Valuation of Wind Farms: Just a Breeze?

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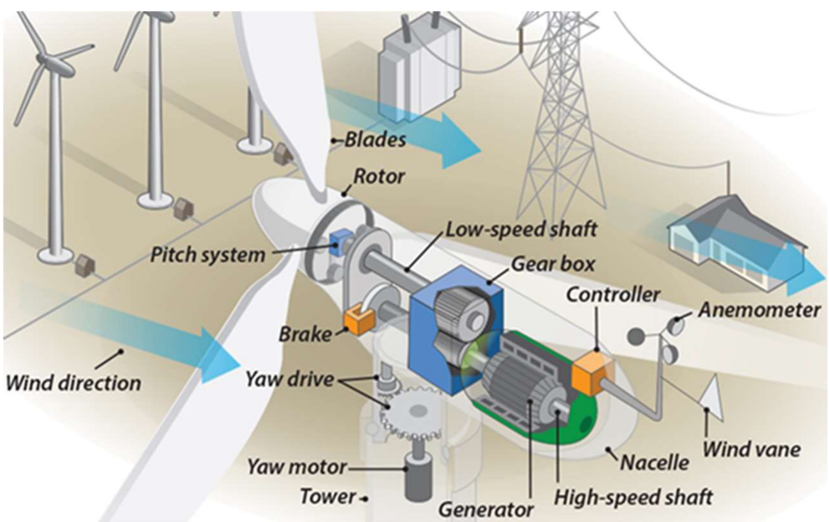
Introduction

Wind farm development in the U.S. has grown significantly over the past two decades, fueled by federal and state incentives as well as mandated state Renewable Portfolio Standards ("RPS"). Property tax abatements are a major incentive offered by many state and local governments which allows the owner of a new wind farm to pay no property taxes for a defined time period, with 10 years being most common. Given the significant number of wind farms installed in the past 10 to 20 years, many property tax abatements have begun to expire. Once a property tax abatement expires, a wind farm is typically taxed at 100% of the market value. In many cases, the assessment of the taxable assets is not representative of market value, resulting in assessment appeals and even lawsuits brought by the property owners. Typically, appraisers are hired to provide an independent and unbiased opinion of the market value for the taxable assets in these cases. In doing so, an appraiser must have a firm understanding of the overall power generation industry, renewable energy resources, and the nuances of valuing wind farms for ad valorem property tax purposes.

Background and History

Wind turbines provide a means to harness the kinetic energy of the wind and convert it into mechanical energy to turn electric generators which create electrical power. There are two different types of wind turbines: vertical axis turbines and horizontal axis turbines, with horizontal axis turbines being the type most commonly employed in the wind power generation industry. Typical components of a horizontal axis turbine consist of blades, drive train, and tower.[1] A detailed diagram of the components of a typical horizontal turbine are shown in the figure below.



Source: http://energy.gov/eere/wind/inside-wind-turbine-0

[1] Wind Energy Development Programmatic EIS Information Center, "Wind Energy Basics," accessed January 11, 2019, http://windeis.anl.gov/guide/basics/.

Harnessing wind energy has been in practice for thousands of years. Originally, small turbines were developed and used to pump water from wells, grind grain, and power sawmills. By the late 1800s, people were starting to use wind energy and small generators for electricity in their homes. From the 1930s on, the expansion of power lines into rural areas led to a decrease in the number of wind turbines used to power homes in rural communities; however, oil price increases in the 1970s drove the need to improve, research, and develop wind technologies. By the 1980s, large-scale wind farms had begun to spring up across the U.S., especially in California.[2]

Development Incentives and Mandates

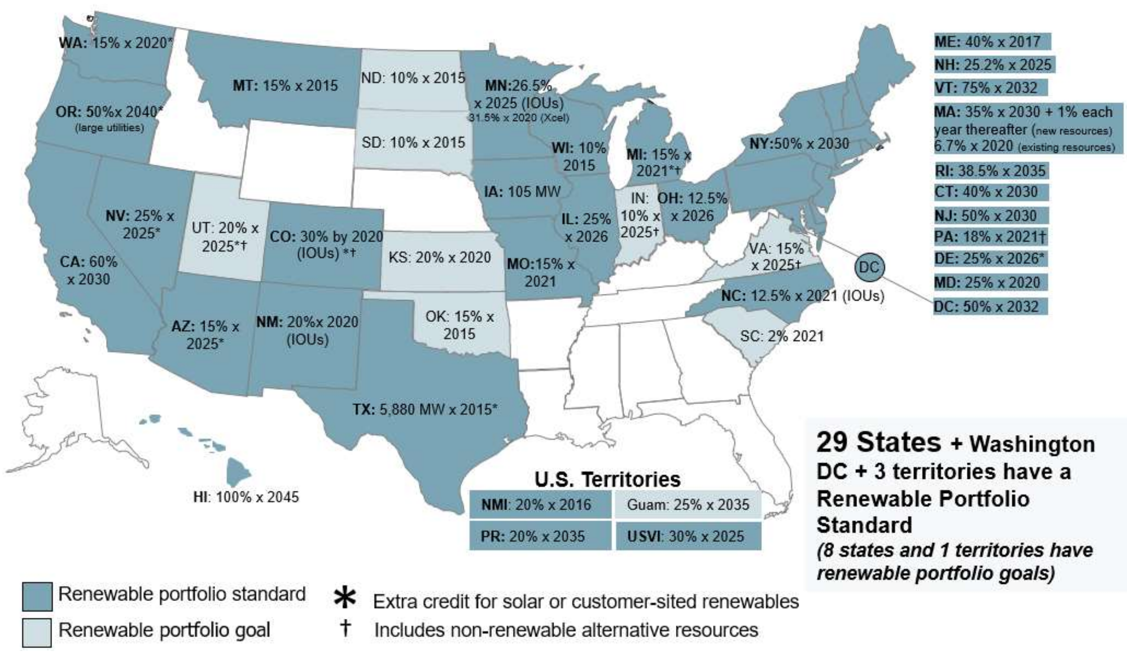
Beginning in the 1980s and continuing through present day, the Federal Government and individual states have developed incentives to promote the growth of renewable energy sources, including wind.[3] Federal tax credits are one of the most important motivators in the development of new wind projects. There are currently two identifiable federal tax credits available to wind project developers, a Renewable Electricity Production Tax Credit ("PTC") and Business Energy Investment Tax Credit ("ITC"). The federal ITC is an income tax credit equal to 30% of the total qualified costs of a new wind project. The most current legislation, the Consolidated Appropriations Act, 2016, extended the ITC incentive for qualifying wind farm projects if construction started prior to January 1, 2017 and the project is placed in service by December 31, 2020. The federal ITC is slowly phased out if construction commences after January 1, 2017, but before January 1, 2020, as outlined in the table below.

