Renewables, Tax Credits and Ad Valorem Taxes: Are Policies Aligned?

BY P. Barton DeLacy, CRE, FRICS, ASA, MAI

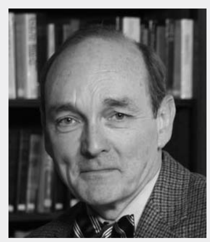
INTRODUCTION

Renewable energy projects, particularly wind and solar farms, are seldom built absent a portfolio of incentives. At the federal level, these incentives include tax credits and favorable depreciation treatment. State and local governments have property taxes to play with. Long supported by public policy, power-generating projects relying on renewable fuels are often sold as economic development for rural communities.

Yet, while hundred-million-dollar construction projects are not unusual, few permanent jobs are ever created. Maintenance can be managed remotely. The power is uploaded to a regional grid, not distributed locally. Thus, expansion of the property tax base may be the only way renewable energy projects benefit the local economy.

However, we have found no consistency across U.S. jurisdictions for property tax treatment of utility-scale renewable energy projects. For instance, what type of property is a wind turbine or an array of solar panels: real or personal? In some places personal property is exempt from property taxes. In many other places, developers have proposed so-called Payment in Lieu of Taxes (PILOT) programs. Such programs are designed to replace or defer property taxes while securing local political support for necessary entitlements to build. Some states have passed ad hoc legislation promoting some renewables, but not others. Finally, the lack of any consensus on appropriate valuation methodology, when ad valorem taxes are imposed, robs the industry of certainty and inhibits the commonwealth from enjoying the real benefits of green energy.

About the Author



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Focusing on the real estate implications of power generation, DeLacy has built valuation models and studied property value impacts for geo-thermal, solar, wind- and coal-fired power generation. He has also developed adaptive re-use studies for obsolete thermal plants. Published in The Appraisal Journal, Real Estate Issues *and* The Journal of the American Planning Association, *he has prepared testimony for federal and state circuit courts and energy siting councils. He has qualified to testify as an expert witness in tax court in several states.*

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AD VALOREM PROTOCOLS FOR PURPOSE-BUILT IMPROVEMENTS

Property taxes are typically administered at the county level with the actual assessment or appraisal functions undertaken by an assessor at the township or county level. Some states also have Department of Revenue staff appraisers for complex properties. Ideally, assessed value is based on market value, derived from qualified arm's length transactions. This system works well for single-family houses, agricultural land and conventional commercial structures. The difficulty comes with purpose-built structures like a semi-conductor fabrication plant, a hospital or a wind farm. If special purpose properties do not regularly trade, then assessors typically turn to replacement cost as the best measure of value.

While few would dispute actual construction costs for either a wind or solar power plant, this article explores what the taxable residual asset is worth after incentives are earned.

The obsolescence concepts discussed here affect both the wind and solar facilities; however, the case has been first developed for wind.

HOW RENEWABLE ENERGY PROJECTS ARE FINANCED

In practical terms, renewable energy projects share characteristics of both real and personal property. The turbine tower, for example, constructed of steel sections that are bolted together, is attached permanently to a reinforced concrete foundation. The foundation is poured, beginning ten feet below grade. The turbine blades are manufactured of composite material and attached to a nacelle atop the 350-foot towers. The nacelle, the size of a boxcar, houses the generator and other necessary mechanical apparatus.

Similarly, photovoltaic solar panels are attached to steel racks, bolted to poles driven into the ground.

Renewable energy power plants are typically funded through project financing. The anticipated revenue stream from sale of the power is used to pay off the debt. However, project financing seldom covers total installation costs. The difference, often up to a third of cost, must be made up by some type of tax credit or cash incentive.

The following considerations drive the enterprise value of a particular renewable energy project:

- Available investment incentives (to overcome the relative high capital construction costs);
- The quality of the renewable resource in a particular location;
- Proximity, availability and cost to connect to the local power transmission grid;
- Revenues generated by the Power Purchase Agreement (PPA) to an off loading entity.

