Renewable Energy: Headwinds Ahead?

BY P. BARTON DeLACY, CRE

INTRODUCTION

ENERGY TOUCHES EVERY ASPECT OF LIFE. HOWEVER, SEARCH engines, when queried for the terms "energy" and "corporate real estate," will return countless references to conservation and sustainability. Missing in the discussion of clean, green and renewable is information on how energy is generated.

The focus of this article is on the interrelationship of fuel, power generation and real estate. Beyond these factors public policy provides incentives, often favoring one form of energy delivery over another. Such policies, informed by science and global politics, strive to override what are considered short-term consumer preferences. For instance, American consumers long favored low-mileage sports utility vehicles (SUVs) when gas was relatively cheap.

MUST RENEWABLE ENERGY BE SUBSIDIZED?

Why does utility-scale renewable energy power generation, as represented by the proliferation of wind and solar farms, require such heavy subsidy? Could such governmental "investment" inflate a bubble, or are the superseding public policy goals sufficient to assure the prudent expenditure of capital and a wise use of the land? So the question becomes, is there sufficient demand in the marketplace to support the scale of renewable power development envisioned by U.S. policymakers or is the stimulus excessive and likely to encourage speculation and over-building? Speculative bubbles have plagued national, if not world, economies ever since trade was globalized—at least since the tulip craze of the late seventeenth century. Most readers of this journal are well aware of the perils of real estate speculation and the current plight of our new-construction-driven housing economy. Yet any commodity, be it tangible (tulip bulbs and oil) or intangible (dot-com and broadband) can spike in price before collapsing in ruin. As we should have learned in the late subprime housing bust, external stimulus can be the catalyst for irrational enthusiasm.

In a tumultuous political year, how we finance and incentivize development of green power has forced the renewable energy industry to confront its economic fundamentals. The bankruptcy of Solyndra, the solar panel manufacturer, brought to light the relative high cost of production components. In the case of California-based Solyndra, heavy taxpayer-financed subsidies were necessary for the company's products to be competitive with Chinese imports (which themselves were heavily subsidized by the Chinese government).

The relatively mature wind industry finds itself in crisis in 2012. Two critical subsidies are, or will be, gone. Without those subsidies, we have learned, most large utility-scale wind projects will no longer be feasible. The soon-to-expire production tax credits (PTC) have been around for a couple decades with periodic extensions. A PTC now

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pays about 2.2 cents per kilowatt-hour of power produced over a ten-year span. When modeling the impact of this subsidy, developers typically showed it returned up to a third of installed project costs.

However, the success of a PTC, or any tax credit, is contingent on having healthy banks that have the income to justify the credit. During the recession of 2008–2009, the number of eligible tax credit investors evaporated. Thus, as part of the Recovery Act,[1] Treasury Grant 1603 provided an outright cash subsidy to renewable energy projects for up to one-third of their construction costs. The grant paid out once a project was put into service. The 1603 grant program expired at the end of 2011 and the PTC is set to expire at the end of 2012.

The American Wind Energy Association (AWEA) has orchestrated a broad-based lobbying effort on behalf of its member developers and component manufacturers to extend the PTC. Without the credit, AWEA claims pending projects will be delayed or abandoned, with thousands of jobs lost. While construction jobs are temporary, and only skeletal staff is needed to maintain operating wind farms, project curtailments threaten widespread layoffs throughout the domestic supply chain.

On one hand, this clamor for continual subsidy may sound like funding the next financial bubble; yet most innovations in energy technology have required significant federal assistance for many years. For instance, the tax code still recognizes depletion allowances and other incentives to aid oil and gas exploration. However, some argue, including Pulitzer Prize-winning author Daniel Yergin, that improvements in the technology for extracting and conveying natural gas to industry and consumers[2] have served to disrupt the narrative that so-called fossil fuels are in danger of being depleted at all.

Understanding the economics of renewables will help real estate advisors support appropriate public policies. In the end, energy is a commodity whose availability and cost can dramatically affect facility location and overall economic growth. Focus on the wind industry brings these observations into high relief, beginning with a review of the fundamentals of power generation.

