = annual production in kWh*system cost*0.25/ (turbine capacity [kW] at 24.6 mph x 1,752) (maximum 25 percent of install cost or $35,000)
- Customer is able to use entire Federal Energy Production Tax Credit = 2.1 cents/kWh for first 10 years of operation
- "Interest" rate = 12 percent on 10-year loan

Price = 38.25 cents/kWh

[7] The only comments in the docket for wind systems came from RENEW. For capacity factors, RENEW notes variability based on site and indicates a range from 14 percent-26 percent; the midpoint of this range is 20 percent.
[8] This value comes from Energy Center of Wisconsin data. RENEW cited a much higher value, $6755/kW, but did not indicate the source of the value.
[9] RENEW suggests this value as the average from 2008 Focus on Energy data.

Sensitivity Runs:

- 6 percent interest rate (cost recovery only) = 29.5 cents/kWh

Category 2 Wind Scenario

50 kW turbine

Assumptions:

- Same as above, except:
- Capacity factor = 21 percent[10]
- Construction costs = $5330/kW[11]
- Customer receives competitive Focus on Energy grant = annual production in kWh*system cost*0.35/ (turbine capacity [kW] at 24.6 mph x 1,752) (maximum 35 percent of install cost or $100,000)

Price = 34.13 cents/kWh

Sensitivity Runs:

- 6 percent interest rate (cost recovery only) = 26.4 cents/kWh
- $2111/kW construction costs[12] = 12.2 cents/kWh
- $2111/kW construction costs and cost recovery only = 9.2 cents/kWh

Categories 3 and 4 Wind Scenarios

Category 3: 600 kW turbine
Category 4: 1650 kW turbine

Assumptions:

- Same as above, except:
- Capacity factor = 24 percent[13]
- Construction costs = $2840/kW[14]
- O&M costs = $15/MWh
- Focus on Energy grant not available for systems larger than 100 kW[15]

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[10] The analysis assumes that larger turbines are capable of achieving higher capacity factors. Data from Focus on Energy suggest that several turbine types might achieve 21 percent or better under typical conditions.
[11] This value is cited by RENEW as an average of the turnkey installed costs cited in a 2008 Focus on Energy fact sheet for turbines in Category 2.
[12] This is the lowest value found in a 2008 Focus on Energy report for small-scale (<100 kW) wind systems.
[13] Again, higher capacity factors are likely for full size turbines. RENEW cites 24 percent in its comments.
[14] This value should reflect economies of scale. RENEW suggests this value for a 600 kW system but does not cite their source. RENEW then cites $3000 for a 1500 kW system based on NREL data and communications with project developers. There is no explanation of why the larger system would cost more and it runs contrary to assumptions about economy of scale. This analysis used the same number for both sizes.
[15] Focus on Energy is offering "Opportunity Grants" for a "limited time only" through May 27, 2009, for systems larger than 100 kW. The value is the same as for smaller systems but capped at $250,000. The default analysis assumes opportunity grants are not available.

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Price = 23.31 cents/kWh

Sensitivity Runs:

- 6 percent interest rate (cost recovery only) = 17.8 cents/kWh
- 25 percent cost share available[16] = 17.3 cents/kWh
- 25 percent cost share available plus cost recovery only = 13.2 cents/kWh
- $2000/kW construction costs[17] = 16.2 cents/kWh
- $2000/kW construction costs and cost recovery only = 12.3 cents/kWh
- 25 percent cost share and $2000/kW construction = 12.0 cents/kWh
- 25 percent cost share, $2000/kW construction, cost recovery only = 9.1 cents/kWh

POTENTIAL WIND TARIFF PRICES:

Category 1: Net metering
Category 2: 12.0 cents/kWh for 10 years
Category 3: 10.5 cents/kWh for 10 years
Category 4: 9.2 cents/kWh for 10 years

Rationale:

- Wisconsin already has hundreds of MW of installed wind capacity, which cannot be said of other renewable resources (except hydro). Some of the arguments in favor of ARTs are less compelling for wind for that reason, while the arguments for keeping ART prices close to what it costs utilities to develop wind projects become stronger. Commission staff developed cost estimates for utility scale wind projects at 9.2 cents/kWh. For these reasons, and because ART prices would need to be quite high for Category 1 wind turbines to recover costs even under ideal circumstances, an ART is not suggested for Category 1.

