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SMALL TURBINE COLUMN:

A Call for a Sensible Approach to Small Wind

by Mick Sagrillo

**Dateline: somewhere in the Midwest---
Hospital installs wind turbine on its roof...**

...that “is expected to generate nearly 30,000 kWh of energy a year, roughly the amount used to power two 1,600-2,000-square foot homes...The cost of the installation was about \$100,000.”

At first glance, this recent news article holds the promise of a technological breakthrough, an installation that promises a better return on investment than even the best stock market moves.

Unfortunately, reality sets in for those of us in the small wind industry. The above is just one more piece of disturbing media hype about a new wind turbine design that cannot or will not meet the claims made by either the manufacturer or the installer. Why is this happening?

First the good news...

On October 3, 2008, Congress passed a piece of legislation that included the creation of a federal Investment Tax Credit (ITC) for small wind systems. Small wind turbines include those with rated capacities of 100 kilowatts (kW) and less. The legislation allows a taxpayer to claim a tax credit of 30% of the total installed cost of the system, not to exceed \$4,000. For turbines used for homes, the tax credit is additionally restricted to \$1,000/kW of rated capacity. The credit is applicable for any small wind system installed as of October 3rd, 2008, and is effective through December 31st, 2016.

This is very welcome support for small wind, and begins to level the playing field with other renewable technologies, like solar photovoltaics, which have received tax advantages for years. Many in the small wind industry worked very hard and for many

years for the passage of this legislation, particularly AWEA, Mike Bergey of Bergey WindPower, and Andy Kruse of Southwest Windpower.

Now the more problematic news...

I currently serve as the wind energy specialist for Focus on Energy, Wisconsin's renewable energy funding program. About the time that the passage of the ITC looked imminent, I began getting an avalanche of phone calls from all manner of companies looking to cash in on this new financial support. These calls were not from the companies that have been in business for years, but new upstarts, investors, and entrepreneurs who wanted the know how to get their turbines on the "approved list" for installation in Wisconsin. A combination of state public benefits funding for equipment and the ITC would mean that they too could become viable businesses.

The problem with many of these designs is that they are half-baked ideas, "concept turbines," or one-off installations set up in an ideal location hopefully to optimize electrical output. In talking to most small turbine manufacturer hopefuls, few have any idea how much energy their turbine will generate at a given location for the prospective owner. Phrases like "a homeowner will save 20% to 80% off of their electric bills" hold the promise of large generation potential with absolutely nothing to back up the inflated claims.

In addition, many of these new designs, touted as "urban turbines" or "rooftop wind systems," are designed to be installed in places that are well understood as marginal or compromised wind sites. Based on our experience over the 80-year history of small wind turbine designs and the current laws of physics and fluid dynamics as we know them today, many will likely not work as expected or ever generate meaningful amounts of electricity in their design life in these locations.

What's going on?

The most common strategy used to generate interest in these new products is to shotgun press releases to the media in hopes that someone will pick up the lead and grant an interview. These interviews generate even more media interest, which in turn attract potential buyers and investors, most of which are not at all up on the technological challenges that such designs face, but "like the way the turbine looks."

The result of this is lots of media interest in "new technology breakthroughs." Ron Stimmel, AWEA's Small Wind Advocate, said that of the 112 media interviews he has done in 2008, 80 of them began with the reporter saying, "So when you put one on your roof..."

I've written extensively about optimizing the wind resource for your site with a tall tower, and avoiding places where you are not likely to find any useful winds, most often on the ground or on top of your roof. These are archived at www.awea.org/smallwind/sagrillo/index.html and

www.renewwisconsin.org/wind/windtoolbox.html . The foundation of these pieces is the history of small wind as well as the physics of the technology and wind.

A history lesson

My tenure with small wind dates back to the very early 1980s. I got my start repairing wind turbines that were funded under federal renewable energy tax credits during the Carter and Reagan administrations. To refresh your memory, that was an era of extensive experimentation with small wind. The federal government paid 40% of the cost of a wind system, while many states had their own similar renewable energy tax credits. In Wisconsin where I live, an additional 26% was allowed as a tax credit for such system. As a result, many turbines of all conceivable designs were sold and installed. The first system my family and I installed at our farm benefited from a whopping 66% in combined tax credits, not an unusual level of incentives in the U.S. at the time.

But there were many failures. Experiments naturally have a high failure rate; otherwise, they would not be experiments. The point of that funding was not necessarily to get kilowatt-hours of electricity on the utility grid, but more to help pay for the development of these experimental wind turbines and other renewable technologies by stimulating the marketplace. All of us consumers were (hopefully) willful participants in the experiments, knowing full well that the designs were new, and many were completely untested.

Of the 80 or so wind turbine manufacturers that set up shop and sold wind turbines back then, only a handful are still in existence and manufacturing wind systems. The rest went belly up—an incredibly high attrition rate. Wind obviously took a lot of hits during that time. What people don't understand is that the purpose of the tax credits was to fund equipment that would allow companies to experiment with all manner of new and innovative designs. The few successful companies to come out of that era include Bergey WindPower, Northern Power, Wind Turbine Industries Corp., and the precursor to Entegri Wind Systems.