POWER GENERATION

Power plants include any facility housing a turbine connected to a generator that converts kinetic energy into electricity. Examples range from hydroelectric dams to wind turbines to steam-powered generators. Photovoltaic solar panels and fuel cells create electricity through chemical reactions.

How can real estate professionals participate in the energy marketplace and its growing appetite for property? As a start, lenders and investors need to appreciate there is a financeable asset once these capital intensive projects are built.

Energy markets can be defined as those enterprises that bring together all factors necessary to generate the power needed to operate within our urban landscape where so-called "peak loads," i.e. demand for electricity, are generated. Today these markets may include:

Fuel:

- non-renewable from fossils (natural gas, coal and oil);
- renewables: wind, water and sun; also geothermal and biomass (synthetic gas).

Generation:

- power to spin an axle (water wheels to jet engines);
- kinetic energy from spinning electro-magnets (creates electricity);
- fuel cell chemistry.

Transmission (collect, transform, upload and send the power):

- switching stations to collect and transform electricity for conveyance;
- overhead transmission corridors;
- subterranean pipelines.

Distribution (download power and connect to users):

- substations;
- local overhead lines/cable distribution;
- local distribution (i.e., roof-mounted panels).

Historically the industry has been segmented to concentrate, say, on the oil market and the price of gasoline, or utility stocks and consumer electricity rates. Today, all these submarkets have converged and the impact of one or another can no longer be understood in isolation. The economics of energy creation, distribution and use are influenced not only by fuel supply and consumer demand, but by public policy, science, the environment, technology and global events.

The real estate implications for the energy markets are inevitable because all of these factors involve locations, connections and space.

Figure 1

Photo by P. Barton DeLacy

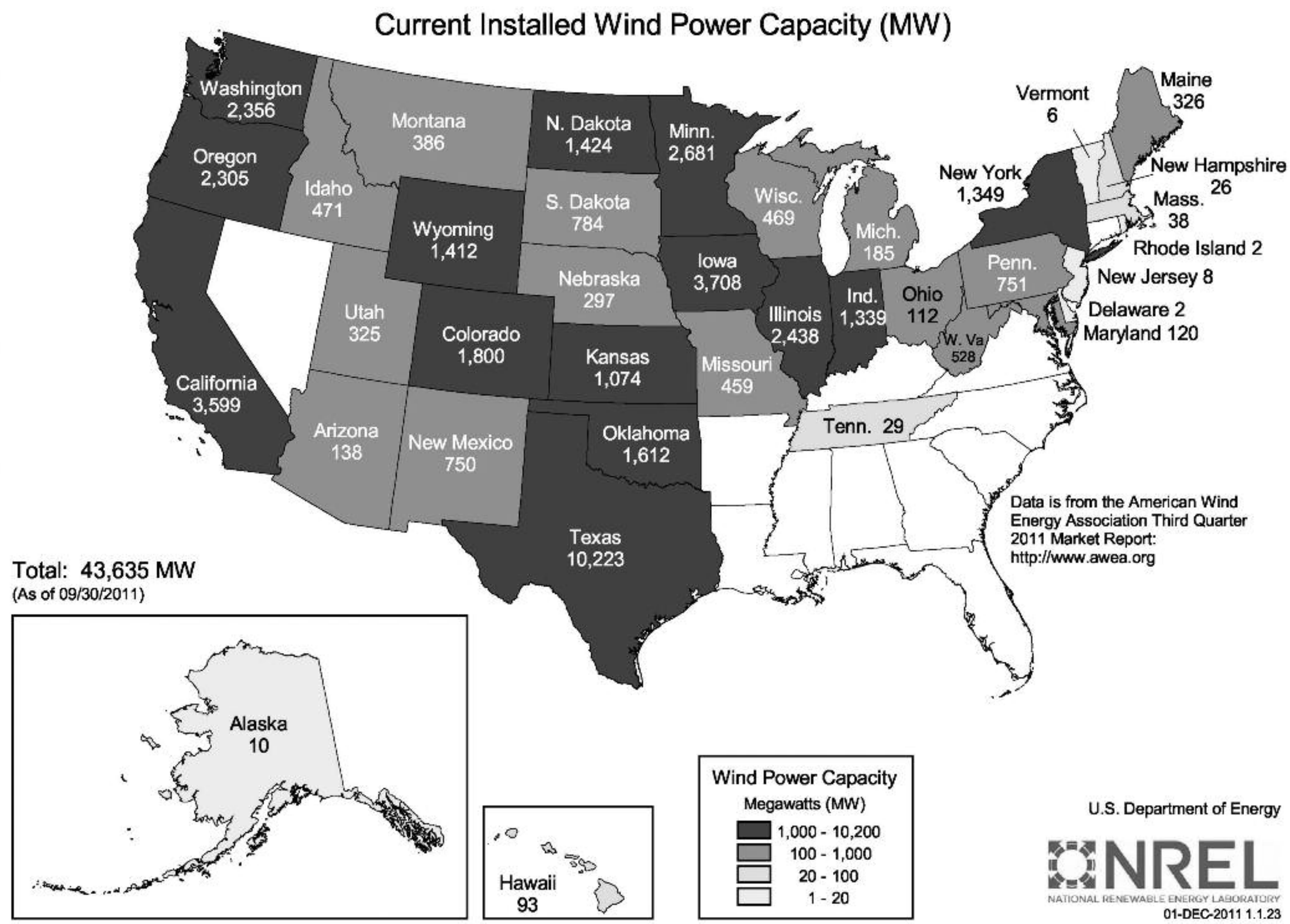
A row of wind turbines dominate the landscape of Wasco County, Oregon. Power generated here is typically sold into California.

