

## What's All This Talk about Power from Windmills?

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### INTRODUCTION

Spain currently is very enthusiastic about wind-generated energy. When you go to periodicals in that land seeking information on wind, or *viento*, don't be surprised if you run into: "*Lo que el viento se llevó*." The Spanish are familiar with that book; it's by Atlanta's Margaret Mitchell. In America, we have always called it *Gone with the Wind*.

In the current study, that well-remembered book and motion picture are something more than just inappropriate insertions of *literature*. We shall discover that there are negative forces today which feel that the concept of wind power should be – like Margaret Mitchell's Old South – "**gone** with the wind."

Of course, we want to know the formula for the generation of power via the wind. Well, here it is according to the website *ecolo.org*:  $P_w = C \times k \times D^2 \times V^3$ . That means: the power produced by a windmill (in watts) = a Constant times the efficiency factor **k** times the squared diameter of the windmill in meters times the wind velocity in meters per second to the third power (8).

### HISTORY

In late October of 2003, Matt Roper and Clare Goldwin, writing for the British medium

*Mirror*, explained how a typical day in the future would end for a British family:

As darkness begins to fall you check the electricity meter and see that the family is in credit – the house's windmill generator and solar panels are putting more energy into the national grid than the household is using, adding to the family income (38).

Ah, the future and its wind power! But we must remember film star Michael J. Fox in *Back to the Future*, a delightful experience in which *past* and *future* became mixed. To understand wind power, with Michael J. Fox in mind, we must go *forward* to the *past*! Here's how, according to the website *The Energy Planet*:

*Incluso en civilizaciones antiguas, el viento era sabido para ser una fuente de la energía que se podría cosechar para beneficiar a la sociedad. La gente ha utilizado el viento para mover los barcos, dispersa el grano, cometas de la mosca, y el agua de bomba por siglos. Ténganos solamente recientemente utilizó energía del viento para accionar el equipo electrónico (48)* – Even in ancient civilizations, the wind was known to be a force of energy to be harvested for the benefit of society. For centuries, people have used the wind to move ships, spread grain, fly

kites and pump water. It is only recently that we have used the energy of the wind to activate electronic equipment.

With this background in mind, there is much belief worldwide that we are on the right track!

## SUPPORT FOR THE WIND

As early as June 15, 2003, in California there was enthusiasm for the idea. Randy Abernathy, writing for *Public Utilities Fortnightly*, explained. The initials MW stand for megawatts or a **million** watts:

On July 1, the California Independent System Operator [ISO] will launch its Intermittent Resources Program – the first of its kind in the nation. The new scheduling system encourages renewable resources such as wind to bid into the ISO's markets. The program will open with about 300 MW of new wind capacity this summer with another 2,000 MW possible for the ISO's markets by the fall. Current estimates suggest that a total of 4,000 to 5,000 MW of new wind power capacity may be integrated into the California transmission grid over the next 15 years (1).

On January 18, 2004, in *Knight Ridder Tribune Business News*, Timothy C. Barmann reported on a favorable venue for wind power:

Rhode Island, with its miles of windy coastline, is suggested by some proponents as an ideal place for

generating electricity. According to a 2002 report by the Environmental Protection Agency, wind turbines covering about 8 percent of Rhode Island could produce 2 million megawatt-hours a year, enough for about 31 percent of the entire state's energy needs (3).

At just about that same time, *Building Operating Management* of Milwaukee told of the coming of wind power to a very special spot:

The 70-story, 2.6 million-square-foot office tower planned for the World Trade Center site was designed to make an architectural statement in many ways, including energy. On top of the soaring structure will be an open-air structure on twin concrete cores with 1 to 3 megawatt wind generators capable of producing up to 20 percent of the building's electrical needs (51).

And right there at the start of the Democratic presidential primaries in the middle of January, 2004 – with the winning candidate far from being decided that early – Christine Real de Azua authored a news release for the American Wind Energy Association (AWEA) with the headline: “Most Presidential Candidates Strongly Support Wind Energy Development in the U.S.” A very strong statement on the matter came from Retired General Wesley Clark:

“...the increased domestic demand for wind power prompted by an RPS [renewable portfolios standard] will help America's wind industry develop into another American high-tech success story” (15).

That demand for wind power has received tremendous support from the Kyoto Protocol.

## ROLE OF THE KYOTO PROTOCOL

In its most simple and most general form, here is the goal of the Kyoto Protocol:

...negotiated by over 160 countries in December 1997....the agreement would require 38 industrialized countries to reduce the emissions of six major greenhouse gases by 5.2 percent during the 2008-2012 period (25).