Congress and many states funded substantial incentives due to concerns about control over the world's energy resources. With the 1973 OPEC oil embargo that came in response to U.S. support of Israel during the Arab-Israeli War, and the fall of the Shah of Iran during the Iranian Revolution in 1978, the cost of oil skyrocketed and all of us in the Western world got the jitters about where our energy was going to come from. Both in the U.S. and in Europe, incubating renewable energy companies to create new solutions was seen as a possible way to grow some of our own energy.

Sound familiar? It should. Only today we are also saddled with concerns over global climate change.

But there was a serious downside to this era of experimentation. Most of the turbines designed and sold had fatal flaws, so much so that most rarely saw one year of successful operation. A few designs lasted longer than that, but when the tax credits sunsetted on

December 31, 1985, only two companies made it into the summer of 1986. No replacement parts, no technical support—no real small wind industry to speak of—meant that small wind came to a crashing halt. Wind installers and dealers quickly looked for other, more reliable work. Most wind turbine owners ended up with orphan systems. Those that had operable systems continued to run them until the turbines wore out or simply fell apart.

The worst part of all of this was the terrible black eye that small wind got. While all renewable technologies were abandoned by the federal and state governments during the Reagan administration, the repercussions to wind was somewhat unique due to its high visibility on the landscape, both literally and figuratively. For example, if you had a solar system and it quit working, it likely continued to sit on your roof smiling at the sky—no one knew if it was working or not. If you had a hydro plant and it quit generating, no one knew—after all, it was still sitting in the water. But if your wind turbine stopped working... That's right, the whole neighborhood, as well as anyone just passing by, instantly knew that your wind system was nonfunctional.

Due to the expense to hire a contractor to uninstall the derelict wind system, many “expired” turbines just sat atop towers for years, slowly disintegrating. This was so common that in many locations people voiced surprise upon hearing of small wind systems that actually operated and generated electricity. Small wind's reputation was seriously tarnished.

So, why do I care?

Good question.

A number of us in the small wind industry have worked very hard over the past two decades to dig ourselves out of the hole we were in, to bring respectability back to small wind. I and many others firmly believe that wind is part of the solution to global climate change and also offers the ability to grow some of our own energy. But the unfortunate result of the 1980s tax credit era was that wind got a very black eye—the word on the streets was that wind was a failed experiment. After all, “Just look at the derelict equipment left dangling from towers.” The common conclusion: “wind doesn't work.”

Over the interceding years, big wind has exonerated itself. There are now numerous wind farms scattered across the U.S. generating clean, reliable, cost effective electricity that is economically competitive with conventional fossil and nuclear generated electricity. With over 25,000 large wind turbines installed in the U.S., representing over 21 gigawatts of capacity, big wind is indeed a substantial player in the energy marketplace.

But small wind? Well, at some point all those turbines disappeared from the landscape, although the memory of them did not. Small wind was just a curiosity, or worse, small wind “didn't work.”

Fast forward to today. There are just over a handful of viable U.S. companies in business manufacturing reliable small wind turbines, with another handful of international companies importing reliable products. In addition, there are a comparable number of manufacturers and products that are not ready for prime time—yet. And they may never be serious players, depending on whether they can improve the reliability and cost effectiveness of their designs.

However, there are also dozens of startup companies ready to take your money. Some have untested products, some have concepts, but none can become serious businesses without sales. Those sales leads, unfortunately, are all too often generated by media hype.

Where we absolutely do not need to go is back to the 1980s—that is, a time of unreliable small wind systems that ultimately become monuments to “wind doesn’t work.” I’m certainly not arguing to squelch experimentation. But people, both consumers as well as members of the media, need to understand the difference between tried and tested equipment that we know will do what the manufacturers say they will do, and the experiments, “technology breakthroughs,” and just plain scams that are so dominant in today’s media, unwittingly portrayed by scientifically unsophisticated “reporters” as viable products.

I believe this issue is quite serious for small wind. As AWEA’s main contact for small-wind media questions, Stimmel finds that stories on small wind often originate from claims of a technological or scientific breakthrough, but that reporters seldom ask the right questions about the product or application. I hope that turbine certification one day becomes the reporters’ first line of questioning, rather than how much money a consumer can save on tower costs by installing a new turbine design on a rooftop. The responsibility for this shift lies with all of us in the industry, but especially those who manufacture and market turbines. Certifying turbines to a performance, safety, and reliability standard in the near future will, hopefully, settle many of these issues naturally.

Until then, and without a higher standard of marketing integrity and public education, the industry may be at a fork in the road, with two paths leading into the future. One path leads to an industry that will be highly regulated, very likely by public benefit programs, although regulation could come from individual states. The worst-case scenario? Picture a world where an engineer’s wet stamp is required on every installation. Don’t laugh. Several states are actually beginning to move toward requiring a professional engineer to inspect and approve every small wind turbine that is installed.