Figure 2

Photo by P. Barton DeLacy

Traditional thermal power has long been generated by oil-, gas- or coal-fired plants. This one-time 1000-plus MW natural gas-fired plant has been relegated to use as a peaker [3] station on the California coast—its future may be backing up nearby solar projects in San Luis Obispo County.

Figure 3



THE ECONOMICS OF THE U.S. WIND INDUSTRY: AN OVERVIEW

In many parts of the country, the iconic wind turbine—an elegant, if outsized, sculpture—has come to populate gusty prairies and high desert expanses. The history of wind farm development in the U.S. cannot be understood without recognizing the role of public policy in shaping demand.

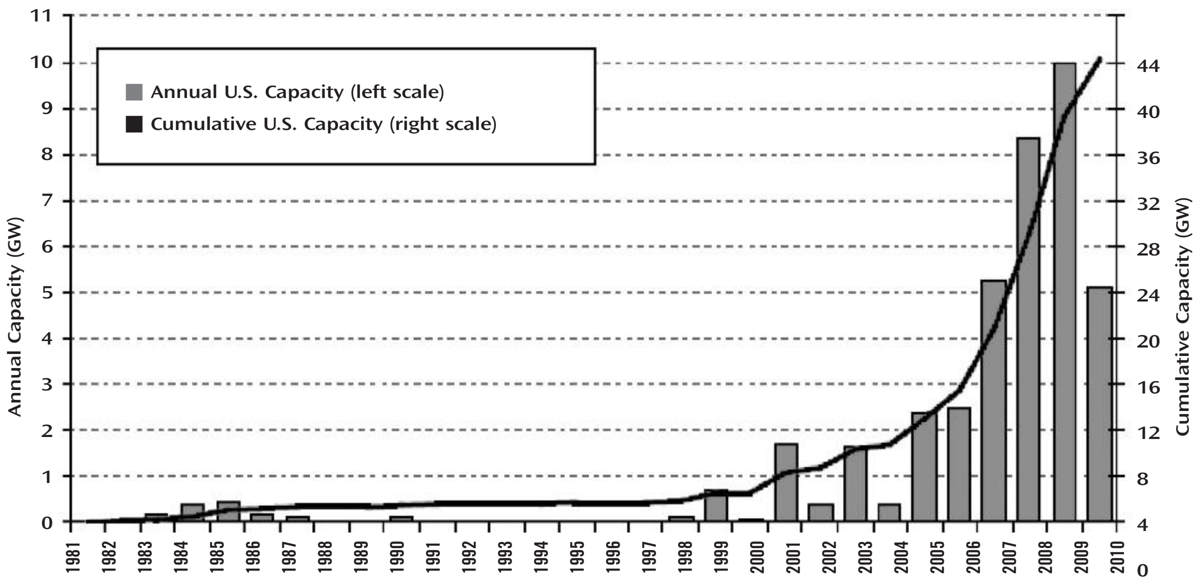
The U.S. wind energy business got its start in California during the 1970s when spikes in oil prices forced policymakers to look for alternative fuel sources. In the intervening 40 years, the wind industry has continued to be driven by federal policies that offer significant financial incentives for its development. This public policy is supported by national goals to achieve energy independence, coupled with environmental goals to reduce the U.S. carbon footprint in a time of concern over climate change. However, growth is very much contingent on government funding.