Other variables, such as the efficiency of the turbine or the panels and the quantity of power generated are reflected in Net Capacity Factors (NCF). Curtailment is the occurrence of downtime for repair or because of grid capacity constraints. Curtailment rates may vary with location and with the age, design and performance of individual turbines or solar arrays. Hence, while we might develop a formula, or model to uniformly assess power-generating facilities, the actual assessment of value must be made on a case-by-case basis, much like any other uniquely located parcel of real estate.

At issue here is the market value of the installed renewable energy power plant and what should be the appropriate ad valorem assessment given project costs, risks, potential revenue and public policy.

Wind or solar farms are appraised as whole plant enterprises combining value contributions from all asset classes including real property, personal property and intangibles. Most assessing authorities are limited to taxing only tangible assets since intangible value can be taxed in some other form as income.

THE METRICS OF RENEWABLE ENERGY

The metrics of renewable energy count the installed "nameplate" power capacity as the best measure of market presence. This capacity can be expressed in terms of multiple megawatts, a common unit of energy comparison. Hence a utility scale solar farm might be rated as "10 megawatts (MW)." A single wind turbine might be rated as "2 MW," while a large wind farm can be rated in the hundreds of MW in capacity.

Today, as of late 2013, the U.S. has at least 60,000 MW, or 60 gigawatts (GW) of installed wind power; from Alaska and Hawaii to Maine and south to Texas.[1] Of interest, there are virtually no significant wind installations east of Texas and south of Tennessee. The wind resource is simply not very good in the humid, southeastern U.S.

Solar development is growing more rapidly, but is not yet as pervasive as wind, accounting for 4,751 GW of nameplate capacity, about eight percent of total installed wind capacity in the U.S. However, according to the Energy Information Administration (EIA) of the U.S. Department of Energy (DOE), solar technology may have better long-term upside.

For perspective, consider that the average wind turbine installed today is rated between 1.0 and 2.0 MW. Hence, there are at least 50,000 wind turbines operating at that capacity today across the U.S. Yet, at best, wind accounts for less than two percent of all electrical power produced in the U.S.

One could compare a large 250 MW wind farm (say 150-plus turbines spread over 30,000 acres) with a small 500 MW coal-fired power plant. The power plant might be sited on as few as 10 acres, plus a cooling pond. While nameplate capacity suggests the coal plant could barely double the output of the wind farm, in fact, the wind farm would produce far less. Wind blows intermittently and at inconsistent velocity. If the coal-fired plant has fuel to burn, it can generate power 24/7.

In general, a wind energy power plant (referred to as "utility-scale" and typically having sufficient turbines to produce 10 MW or more power) will generate its nameplate capacity 30–35 percent of the time. For coal, that number is closer to 90 percent. Coal-fired units are curtailed only periodically for servicing. Natural gas "peaker" units, much more compact and efficient, can be brought online at the flick of a switch.

THE ADVANCE OF RENEWABLES: POWERED BY PRODUCTION TAX CREDITS

The issue of government subsidies for energy production is controversial. It can be argued all energy resource development has benefited from some form of subsidy. From ongoing oil depletion allowances to Depression-era dam-building projects, the federal government has helped fund the building of U.S. energy infrastructure for decades.

Yet, but for enabling state and federal policies, most renewable energy projects would not have been built. The steady increase in installed capacity has been propelled by two critical incentives:

1. Production Tax Credits (PTC);
2. State by State Renewables Portfolio Standards.

In 2012, the wind industry suffered a near death experience when Congress delayed renewing the PTC program until the last minute and then only for one year. Industry advocates have long lobbied for a permanent entitlement to better sustain the renewable energy business and its domestic supply chain for components and parts. Solar tax credits expire in 2016.

The American Wind Energy Association (AWEA) explains that the late extension of the PTC and historic levels of installation during the fourth quarter of 2012, led to the anemic levels of turbine installations through 2013. Without tax credits, the growth in renewable energy projects is expected to slow. Profits and performance will then shift to operational efficiencies. Property taxes are the major variable operating expense confronting many of these projects. Hence, debate over appropriate taxation of these power plants is unlikely to abate any time soon.