- The potential prices indicated above for Categories 2 through 4 are much lower than the hypothetical prices for full cost recovery plus profit, but higher than the prices currently being offered by Wisconsin utilities. The available information shows a very wide range in construction costs per kW of installed capacity. The hypothetical prices are generally based on average values within each Category, but the range of actual values for installed costs makes it evident that cost recovery and profit will be possible in some circumstances at much lower prices.

- The indicated price in Category 2 is based on WEPCO's current ART, which is essentially an expansion of its net metering tariff for wind projects up to 100 kW. For most residential and farm customers, this is equivalent to 11.8 cents/kWh. Because

[16] Sensitivity runs assume that some source of grant funding is available, perhaps through an extension of the Focus on Energy opportunity grants ($250,000), or through federal Rural Energy for America Program grants (25 percent of installation cost), or through other similar current or future grant programs. Such funding may or may not be available in reality.

[17] This value is not based on published data or comments in the record but rather an assumption that larger installations should be able to achieve lower installation costs than smaller (Category 2) installations, due to economies of scale.

WEPCO's tariff has attracted limited participation (two customers), the indicated price is slightly higher. Based on sensitivity analyses, if a customer has a good site (high capacity factor) and keeps construction costs near the low end of the range cited in the record a return on investment is possible at the indicated price.

- The primary basis for Category 4 is WP&L's current ART which offers 9.2 cents/kWh for wind projects up to 1 MW. The WP&L ART is new and it is too early to tell if this price will attract customer participation, but the sensitivity analysis indicates that under ideal circumstances a customer in a good site might be able to earn a very small return on investment at this price.
- The indicated Category 3 price is set roughly halfway between the prices for Category 2 and Category 4.

Category 2 Biogas Scenario

150 kW anaerobic digester on a farm

Assumptions:

- Capacity factor = 80 percent[18]
- Construction costs = $5000/kW[19]
- O&M costs = $17/MWh[20]
- Fuel costs = $6.50/MWh[21]
- Farm receives competitive Focus on Energy grant for electric production (kWh) but not gas production (therms) = $9,150 x [(rated capacity in kW) x (capacity factor)]$^{0.63}$ up to maximum of 25 percent of install cost or $250,000
- Farm is able to use entire Federal Energy Production Tax Credit for "open loop biomass" = 1 cent/kWh for first 10 years of operation
- "Interest" rate = 12 percent on 10-year loan

Price = 10.83 cents/kWh

[18] Comments in the docket suggest capacity factors of 75-91 percent. Commission staff reviewed actual operating data for Wisconsin digesters and suggested 65-80 percent was more realistic. Commission staff assumed 80 percent for this analysis.

[19] Several docket responses suggest installed costs from $3443/kW to $4500/kW, but apparently based on systems larger than the 150 kW in this scenario. Storm Fisher's response indicates a much more expensive range of total capital costs for systems of this size from $6000-$8000/kW. Commission staff assumes $5000/kW construction costs for a 150 kW system on the assumption that smaller systems will cost more per kW to install than $4500 but less than Storm Fisher's numbers.

[20] O&M cost assumption is based on Commission staff's number, which falls in between but close to the numbers cited by Storm Fisher and RENEW.

[21] Fuel costs also based on Commission staff numbers.