The U.S. Wind Limited wind farm development proceeded apace (thanks in part to tax credits) beginning in the 1980s, but was stalled through the 1990s when electric utility restructuring disrupted energy pricing and tax credit programs began to expire.[4] Since 1999, installed wind capacity has grown every year. The AWEA provides a graphic snapshot (Figure 3) of installed wind power over the past three decades.

Yet, absent significant tax credits (investment tax credits or production tax credits), it is unclear to what extent pure market forces would have propelled “big wind” to compete with fossil fuels. In essence, while the fuel, i.e., wind, is free and without harmful externalities, the capital costs to build wind power are significant. Most industry observers now agree that absent a change of heart by

Figure 4

Annual Installed Wind Capacity in the U.S. 1999–2011



Source: American Wind Energy Association project database

Congress, the tax credits will not be renewed beyond 2012. If history is any indicator, big wind projects will drop precipitately. The impact has already been seen in Illinois where, according to the *Chicago Tribune,* more than 150 companies that either develop or supply wind power are now based. As of February 2012, nearly 14,000 megawatts of capacity, now permitted, may be abandoned or postponed absent the tax credit.

The PTC is awarded once a project is completed and its power has been offloaded to a utility. The second component to financially model a wind project is a power purchase agreement (PPA). A PPA is a long-term, fixed-price off-take contract. It funds operations and a return on investment to the developer. This funding vehicle can be used for any power generating project where the power producer is independent of the utility. The PPA is typically negotiated on a price per kilowatt-hour basis. That rate will vary depending on the avoided cost of local electricity.

An alternative financing mechanism, so-called feed-in tariffs (FIT), are used in parts of Canada. Under a FIT system, regional or national electricity companies are obligated by governments to buy renewable electricity (electricity generated from renewable sources such as solar photovoltaics, wind power, biomass and geothermal power) at above-market rates. These rates differ among the different forms of power generation, depending on the capital cost and commercial maturity of each technology. At this date and given the weak post-recessionary economy, surcharging electricity rates to pay for renewables is a tough sell to the consumer lobby.

Capital costs to build utility-scale wind, on a dollar per megawatt of electrical power produced, still exceed capital costs for conventional thermal power plants (burning coal or natural gas).[5] Offshore wind may come on line in the U.S. as early as 2012, but its costs are significantly higher still, compared with onshore farms.

The relative ranges of cost per kilowatt-hour for different power sources still favor thermal sources, i.e., coal- or gas-fired generators. Today, the installed cost of a typical 2.0 megawatt turbine in a utility-scale project (generally more than 20 megawatts, so at least 10 turbines) can run between \$2.5 and \$3.0 million per turbine or \$1.25–\$1.5 million per megawatt of installed capacity. A state-of-the-art combined cycle gas turbine rated at 100 megawatts could likely be installed for well under \$1.0 million per megawatt.

However, the Department of Energy last reported that cost ranges from 2003–2004 compared with costs for similar facilities in 2008 showed wind power declining on a dollar-per-megawatt basis, compared with thermal alternatives. This trend may have continued through 2011 as the U.S. domestic supply chain was built out, reducing costs for component parts. However, the expected expiration of the PTC may throw this trend in reverse. Less big wind may get built and at a higher per-megawatt cost. Utility-scale solar installation costs are higher still (at more than $3.0 million per megawatt) but are more likely to be reduced over time because the science may be more open to further technological improvement.

However, as noted earlier, almost all forms of energy production are supported by some type of federal incentive or special government regulation (from oil-depletion allowances to the monopsony status of many public utilities). Thus, as federal tax credits are designed to support the supply of renewable energy projects such as utility-scale wind, renewable portfolio standards (also referred to as renewable energy standards) were intended to assure demand, even in the face of consumer resistance to cost.