What kind of progress has the Kyoto Protocol brought about so far? In the issue for spring of 2002, Liuchen Chang of Canada's University of New Brunswick wrote the following positive report for the *IEEE Canadian Review*:

More and more countries are ratifying the 1997 Kyoto Protocol, and wind power has become one of the most effective ways to reach its goals.... In addition to business opportunities as a result of deregulation in the electricity market, wind power generation has great potential to create employment in wind system development, manufacturing, maintenance and operation (11).

To show how important is this movement in which wind power is playing a role, Professor Chang makes a statement that is significant but hard to grasp. He informs that "world energy consumption will increase from 12,833 TWh in 1999 to 22,230 TWh in 2020" (*Ibid.*). "TWh" stands for a **trillion watt hours**.

Despite the role that wind power can play in nations around the world in fulfilling the

Kyoto Protocol, there is resistance to such power.

## OPPOSITION

Perhaps as soon as the first wind turbine was proposed, there was opposition. Writing for the Heartland Institute in January of 2002, Michael Heberling had this to say:

Between four and five million birds are killed every year in collisions with stationary, generally solitary, communications towers. One can conservatively estimate that three times as many wind turbines will cause three times as many bird deaths: between 12 and 15 million. A wind turbine with long, rotating blades (regardless of whether those blades have been slowed) clearly will kill more birds.... (20).

In June of 2003, Pamela Podger, writing in the *San Francisco Chronicle*, told how some citizens and the authorities in Sonoma County felt about the new development:

...some people told the supervisors that the wind turbines are ugly, noisy and shouldn't be permitted near urban areas. The public uproar resulted in a temporary moratorium...on small wind systems within 2,500 feet of water and sewer connections (31).

In September of 2003, the *Boston Globe* offered a Charles M. Sennott treatment of public reaction to wind turbines on Cape Cod in Massachusetts:

...Erwin Thoreus, chairman of the Neighbors group...contends that the wind turbines have proven noisy and

that the shiny rotors often create a distracting glare in the sunlight. Thoreus, who lives only a few hundred yards from a towering windmill in a field adjacent to his home, said the annoying glare was like “a flashbulb going off in your living room every four seconds” (42).

As 2004 dawned, new California bird-kill figures (blamed on the wind turbines) were reported by Bobby Caina Calvin for the *Boston Globe*:

Each year, at least 60 golden eagles die in collision with windmills, as well as 300 red-tailed hawks and 270 western burrowing owls, according to statistics the biological diversity center compiled from studies conducted by the state Energy Commission (9).

But it’s not just “biological diversity” groups which are negative. Writing for the American Wind Energy Association in late January, 2004, Belyeu and de Azua reported that in 2003 alone, *newly added* wind energy could serve an additional 425,000 homes. But they indicated a down side:

The near-record performance for the American wind industry is overshadowed, however, by the **failure of Congress** to pass comprehensive energy legislation including a three-year extension of the wind energy production tax credit, an incentive that is vital to the industry’s future growth (4, **bold** emphasis by the current authors).

In Great Britain also, a *Government* unit was standing in the way of the wind! Russia’s *Лента.Ру* told the story on March 1, 2004:

Британская программа строительства ветряных электростанций оказалась под угрозой из-за действий военных, которые требуют ставить турбины не ближе, чем в 74 километрах от радаров сил противовоздушной обороны (6) – The British program for constructing wind-powered electric power stations could prove to be threatened by military operations which require that the erecting of turbines can be no closer than 74 kilometers from anti-aircraft defense radar.

On that same date, Alex Kirby provided additional insights via *BBC News*:

The only other European country with [such] a limit is Germany which sets it at three miles (5 km)... The ministry [MoD or Ministry of Defence – British spelling] says its opposition is by no means hard and fast, and it often helps [wind turbine] developers to choose a good site (23).

But that distance requirement is pretty stringent. In Germany it’s 5 kilometers (3 miles) and in Britain it’s 74 kilometers (46 miles). Hopefully *MoD* and the Government’s efforts at increasing wind power can achieve an area of cooperation – as is the case in other parts of Europe.

## DEVELOPMENTS IN EUROPE

In doing research on wind power for *The Boston Globe* in autumn of 2003, Charles M. Sennott journeyed to *Danmark* and made his way to the beautiful capital city of *København*. Americans would spell that spot as Copenhagen, Denmark. Most tourists to

the København harbor make it a point to see the famous and historic sculpture of Hans Christian Andersen's "The Little Mermaid." But *Globe* correspondent Sennott saw something else in that beautiful spot:

Looking out to sea from this city's picturesque harbor, a wall of 200-foot windmills dominates the horizon with rotors silently spinning in the glinting sunshine as sailboats and fishing trawlers glide past. For most Danes, these towering turbines are anything but an eyesore, and anything but a threat to the environment. In fact, they are featured on postcards and proclaimed attractions by tour guides on ferry boats. They are the pride of the local Greenpeace office, which even owns shares in the project (42).