Sensitivity Runs:

- 6 percent interest rate (cost recovery only) = 8.6 cents/kWh
- 90 percent cap factor = 9.6 cents/kWh
- 65 percent cap factor = 13.5 cents/kWh
- 65 percent cap factor and cost recovery only = 10.7 cents/kWh
- No Focus grant = 14.0 cents/kWh
- No Focus grant and 65 percent cap factor = 16.9 cents/kWh

Categories 3 and 4 Biogas Scenarios

Category 3: 550 kW anaerobic digester on a farm
Category 4a: 1600 kW anaerobic digester on a farm
Category 4b: 4700 kW anaerobic digester on a farm

Assumptions:

- Same as above, except:[22]
- Construction costs = $4300/kW for 550 kW system[23]
- Construction costs = $3500/kW for 1600 kW system[24]
- Construction costs = $3000/kW for 4700 kW system[25]

Price = 11.06 cents/kWh for 550 kW system
Price = 9.80 cents/kWh for 1600 kW system
Price = 8.79 cents/kWh for 4700 kW system

Sensitivity Runs:

- 6 percent interest rate (cost recovery only) = 8.8 cents/kWh for 550 kW system
- 90 percent cap factor = 10.0 cents/kWh for 550 kW system
- 65 percent cap factor = 13.3 cents/kWh for 550 kW system
- 65 percent cap factor and cost recovery only = 10.5 cents/kWh
- No Focus grant = 12.2 cents/kWh for 550 kW system
- No Focus grant and 65 percent cap factor = 14.7 cents/kWh for 550 kW system

- 6 percent interest rate (cost recovery only) = 7.8 cents/kWh for 1600 kW system
- 90 percent cap factor = 8.9 cents/kWh for 1600 kW system
- 65 percent cap factor = 11.7 cents/kWh for 1600 kW system
- 65 percent cap factor and cost recovery only = 9.3 cents/kWh
- No Focus grant = 10.2 cents/kWh for 1600 kW system
- No Focus grant and 65 percent cap factor = 12.2 cents/kWh for 1600 kW system

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[22] Storm Fisher was alone among the parties in suggesting that O&M costs/kWh decrease with system size. For this analysis, Commission staff assumed O&M costs/kWh are constant.
[23] This value reflects economies of scale. One respondent, Green Valley Dairy, reported $4290/kW installation costs for a 550 kW system. The number used here falls within the range of values cited in the docket, except that again Storm Fisher cites significantly higher installation costs.
[24] This value reflects further economies of scale. It is near the low end of the range cited in the docket.
[25] This value reflects further economies of scale. It is the low end of the range cited by Storm Fisher.

- 6 percent interest rate (cost recovery only) = 7.1 cents/kWh for 4700 kW system
- 90 percent cap factor = 8.0 cents/kWh for 4700 kW system
- 65 percent cap factor = 10.5 cents/kWh for 4700 kW system
- 65 percent cap factor and cost recovery only = 8.4 cents/kWh
- No Focus grant = 8.9 cents/kWh for 4700 kW system
- No Focus grant and 65 percent cap factor = 10.7 cents/kWh for 4700 kW system

POTENTIAL BIOGAS TARIFF PRICES:

Category 1:	Net metering
Category 2:	10.7 cents/kWh for 10 years
Category 3:	10.5 cents/kWh for 10 years
Category 4a (1-2 MW):	9.3 cents/kWh for 10 years
Category 4b (2-5 MW):	8.4 cents/kWh for 10 years

Rationale:

- The indicated prices represent an increase in the prices currently being offered by Wisconsin utilities. (Category 4 was split to prevent creating a situation where the prices would be less than what WP&L currently offers a customer in the 1-2 MW range.)
- Prices are set such that the return on investment depends on the capacity factor achieved. In practice this means the indicated price is approximately equal to the "65 percent cap factor and cost recovery only" price. If the customer achieves a capacity factor at the low end of the range cited by Commission staff for digesters currently operating in Wisconsin (65 percent), the customer will recover costs but not earn a return. If the customer achieves the default capacity factor (80 percent), they will make a profit but less than a typical utility rate of return. If the customer achieves a very high capacity factor (90 percent), they could potentially make a profit slightly higher than a typical utility rate of return, but nothing that would be considered a windfall.