THE CONTEXT FOR THE AD VALOREM TAXATION OF RENEWABLES

Although the first utility-scale renewable energy projects date to the 1970s in Southern California, the proliferation nationwide did not commence until the present century. As with other nascent industries responding to shifting public policies, renewable energy projects looked to incentives as much as the resource. Often seen as an economic boon to sparsely populated rural counties, how the power plants might be taxed evolved ad hoc.

Renewable energy development provides short-term construction jobs, sales and use taxes, but limited long-term employment. Thus local governments and school districts covet potential contributions to the property tax base.

As with rural zoning codes, renewable energy projects had not been foreseen by most taxing jurisdictions. Just as many rural planning commissions legislated variances or exceptions to allow electric power generation in farm and pastureland, so too, taxing jurisdictions had to decide if a wind turbine or solar array was some type of farm implement or an industrial power plant.

Not surprisingly, state and local ad valorem assessment practices have yet to converge on any uniform treatment. An excellent resource detailing this variance is the Database of State Incentives for Renewable Energy (DSIRE), maintained by the EIA. DSIRE inventories the 41 states and Puerto Rico, where renewable energy incentives have been put in place.

See *http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=PA26F*.

INCONSISTENT AD VALOREM POLICIES

To highlight inconsistent ad valorem tax policies for renewable energy projects, we will concentrate, going forward, on "big wind," where the fiscal impacts of property tax policy is greatest.

Across the 35 or so states where utility-scale wind farms have been installed (defined as over 10 MW in size), ad valorem valuation practice ranges from complete exemption to conventional depreciated replacement cost. We must remember, wind farms have two unique characteristics:

1. The land they occupy is often leased, not owned outright. Lease terms may vary and include a fixed rate, a royalty-type percentage of output from the turbine, or a combination of the two income streams.
2. The wind turbine is properly characterized as a machine bolted to its reinforced concrete base, and thereby secured to the ground.

Some jurisdictions merely tax the increment in value created by the land lease where personal property is not assessed. Other jurisdictions have deferred the ad valorem issue by accepting PILOTs. Seldom has the issue been dealt with legislatively. A brief overview of some state assessment practices demonstrates this variability:

- Some states, like Wisconsin, exempt renewables from ad valorem taxation.
- In Pennsylvania, non-realty assets are not subject to property taxes. A 2006 statute classifies towers, blades, nacelles and all transmission infrastructure as non-realty. Only the concrete base and road improvements are subject to replacement cost valuation. Leased land is valued using an income approach if comparable sales are not available.
- California, Washington and Oregon tax real and personal property and provide no special tax incentives for wind. Oregon and California, however, do incentivize distributed renewable energy, where power produced is consumed onsite rather than merely uploaded to the grid.
- Colorado exempts facilities under 2.0 MW in nameplate capacity, but otherwise applies a template that factors in nameplate rating and the NCF to calculate assessed values. Importantly, Colorado assessment rates are tied to the relative productivity of utility-scale wind farms as power generators.
- Other states, such as New York, accepted so-called PILOTs from developers in exchange for go-forward exemptions limited to a period of years. Otherwise, New York had had a 15-year exemption for property taxes on renewable energy installations. Oklahoma has a five-year exemption period.
- In New York and Pennsylvania, modest income from turbine land leases offsets unrelated declines in small dairies, making small 200–300 acre landholdings marginally sustainable. Township and county assessing authorities in poor districts have been reluctant to discourage wind development by being too aggressive on taxes.
- In Missouri, the legislature has seen fit to exempt solar farms from property taxes, but is silent on wind.
- However, at least one state, Illinois, reached a fair legislative solution. Prior to 2007, wind energy devices generating electricity for commercial sale were assessed differently depending on where they were located. Some counties valued the entire turbine structure (tower plus generation equipment) as "real property," subject to taxation, while others deemed only the tower portion as taxable property. This difference varied from county to county, and sometimes from township to township. This created dramatically different tax loads and complicated siting projects that crossed jurisdictional lines.