In early 2004, the website *Tierramérica* reported regarding Denmark: "In this European nation, the wind is already providing 13 percent of the energy used by the population" (44). And further evidence for Danish utilization of wind power is a statement from the Finnish Wind Power Association, or FWPA. To be totally accurate and with respect to Helsinki, we must indicate that in their own language that group calls itself *Suomen Tuulivoimayhdistys*. FWPA monitors wind power all over Europe, and their website in early 2004 was indicating who were leading the European field a couple of years ago in terms of megawatts (MW) produced by the wind. It is assumed that a 2004 or 2005 report would produce far, far greater figures:

*Suurimmat markkinat olivat Saksassa (8754 MW), Espanjassa (3337 MW) sekä Tanskassa (2417 MW) (45) – The largest markets are Germany (8,754 MW), Spain (3,337 MW), and Denmark (2,417 MW).*

And France is very much in the picture. For an issue of *Paris Match* in September of 2003, François Labrouillère sketched an intriguing and complex picture of the wind in France. Be warned that Labrouillère wants to make his fact conveyor a *literary* masterpiece:

*Quel placement miracle permet de gagner près de 25% par an après impôts, sans risque commercial et avec une rentabilité garantie sur quinze ans? ....moins aléatoire que le Loto, ce paradis pour investisseurs existe: c'est l'énergie éolienne (26) – What miracle investment would permit one to profit more than 25 percent per year after taxes without business risk and with a profitability guaranteed for 15 years? ....less risk than Lotto, this investors' paradise exists: it is energy from Aeolus [the god of the winds].*

Before continuing with prose from Labrouillère, it should be indicated that E.d.f. (referred to below) is the massive utility *Electricité de France*. Labrouillère returns:

*A l'origine de ce filon: la volonté française de protéger l'environnement en développant sa production d'énergies renouvelables. Depuis un arrêté ministériel du 8 juin 2001, E.d.f. est tenue d'acheter au prix fort...la totalité de l'électricité produite par les exploitants privés d'éoliennes (Ibid.) – At the root of this cushy situation is the French desire to protect the environment and develop its production of renewable energies. Since a [Government] Ministerial decree June 8, 2001, E.D.F. is going to have to buy at a high price...the totality of the electricity produced by the private exploiters of*

the windmills.

In June of 2003, Germany's weekly magazine *Der Spiegel* let us know that there was a slight variation on wind as power – a variation possessing considerable potential:

*Windmühlen unter Wasser. Forscher entwickeln neuartige Gezeitenkraftwerke. Propeller...auf dem Meeresgrund sollen künftig Strömung in Strom verwandeln. Der erste Prototyp geht jetzt ans Netz* (5, p. 146) – Windmills under water. A researcher has developed a new type of tides power station. Propellers...at the bottom of the sea should in the future convert [water] current into [electric] current. The first prototype is now on the [power] network

Developer of this complex off the English coast is Martin Wright of the firm Marine Current Turbines. He enthusiastically states: “*Das Potenzial der Gezeiten als umweltfreundliche Energiequelle ist riesig*” (*Ibid.*), meaning: “The potential of the tides as an environmentally-friendly energy source is enormous.”

The wind power movement is also strong in interesting places rather far from Europe.

## ASIA-PACIFIC

As far back as March 29, 2001, *BBC News* carried a report about Professor Bryan Roberts of the University of Western Sydney in Australia and how he will harness the wind:

[Roberts'] gyromil, as he calls it, is actually a flying turbine. It uses its rotors to climb into the sky and then lies back in the wind as those same

rotors generate electricity. The plan is to send clusters of these vehicles 4.5 kilometres (14,700 feet) up into the jet stream to create a sort of flying power station.... The professor believes gyromils will prove to be a cheaper and more flexible method of electricity generation than traditional wind turbines (32).

Very close by, two years later, there came a report of progress in *nzoom.com*, billed as *the homepage for New Zealanders*:

The first significant impact of New Zealand signing the Kyoto protocol is being felt with two new wind farms coming a step closer to producing electricity.... The wind farms will add 115 megawatts of electricity to New Zealand's generating capacity – enough to supply roughly 50,000 homes. They will treble the current amount of electricity generated by wind turbines and could start producing power by late next year [December, 2004] (24).