<u>Category 4 Biomass Scenario</u>

3.1 MW boiler/turbine system

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Assumptions:

- Capacity factor = 80 percent[26]
- Construction costs = $6800/kW[27]
- O&M costs = $25/MWh[28]
- Fuel costs = $40.50/MWh[29]
- Customer is able to use entire Federal Energy Production Tax Credit for "closed loop biomass" = 2.1 cents/kWh for first 10 years of operation
- "Interest" rate = 12 percent on 10-year loan

Price = 21.62 cents/kWh

Sensitivity Runs:

- 6 percent interest rate (cost recovery only) = 17.6 cents/kWh
- 90 percent cap factor = 19.7 cents/kWh
- Cost recovery only plus 90 percent cap factor = 16.2 cents/kWh
- Construction costs = $2800/kW[30] = 11.5 cents/kWh
- Cost recovery only plus construction costs of $2800/kW = 9.9 cents/kWh

POTENTIAL BIOMASS TARIFF PRICES:

Category 1:	Net metering
Categories 2-4:	10.0 cents/kWh for 10 years

Rationale:

- There is a real scarcity of information available in the docket or elsewhere on small, biomass boiler/turbine systems. Commission staff have no data whatsoever on systems smaller than 3.1 MW. Commission staff assumes the prices noted above would need to be still higher for smaller systems, but have no actual data to analyze.
- Biomass tariffs in other countries tend to be the most complicated and confusing of all ARTs. It is often difficult to tell whether the tariff covers biogas, biomass, or both. In many instances there is a base biomass tariff and a "bonus" depending on the source of the fuel (digester gas, energy crops, wood waste, etc.). In the final analysis, these tariffs appear to end up at values ranging from below 10 cents/kWh to above 20 cents/kWh.
- Considering all of the above, the risk of setting the price wrong in this technology category would seem to be higher than in other categories.

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[26] This figure is based on Commission staff's analysis of a 35 MW biomass system. The only comments in the docket on this topic, which came from RENEW, suggest 90 percent capacity factor based on EPA data. Commission staff used 80 percent for this analysis on an assumption that smaller systems would not have higher capacity factors.

[27] Based on comments of RENEW.

[28] Based on comments of RENEW. Commission staff developed a similar value.

[29] Based on Commission staff's analysis. RENEW did not provide information on fuel costs.

[30] This figure comes from Commission staff's value for a 35 MW project. Energy Center of Wisconsin separately estimated even lower costs, $2000/kW, for a 12 MW project.

- Because WP&L currently offers a tariff of 9.2 cents/kWh for biomass systems up to 2 MW, one obvious option is to offer a similar price for all systems less than 5 MW. The limited information available on biomass systems suggests that such a price is probably unlikely to offer any customer full cost recovery, but by offering it the Commission would at least expand what's currently available while minimizing the risk of setting the price too high.

Category 4 Landfill Gas Scenario

1600 kW engine-generator

Assumptions:
- Capacity factor = 90 percent[31]
- Construction costs = $1020/kW[32]
- O&M costs = $25/MWh[33]
- "Interest" rate = 12 percent on 10-year loan

Price = 4.79 cents/kWh

Sensitivity Runs:
- 80 percent cap factor = 5.1 cents/kWh

POTENTIAL LANDFILL GAS TARIFF PRICES:

Category 1: Net metering
Category 2: Standard avoided cost buyback rates
Category 3: Standard avoided cost buyback rates
Category 4: Standard avoided cost buyback rates

[31] The only comments in the docket came from RENEW. RENEW cites Focus on Energy data for recent projects in Wisconsin. Commission staff used 80 percent.
[32] Again, this value was cited by RENEW based on actual Wisconsin projects. Commission staff used $1750/kW.
[33] This value from RENEW is based again on Focus on Energy data. It is higher than Commission staff's value, but staff used a separate value for fuel costs which may be included in RENEW's estimate of O&M.