CAN RENEWABLE PORTFOLIO STANDARDS ASSURE LONG-TERM DEMAND?

Renewable portfolio standards (RPS) contribute a third leg of government support for utility-scale wind and solar projects (along with tax credits and power purchase agreements, in essence enabled in a quasi-regulated arena). While the goals of the RPS may vary from state to state, an RPS requires retail electricity suppliers and load-serving entities to purchase a minimum quantity of eligible renewable energy. These load serving entities, technically referred to as independent service providers are, in lay terms, local and regional utility companies. These standards are intended to stabilize the industry.

Of the 35 states that have adopted mandatory RPS, performance goals (as a percentage of electricity sales) vary from 10 percent by 2015 (Michigan and North Dakota) to Maine's 40 percent by 2017. California now has a 33 percent goal by 2020 and is struggling to expand its transmission capacity amidst a state government fiscal crisis. Most states that have adopted RPS have set a 20–25 percent goal within a 10–15 year time frame.

Compliance with RPS entails owning a facility or its output generation, purchasing a renewable energy certificate, or purchasing bundled renewable electricity. RPS requirements are most commonly applied to investor-owned utilities and electric service providers. It is unusual for mandatory RPS requirements to extend to municipal utilities and cooperatives, as these entities are predominately self-regulated. However, some states have included provisions for municipal utilities and cooperatives to voluntarily join the RPS program or to "self certify."

What qualifies as "renewable energy" at utility-scale project size?

Wind – electricity generated by "farms" or clusters of wind machines referred to as turbines;

Solar – technology varies and is maturing, typically relies on photovoltaic devices, often arrayed as ground- or roof-mounted panels;

Geothermal – relies on hydrothermal resources, concentrated in California, Alaska and Hawaii;

Biomass – wood, corn, landfill gases, garbage and ethyl-alcohol fuels; still a nascent technology and not necessarily energy efficient;

Water – hydropower, or wave action offshore (latter still experimental).

THE REAL ESTATE COMPONENT OF RENEWABLE ENERGY

Wind and solar power account for only a fraction of renewable energy produced in the U.S. today (compared to hydropower). Yet wind and solar farms encompass a significant amount of real estate. Figure 5 below shows the relative amount of land consumed by different power plants:

Figure 5

Renewables vs. Thermal: Some Comparisons

THERMAL:	FUEL	NAMEPLATE CAPACITY	NCF	LAND
Steam turbines	coal	100-500 MW	95%	fractional
Combined cycle peaker	gas	up to 150 MW	97%	fractional
RENEWABLE:				
Utility-scale wind	wind	1.5-3.0 MW	25-35%	40-50 ac/MW
Utility-scale solar (PV)	sun	arrays up to 10 MW	10-12%	10-12 ac/MW

Source: P. Barton DeLacy

Solar panels, arrayed on rooftops or ground-mounted, consume six to ten acres of land per megawatt of potential or nameplate power generated. The wind developer may need 50–100 acres per megawatt, depending on topography and how the wind blows, although a wind turbine platform and its network of access roads will actually displace less than one percent of the land taken up for staging.

Thus, solar photovoltaic projects will consume hundreds of acres to achieve utility-scale efficiencies, whereas wind farms encompass acreage by the thousands. Nevertheless, building photovoltaic projects costs three to five million dollars per megawatt of installed power[7] compared with installed costs of one to two million dollars for wind.

Today, the Department of Energy reports that wind power represents the second largest new source of electric capacity additions to the U.S. It trails new natural gas plants, but is ahead of coal.

ENTITLEMENT: LAND USE AND SITING CHALLENGES FOR BIG WIND VERSUS UTILITY-SCALE SOLAR

The successful entitlement of land for wind farm development requires a lengthy and collaborative process in which real estate consultants, if not appraisers, may play an important—albeit peripheral—role. Appraisers often are asked to participate in the permitting process when expert opinion is necessary to advise siting authorities on local property value impacts.

Three geographic characteristics will dictate placement of utility-scale renewable energy projects:

- availability of the resource (wind, sun, geothermal vents);
- availability of land;
- proximity to the power grid.