In the beginning of 2004, there was this report from *SinoCast China Business Daily News*:

BEIJING, February 19 – It is expected that China's installed capacity of wind power will reach 4 million KW in 2010, and 6 million-8 million KW by 2020. Wind power not only can save expenses on lighting for residents in pasturing areas, but also improve the quality of energy supply.... The majority of users are residents in Inner Mongolia Autonomous Region (50).

So that these figures can be compared to figures elsewhere in our analysis, it should be

indicated that a KW, kilowatt, is one thousand watts, whereas the MW, megawatt, is a million watts. So the China goal of 4 million KW in 2010 is equivalent to 4 thousand MW – a figure close to Spain’s capacity of 3,337 MW as reported by the Finnish Wind Power Association.

One week later, *Knight Ridder Tribune Business News* furnished this information:

OSAKA, Japan – Kansai Electric Power Co. said Thursday it will take a stake of about 20 percent in Eco Power Co., one of Japan’s biggest wind-power generating companies, next month.... The move by Kansai Electric follows a state requirement for electric power companies to have electric power from new energy sources such as solar power and wind power account for a certain portion of electric power they sell.... (22).

Returning home, we find that a particular part of the United States is really into wind power.

## AREAS OF THE UNITED STATES

Very clearly, the Southwestern quarter of the United States is very much engaged in the development of wind power. Here is just a limited sampling of such activity. In May of 2003, *Transmission & Distribution World* told of a new development:

Public Service Co. of New Mexico (PNM)...and FPL-Energy (Juno Beach, Florida) began construction of the New Mexico Wind Center and Switching Station in February 2003. The 204 MW...wind farm is located...northeast of Fort Sumner, New Mexico.... The...project will

supply enough electricity for 94,000 homes (29).

In October of 2003, when his Caprock Wind LP announced installation of wind turbines east of Tucumcari, New Mexico, company president Walter Hornaday explained why all this New Mexico activity made good sense. He was quoted in *Utility Fleet Management*:

“Generation from wind is particularly attractive in this region because of the strength of winds here and because wind generation, compared to generation at conventional powerplants, conserves water, which is particularly important in this area” (10).

SeaWest, the largest independent developer of wind power on the West Coast, was the focus of a November 17, 2003 article by Rene’e Beasley Jones in *San Diego Business Journal*. SeaWest got started in the early 1980’s and its history is summed up like this: “In all, SeaWest has installed 3,273 turbines totaling more than 950 megawatts, including the Palm Springs project now under construction” (21).

And the science of wind power has become more sophisticated and efficient, according to Reed Fujii, writing in the December 29, 2003 issue of *Knight Ridder Tribune Business News*:

In the early 1980’s, when the first utility-scale turbines were installed, wind-generated electricity cost as much as 30 cents per kilowatt-hour. Now, state-of-the-art wind plants generate electricity for less than 5 cents per kwh, according to the American Wind Energy Association (17).

As 2004 began, Rosalie Rayburn wrote in *Albuquerque Journal* and *Knight Ridder*

*Tribune Business News* that New Mexico – unless they rethink it – has a “renewable rule” which states that by January 1, 2011, ten percent of retail electricity must come from renewable sources, such as water, solar **and wind** (37).

Not far away, there’s wind-power development in Oklahoma. Mike Coppock wrote about it on February 26, 2004 for *Daily Oklahoman* and *Knight Ridder Tribune Business News*:

Fifteen landowners are participating in wind power farms near Lawton and Woodward. The Woodward wind farm has 68 turbines and Blue Canyon Wind Farm near Lawton has 45.... The two large-scale farms will be supplying enough electricity to power about 52,000 homes in Oklahoma.... Oklahoma ranks eighth in the nation for wind power potential (13).

## CONCLUSION

Although we have devoted considerable focus on just one quadrant of the United States, there are wind-power possibilities throughout the nation – and indeed around the world. Back in the 1980's, we are told, wind power came on the economic scene like the Chicago fog so beautifully described by Carl Sandburg: “The fog comes on little cat feet” (40, p. 71). Wind power was a quiet, almost science-fiction notion having all the impact of a little kitty’s silent footsteps.

It’s not so quiet now. As early as May of 2003, an executive with General Electric cited three reasons for his worldwide giant corporation to get involved with the wind:

The cost of electricity generated from wind power dropped to the point where it was competitive with other sources; the [wind] business could benefit from technology from other GE businesses; and GE customers were increasingly interested in renewable energy sources (12a).

In 2005 and years to follow, wind power will not be coming “on little cat feet!” It will move in with dinosaur footsteps that will cause the earth to tremble. Let’s keep watching!

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