  Hence, a legislative compromise was crafted whereby the statutory "value "of a wind farm in Illinois is based on approximately $360,000 per MW, about one-third the installed costs. A formula is then applied to that "market value" to calculate an actual assessed value. As shall be shown, the Illinois formula may have gotten it right.

The contribution of industrial utility-scale wind projects to local economies is mixed. Property tax receipts in Sherman County, Oregon, a remote wind swept jurisdiction of 1,800 people in the Columbia River Gorge, have reaped tens of millions of dollars for local governments—a literal "windfall." Yet the balance between enrichment and the perceived degradation of scenic landscapes varies with population density and the proximity of wind farm to urban area.

Notwithstanding the variable socio-economic political environment of a particular state, professional valuers should still be ready to advise local assessors on best practices for valuing this complex improvement to the land.

APPLICABILITY OF THE THREE APPROACHES TO VALUING RENEWABLE ENERGY PROJECTS

In this section, the applicability of each of the three approaches to value is discussed. In the end, most assessing authorities will likely rely on a cost approach. As with any purpose-built facility where it may be difficult to demonstrate a discrete property market, assessors will look at actual costs or defer to a cost service like Marshall Valuation.

A. The Income Approach

Most utility-scale renewable energy developments are project financed. This means lenders tie debt repayment to the anticipated revenues to be generated by the PPA. The financial model is essentially a discounted cash flow analysis where the revenue of the project has been predicated based on wind studies, the efficiencies of the installed turbines and the price paid for the power to be offloaded to the grid. This is an enterprise model with no relation to the real estate except for the land lease; an incidental operating cost. Assessors will value the land separately, in part because another party typically owns it in fee.

The PPA, which drives the value, is an intangible asset, typically ineligible for ad valorem taxation. While the PPA is modeled like a net lease, it is tied to electricity output and the price of that commodity.

B. The Sales Comparison Approach

Renewable energy projects do occasionally sell, but those transactions also have been at the enterprise level without clear allocations of value to the tangible asset classes involved. Hence, we find that the Cost Approach to value is the default indicator for taxing authorities. Further, as we shall show, obsolescence theory can be used to reflect some of the unique attributes of operating wind farms.

C. The Cost Approach

Whenever transactional market data is limited, assessing authorities typically look to a traditional Cost Approach to estimate ad valorem market value. In essence, the Cost Approach is comprised of two components; the market value of the land, as if vacant, and the depreciated replacement cost of the improvements. This method is also appropriate for special use properties where use value can approach market value if the case can be made for a viable enterprise within a stable or growing industry.

We first start with replacement cost or actual costs if available. Replacement Cost is the estimated cost to construct as of the effective date of value, a substitute, using contemporary materials, standards, design and layout.[2] Component costs can be volatile, so the valuer should consider construction costs as of the valuation date. Costs may actually decline as the supply chain mobilizes to serve demand.

MISSOURI WIND FARM AS CASE STUDY

To demonstrate how these theories on obsolescence might work, we cite the following example as a case study. Lost Creek Wind Farm is a 150 MW, 100-turbine renewable energy projects, built in northwestern Missouri. It has operated since mid-2010. The owners are appealing the county's ad valorem assessment.

The DeKalb County assessor based her ad valorem assessment on reported actual construction costs. The taxpayer has argued that actual market value (the basis for tax assessment) is much lower because earned tax credits constitute economic obsolescence, while the inverse of the NCF constitutes functional obsolescence for this power plant.

Estimating Replacement Cost New

Actual construction costs are based on an contract engineering, procurement and construction contract where the contractor designs the installation, procures necessary components and builds the project. The chart below shows how replacement cost might be evaluated on a per installed turbine basis.

Figure 1
Replacement Cost New

1.5 MW Turbine cost	$1,700,000	
Installation (per EPC contact)	$ 510,000	30.00%
Soft Costs	$ 102,000	6.00%
Total installed cost/turbine	**$2,312,000**	**/turbine**
Installed cost/MW	$1,541,333	**/MW**

Source: P. Barton DeLacy, CRE

These costs can then be applied to the entire project. We have assumed one hundred 1.50 MW turbines.