Given the near 40-story height of most wind turbines, opposition to so-called big wind is grounded in fears of diminished property values and increasing concern over loss of raptors (hawks, eagles, etc.) and, in the Midwest, bats!

Offshore wind has been successfully developed in Europe but poses significant environmental concerns that have yet to be resolved in the U.S. The big challenge in deploying more wind across the central U.S. is transmission capacity, a topic beyond the scope of this article.

Solar takes less land and is seen as less obtrusive than wind, yet siting objections tend to do more with taking farmland out of production. As distinguished from wind, solar energy systems are smaller, modular and can be deployed at the retail or household level, as in roof-mounted panels to heat domestic hot water. However, the focus of this discussion is on utility-scale projects of at least 10 megawatts—the threshold for a solar development.

So real estate professionals may expect to find important roles in the brokering, entitlement and valuation of renewable energy projects, certainly at the local or "micro-economic" level. But why should the real estate counselor bother being conversant in the parlance of energy or power generation? Why should we learn to speak "megawatt?"

It goes back to the three things that count most in real estate: location, location and location.

CONCLUSIONS

The biggest drawback to renewable power is that the resource is intermittent. It can be unpredictable, contingent either on the wind blowing or the sun shining. Neither solar nor wind power can be turned on or off at will. Hence, to integrate such "renewables" into a regional utility grid requires back-up "peaker" capacity, typically provided by gas-powered generators. The integration of renewable with conventional thermal power probably poses the most intriguing challenge to energy sufficiency in the U.S.

Utility-scale wind and solar energy developments will encompass more of the U.S. rural landscape as renewable portfolio standards proliferate. RPS mandate that retail electricity suppliers procure minimum quantities of eligible renewable energy. State by state passage of RPS, converging federal tax policies and maturing technologies promise to realize the ambitions of the environmental movement for a "greener" America. However, does the market really support this proliferation and the pipeline of product? Are there signs that incentives and public policy alone feed demand so that unforeseen price changes in alternate fuels could create a bubble? Could such a bubble trigger contagion into other markets, real estate and otherwise, as the housing bubble did this past decade?

While those questions identify potential future roadblocks, significant current challenges may yet further limit the proliferation of renewable power generation. These include:

U.S. ELECTRIC GRID:

- Power transmission is fragmented throughout U.S.—there is no equivalent to the interstate highway system;
- Existing transmission lines are approaching capacity in the West;
- further investment is needed to connect the resource with the load (think: conveying North Dakota wind power to Chicago demand);

SUPPLY CHAIN:

- tax credit availability has been inconsistent;
- the U.S. has been slow to develop component manufacturers.

INTEGRATION:

- wind and solar are intermittent resources and require thermal backup to assure peak performance and load balance;
- wind and hydro integration is complicated and expensive.

STORAGE:

- there is no way to efficiently store wind power;
- battery technology has a long way to go.

The one component, the factor of production that may bring together divergent energy interests across industries, may be land—getting power to the load and bringing wind from the plains to the demand in the cities. What about the real estate implications of repurposing obsolete thermal (i.e., coal or even nuclear) plants? Many of those obsolete facilities enjoy truly irreplaceable locations adjacent to switching yards and transmission corridors. All of them involve geography and the land that links locations. Maybe it is time for real estate counselors to speak and think in megawatts. ■

ENDNOTES

1. American Recovery and Reinvestment Act of 2009.
2. The technology is subterranean fracturing of shale rock. See Yergin, Daniel, *The Quest: Energy, Security and the Remaking of the Modern World,* Penguin Press, 2011.
3. A "peaker" power station, also known as peaker plants, and occasionally just "peakers," are power plants that generally run only when there is a high demand, known as peak demand, for electricity. Today, peaker plants are often fueled by natural gas and are frequently needed to help balance the intermittent power generated by wind and solar plants.
4. Herzog, Steven J., "Wind Energy: Power and Policy," *The Appraisal Journal*, January 1999, pp. 24–28.
5. Ibid.
6. U.S. Environmental Protection Agency, Renewable Portfolio Standards Fact Sheet *http://www.epa.gov/chp/state-policy/renewable_fs.html.*
7. Costs cited were provided by Paul Wormser, senior director, Engineering, SHARP Electronics Corp.