The other path in small wind’s future—without certification becoming the small wind center of gravity to guide the industry, consumers, and the media like—leads to a repeat of 1980s history, if the reputation that “wind doesn’t work” is reinforced by unreliable, untested, or half-baked designs that parasitize public benefit programs. If state public benefit programs or Congress loses faith that small wind is part of the solution, neither will hesitate to cease incentive or tax credit programs that are currently in place. Don’t take this concern lightly. Massachusetts recently put a hold on its small wind incentive program. The reason? None of the state’s small wind installations is currently

performing as expected, and so the program managers decided to restructure the incentives to reflect the reality of the situation.

Neither of these paths is acceptable.

My recommendations

So, how do we proceed? How can state public benefit programs, as well as consumers, be assured that the turbines being bought will actually generate the amount of electricity that the manufacturers claim, and do so reliably for decades? Here are my thoughts.

1. The small wind industry needs product certification now. A number of us in small wind have been working on a certification standard for the past five years. That process has stalled a number of times. The standard would specify reliability requirements, documentation of annual energy output and rated power at a rated wind speed, various safety parameters such as overspeed control and shutdown mechanisms, and documentation for such things as sound emissions. Test results submitted by the manufacturers would be reviewed by an independent agency, and, if deemed accurate, a particular turbine model would receive certification that it meets the standard.

At least one certifying organization is up and running and can begin reviewing applications for certification early in 2009. All we need is the certification standard to be completed—of course, preferably now, if not sooner.

2. State public benefit programs need to give serious consideration to funding this equipment certification effort on a national level. Currently, these programs are dispensing utility ratepayer or tax payer dollars virtually blind. With a certification standard in place, these programs will finally have a list of turbines that they can be assured meet the public standard inevitably required by funding agencies or program evaluators, who are responsible for the financial protection of taxpayers, consumers, and industry.

3. Manufacturers need to fine-tune their siting guidelines and marketing integrity with respect to their products. With the new ITC in place for only six weeks, we have already seen the phenomenon of “rated capacity creep,” or, the upward rating of some turbine models to take better advantage of the tax credit, optimizing the amount of money the consumer will get from their product versus a different choice. This is a blatant marketing ploy designed to increase sales and market position.

In addition, some companies still participate in installations that are seriously compromised by the erroneous rationale that any exposure to wind is good exposure. Companies have been known to apply such reasoning to both a given site as well as to the public and media. Unfortunately, installations at poor wind sites, which invariably result in poor performance, generate nothing but cynicism towards all small wind turbines, and to renewable energy as a whole.

4. It might well be time for manufacturers to offer money back or production guarantees if the turbine does not generate the amount of electricity that the manufacturer claims it will. These arrangements might include system and installation buy-back guarantees, or could include production payments if the system did not generate a certain percentage of claimed electricity.

As things sit right now, many manufacturers are wildly optimistic about their products' performance, with some claims bordering on outright fraud. An egregious example of this is the clip from the news story that began this column. The claimed 30,000 kWh of electric generation per year for the swept area of the turbine is overestimated by at least 10 times, but more likely 20 times the actual production, based on a mathematical analysis of the rotor size and the laws of physics here on planet earth that dictate the amount of energy available in the wind. And yet the unwitting consumers can only trust what the manufacturer tells them. They currently have no recourse if the manufacturer knowingly deceives them.

5. The media needs an enormous amount of education about what is reality versus what is hype with respect to some of these turbine designs, and that education needs to come in large part from manufacturers—often prime media sources—who are not afraid or unwilling to be completely honest about their products and what can realistically be expected from them. I would also suggest that all environmental advocacy groups supporting renewables get up to speed on what works, what is sham science, and why. We definitely need more boots on the ground interacting with the media. This certainly includes all readers of this column.

6. To that end, I'd also suggest that installers begin touting their work. After completing an installation, contact members of the media (print, TV, and radio) and suggest they come out and do a local interest story on the turbine and its owner. But don't stop there. On the one-year anniversary of the installation, urge that they do a follow-up story documenting the turbine production and any other relevant information about the system. Keep these installations on the radar screen. Make this an annual media story.

Indeed at a crossroads

If we, the small wind industry manufacturers, installers, dealers, and advocates, as well as environmental organizations, do not speak out for reliable products, truth in advertising, and reality checks in "news" coverage, we may indeed find ourselves saddled, one last time, with the conclusion that "wind doesn't work."

I've described two potentially treacherous paths that lie before us, as we stand now at our crossroads. But a third path leads to a great future for small wind. We are actually already several steps down this path, helped by the new federal incentives, state public benefit programs, record media attention, and an optimistic buying public.

But we still have a lot of work to do. Small wind certification is imperative. And some products' wild claims about their performance and viability must cease. If we embrace a

policy of transparent certification and maintain our integrity as an industry, we will all be better off. The industry must choose: short-term, isolated gains, or a long-term sustainable industry.

We must all work to sustain the industry of sustainability.

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