Figure 2

Project Nameplate Rating

A	Number of Turbines	100.00	
B	Nameplate Rating	1.50	MW
	System Peak Rating (AxB)	150.00	MW

Total Project Cost

Total installed cost/turbine	$2,312,000	**/turbine**
Number of Turbines	100.00	
Total Project cost	$231,200,000	

Source: Barton P. DeLacy, CRE

These costs include labor, materials, supervision, contractor's profit and overhead, architect's plans and specifications, sales taxes and insurance.

The overall cost per megawatt is a significant indicator here because when compared with the costs to install alternate means of conventional thermal power, wind and solar plants have had a significantly higher installed cost per megawatt of nameplate capacity. When the NCF is included, the up-front cost differential becomes even more dramatic.

For perspective, consider that conventional combined natural gas-fired turbines can cost less than $1 million per MW installed (compared to more than $1.5 million per MW for a wind turbine in this example). Natural gas-powered turbines have a much higher NCF, meaning they can be efficiently operated close to 90 percent of the time, where even the best wind farms struggle to have an NCF higher than 40 percent.

The EIA has published a comparison of Total System Levelized Costs that calculates overall costs on a per kilowatt-hour (kWh) basis over an expected 30-year financial cycle and "duty" life of a power plant. This model surcharges coal for creating greenhouse gas externalities and takes into account the relative low fuel costs for wind and solar power.

Figure 3

Levelized Cost Projections 2018*

Plant Type	*NCF*	*Levelized cost/ kWh*
Conventional Coal	85.00%	$100.10
Natural Gas		
NG Combined Cycle	87.00%	$ 67.10
NG Conv. Combustion	30.00%	$130.30
Geothermal	92.00%	$ 89.60
Biomass	83.00%	$111.00
Wind	**34.00%**	**$ 86.60**
Solar PV	25.00%	$144.30

* DOE EIA Projections w/o tax credits or incentives, assumes 30 yr. life

Source: P. Barton DeLacy, CRE

These costs are projected five years out and will vary regionally. They emphasize the relative economy of wind over time and may not account for sustained low natural gas pricing.

The fact remains that as of 2014, capital costs for wind development in the U.S exceed the present value of the revenue wind farms generate at an acceptable rate of return. Thus, wind development remains dependent on tax credits and/or other incentives to help overcome wind's relative high capital costs. This leads to discussion on what forms of obsolescence, both functional and economic, should properly be applied in a cost approach for ad valorem assessments.

APPLICATION OF DEPRECIATION CONCEPTS

The key to appealing or modifying assessor cost estimates of wind farms is the careful application of accepted depreciation concepts. Application of a conventional Cost Approach contemplates application of the three types of accrued depreciation:

1. Physical deterioration
2. Economic obsolescence
3. Functional obsolescence

Assuming the absence of any incurable defect, most assessors acknowledge a traditional straight-line age-life method for simple physical depreciation. Alternatively, they rely on a cost service or other conventions.

The application of economic and functional obsolescence to the high replacement costs helps bring wind farm assessments into line with other means of conventional power generation. As noted above, installation costs for wind, based on the electric power it produces, are significantly higher than gas-fired alternatives.

The Case for External Obsolescence

Does the necessity of a significant tax credit to make a wind farm a viable investment constitute an externality, qualifying as economic obsolescence?

External obsolescence is the adverse effect on value resulting from influences outside the property. External obsolescence may be the result of lagging rental rates, high inflation, excessive construction costs, restricted access, the lack of an adequate labor force, changing land use patterns and market conditions, or proximity to an objectionable use or condition.

This means the high capital costs to develop wind power capacity can cancel out the benefits to investors, save for financial incentives like PTCs. The AWEA and the DOE have shown that wind farm development falls off dramatically as these credits expire. In our cost model we show that the need for up-front capital incentives should be treated as economic obsolescence. The present value of such tax credits can amount to 30–35 percent of total project cost.