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Rationale:

- Commission staff assumed the project did not receive any state or federal grants or incentives. If it did, the actual price needed to earn a return would be even lower.
- Buyback rates based on avoided costs are currently ~4.9-6.5 cents/kWh. There is no point in setting an ART price less than the standard buyback rate.
- About half of the active landfills in Wisconsin are already generating electricity without requiring an ART. Several others use captured gas for purposes other than generating electricity.
- There appears to be little rationale for offering an ART for landfill gas.

Category 3 Hydro Scenario

650 kW generator

Assumptions:

- Capacity factor = 57 percent[34]
- Construction costs = $884/kW
- O&M costs = $0.01/kWh
- "Interest" rate = 12 percent on 10-year loan

Price = 4.14 cents/kWh

POTENTIAL HYDRO TARIFF PRICES:

Category 1: Net metering
Category 2: Standard avoided cost buyback rates
Category 3: Standard avoided cost buyback rates
Category 4: Standard avoided cost buyback rates

Rationale:

- Commission staff assumed the project did not receive any state or federal grants or incentives. If it did, the actual price needed to earn a return would be even lower.
- Buyback rates based on avoided costs are currently ~4.9-6.5 cents/kWh. There is no point in setting an ART price less than the standard buyback rate.
- There appears to be little rationale for offering an ART for hydro projects.

[34] The only comments in the docket came from RENEW. Assumptions are based on the data provided.

CATEGORY 3

Costs in $ / MWH

	Capital	Fuel	O&M	PTC	Total
Biomass					
Biogas	$97.12	$ 6.50	$ 17.00	($10.00)	**$110.62**
Landfill Gas					
Hydroelectric	$31.42	$ -	$ 10.00	$0.00	**$41.42**
Solar PV					
Wind	$239.08	$ -	$ 15.00	($21.00)	**$233.08**

	Biomass	Biogas	Landfill Gas	Hydroelectric	Solar PV	Wind
Capital Costs						
Annual revenue required		$374,322		$101,695		$301,581
kW		550		650		600
hours per year		8760		8760		8760
capacity factor		80.0%		57.0%		24.0%
kwh each year		3,854,400		3,236,800		1,261,440
Capital Costs ($/MWh)		**$ 97.12**		**$ 31.42**		**$ 239.08**

Fuel costs						
Heat Rate (BTU/kWh)		13,000		0		0
Fuel heating value (BTU/lb)						
Average Price($/MMBTU)		$0.50		$0.00		$0.00
Production Tax Credit (PTC)		-$1.00				-$2.10
Total Fuel Costs ($/MWH)		**$ 6.50**		**$ -**		**$ -**

O&M Costs	Biomass	Biogas	Landfill Gas	Hydroelectric	Solar PV	Wind
variable O&M costs ($/MWH)		17		10		15
fixed operating costs ($/kW/year)		NA		0		0
annualized variable costs		$65,525		$32,368		$18,922
annualized fixed costs		$0		$0		$0
Total fixed and variable		$65,525		$32,368		$18,922
O&M cost expressed as $/MWh		**$ 17.00**		**$ 10.00**		**$ 15.00**

Project Cost	**Biomass**	**Biogas**	**Landfill Gas**	**Hydroelectric**	**Solar PV**	**Wind**
per kW		$ 4,300		$ 884		$ 2,840
Direct Construction Costs (2007)		$2,365,000		$574,600		$1,704,000
Focus on Energy reward or grant		-$250,000		$0		
Federal tax credit						
Total Project Cost		**$2,115,000**		**$574,600**	**$0**	**$1,704,000**
-Interest Rate		12.00%		12.00%		12.00%
-Recovery Period in Years		10		10		10
Annual Revenue Required		**$374,322**		**$101,695**		**$301,581**

Reward Factor unrounded		0.567351598
Reward Factor		0.56
Focus Grant - formula	423444.2893	706406.4
Focus Grant - cost share cap	$591,250.00	$596,400.00
Focus Grant - dollar cap	250000	250000