It can be argued that but for the PTCs, most U.S. wind projects would not get built. In fact, as AWEA predicted, wind farm development has once again stalled, as it has in the past, because of continued uncertainty over PTC incentives. They were extended through 2013, but are once again in limbo.

Hence, we find this necessary supplement a potential measure of *inverse economic obsolescence*. If the PTC goes away, many planned wind farms will stay on the drawing board pending some other form of subsidy or change in the economics of electric power generation.

An analogous situation is the treatment of Low-Income Housing Tax Credits LIHTC, a federal subsidy also referred to as Section 42 credits, referencing the applicable section in the Internal Revenue Code. Many (though not all) taxing jurisdictions exempt or deduct tax credits from ad valorem assessments.

Tax credits are provided for low income housing because the government regulates the maximum rents that can be collected based on the income level of the occupant; it also limits the number of occupants who earn above a certain income level. These regulatory limitations restrict the developer's cost recovery. But for the tax credits, subsidized housing would not be built.

The tax credits, created under the Tax Reform Act of 1986, were intended to incentivize private investment in affordable housing. Typically the all-in cost to deliver qualifying units exceeds any capitalized market value based on net income after allowing for restricted rents. The owner's value thus falls well below costs to build. While selling tax credits to qualifying investors can make up the difference in construction cost, those benefits cannot be passed on to the next buyer. Thus, the argument goes, ad valorem property taxes should be based on an income approach. The amount of the tax credit subsidy would be deducted from any replacement cost estimate to reconcile with the lower net value projected by the income approach (without the subsidies).

With renewables, the long-term PPA, based on local avoided utility costs, seldom is sufficient to generate an acceptable return on cost to the project developer. Should the valuer deduct the outright subsidies offered by such tax credits as a type of economic obsolescence?

The Case for Functional Obsolescence

According to the Appraisal Institute, functional obsolescence can be caused by changes in market conditions that have made some aspect of a structure, material or design, obsolete by current market standards. Functional obsolescence can also be curable or incurable.

To be curable, the cost to correct the deficiency must be equal to or less than the anticipated increase in value. We discussed the NCF as a relative measure of wind farm efficiency. It is a particularly useful metric to compare the efficiency of one type of power generator with another. Since the price of the power derived from wind farm operations is predicated on the cost of alternate fossil fuels, then the cost to use alternative fuels must be balanced against the relative efficiency of its generation. Hence, the inverse of the NCF is considered a reliable method to gauge functional obsolescence, as we will calculate in our model.

As mentioned above, individual renewable energy projects can be distinguished from one another by their relative efficiency as measured by their NCF. Essentially, an NCF calculates what percentage of the time a renewable energy project is actually generating electricity. It also reflects the relative mechanical proficiency of the installed power plant, regardless of its fuel.

The NCF of a coal-fired power plant might be close to 90 percent because it operates 24/7. In contrast the NCF of a solar farm can be as low as 10–12 percent of its nameplate capacity because of cloud cover, night darkness, etc. Wind falls somewhere in the middle.

Hence, the NCF can be used as a measure of functional obsolescence for renewable energy projects where the NCF can vary from 10–40 percent of nameplate capacity, based on the fuel resource, coupled with the performance of the power plant. It should be noted that the NCF for wind farms using larger, more advanced turbines is approaching 50 percent. This suggests this measure of utility can be improved with technology.

Calculation of Values: Wind Farm Example

In the table below we have calculated a market value for ad valorem assessment purposes based on the following assumptions:

1. Replacement Cost New (RCN) based on turbine and wind farm specifications discussed above;
2. We have assumed that the net present value of PTCs and other incentives would account for 30 percent of total costs to install the hypothetical 100-turbine wind farm on leased land;
3. Given a leased land scenario, land value or land assessments are not included;
4. The RCN is first adjusted for economic obsolescence: with wind farms, this is quantified by tax credit incentives that can average as much as 30 percent of project costs;
5. Net RCN adjusted for tax credits then must be charged for physical depreciation; here we project four percent per year based on an expected 25-year economic life. In this example, the plant is assumed to be two years old.
6. A NCF of 35 percent would mean the plant produces its nameplate output only 35 percent of the time; thus, it is the inverse, or 65 percent impaired by the intermittency of the wind.

Figure 4

Project Nameplate Rating			
A	Number of Turbines	100.00	
B	Nameplate Rating	1.50	MW
	System Peak Rating (AxB)	150.00	MW
Total Project Cost			
C	Total installed cost/turbine	$2,312,000	/turbine
D	Number of Turbines	100.00	
E	Total Project Cost (CxD)	$231,200,000	
Depreciation and Obsolescence Factors			
F	Age	2	years
G	Tax Credits as % of RCN	30.00%	
H	Net Capacity Factor (NCF)	35.00%	
Application of Age and Obsolescence Factors			
J	Total Replacement Cost New (RCN)	$231,200,000	
K	Economic-less TC incentives (GxJ)	-$69,360,000	
L	Net RCN les econ. obs. (J+K)	$161,840,000	
M	Physical (straight-line/yr.)	-$6,473,600	4.00%
N	Accrued Phys. Dep. (L+N)	-$12,947,200	
O	RCN less Phys. Dep. (L+N)	$148,892,800	
P	Functional Utility (1-H)	65.00%	
Q	Adj> for Functional OBS. (OxP)	-$96,780,320	
R	MV based on Cost Approach (O+Q)	$52,112,480	
S	MV/turbine (R/D)	$521,125	
	MV/MW (S/B)	$347,417	

Source: P. Barton DeLacy, CRE

The resulting market value for assessment purposes is $52,112,480 in this example. That is equivalent to approximately $521,000 per turbine or $347,000 per megawatt of nameplate capacity. This value should be compared, on a net capacity basis, with assessed values for alternate means of generating electric power.

Based on these assumptions, not atypical for a utility-scale wind power plant of this size, we have reduced the nominal replacement cost value by more than 75 percent. Absent market sales of wind power plants to challenge theory, the appraiser must apply his/her best curbside judgment and ponder, "Is this reasonable?"

PERSPECTIVE: WIND AND SOLAR FARMS AS POWER PLANTS

Renewable energy projects are fundamentally electrical power generating plants. Their fuel may be wind, sunlight or biomass. In the case of wind, it performs the same function that pressurized steam does in a compact gas-fired thermal plant or falling water in a hydroelectric dam. In each case, the kinetic energy of turning rotors in a turbine spin magnets generating electricity. Thus it can be argued, for perspective, the valuer should look to relative costs or the occasional sale of a power plant in use to test the reasonableness of these adjustments.

The critical value drivers here are the tax credit incentive and the NCF. Both can vary with the renewable energy project. The tax credit provides a subsidy when the negotiated PPA does not pay enough over time to yield an adequate return to the investor. The PPA is typically a 20–25 year contract negotiated with the off loading utility and is based, in part, on avoided costs of electric power generated conventionally. When natural gas or coal prices are high, the PPA will be higher and wind more competitive.

At the same time, renewable energy projects of identical specification will perform dramatically differently depending on the long-term consistency of the local wind or sunlight resource.

We have focused here on wind farms, the major consumer of tax credits to date. In some locations the NCF for wind farms approaches 50 percent. Offshore wind can raise the efficiency further. However, when incentives are increased, wind can be built where the NCF is below 30 percent. Finally, the turbine itself can be made more efficient by increasing its height.

The wind industry and public policies pursuing renewable energy solutions are still young. As the industry matures and power plants age, operating efficiencies will demand closer attention. Volatile property taxes and unsettled ad valorem policies will create economic inefficiencies and potentially hinder power delivery.

This article has attempted to raise issues for further study and, inevitably, debate. ■

Editor's Note: *Portions of this article have been previously published in* The M&TS Journal.

ENDNOTES

1. AWEA U.S. Wind Industry Second Quarter 2013 Market Report.
2. Ibid., p. 385.