ITC Reduction Summary		
If Construction Begins By:	**Reduction (%)**	**Effective Credit (%)**
December 31, 2016	0	30
December 31, 2017	20	24
December 31, 2018	40	18
December 31, 2019	60	12

The federal PTC is an income tax credit that new wind projects can utilize for energy generated and sold to an unrelated party. The PTC is available for 10 years after the new wind project is placed in service. The value of the PTC is inflated annually per IRS publications. In 2018, this credit was equal to 2.4 cents for each kilowatt hour of electricity generated at a wind farm.[4] The Consolidated Appropriations Act, 2016, also extended the PTC for qualifying wind farm projects if construction started prior to January 1, 2017, and the project is placed in service by December 31, 2020. The same percent reductions as previously presented for ITCs apply to PTCs for facilities that commence construction in 2017 and after. Any qualifying wind facility can claim either ITC or PTC, but not both.

[2] U.S. Energy Information Administration, "Wind Explained: History of Wind Power," accessed January 11, 2019, https://www.eia.gov/energyexplained/index.php?page=wind_history/.
[3] Ibid.
[4] Internal Revenue Service, Department of the Treasury, "Credit for Renewable Electricity Production and Refined Coal Production, and Publication of Inflation Adjustment Factor and Reference Prices for Calendar Year 2017," *Federal Register* 82, no. 69 (April 12, 2017): 17740. https://www.govinfo.gov/content/pkg/FR-2017-04-12/pdf/2017-07493.pdf.

In addition to federal tax credits, many individual states or taxing jurisdictions offer additional incentives including state-level tax credits and property tax abatements for a defined period after development. Further, individual states have developed an RPS to drive development of renewable energy resources, including wind. In general, an RPS sets a minimum amount of electricity in a certain state that must be generated by a renewable energy resource. Today, 29 states and Washington, D.C., have an RPS in place, and eight states have adopted renewable energy goals.[5] Each state is unique in the development of its RPS and the mechanisms set up to achieve the RPS. California and Hawaii have the most aggressive RPS, requiring that 60% of their electricity is generated by a renewable energy resource by 2030 and 100% by 2045, respectively.[6] The map below shows the renewable portfolio standards in each state as of October 2018.



http://www.dsireusa.org/resources/detailed-summary-maps/

The progress of a state's RPS is tracked by the issuance of Renewable Energy Certificates ("RECs"). RECs are issued to an entity for each megawatt-hour of electricity generated by a renewable energy source. RECs are used by a generator to prove it has complied with the respective state's RPS. If a certain entity generates more electricity from renewable energy resources than is needed to meet the RPS and thus has excess RECs, then the excess RECs may be sold to other entities that may not have enough RECs to meet the RPS. Entering into a Power Purchase Agreement ("PPA")[7] to buy energy from a renewable energy resource may be another way for entities to meet an RPS without developing a large-scale renewable project. Generally, a PPA established with a renewable energy resource will also include

[5] National Conference of State Legislatures, "State Renewable Portfolio Standards and Goals," accessed January 11, 2019, http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx#nc/.

[6] NC Clean Energy Technology Center, "Detailed Summary Maps," accessed January 11, 2019, http://www.dsireusa.org/resources/detailed-summary-maps/.

[7] A PPA is a long-term agreement to purchase a specific amount of power, capacity, or RECs at an agreed-upon price. Typical PPAs for wind farms range from 15 to 25 years, with the most common term being 20 years.

the RECs associated with the energy generated. In some cases, contractual agreements are also established to purchase only the RECs from a renewable energy resource.

These federal incentives and state RPS have largely been effective in promoting development of renewable energy resources, especially wind projects. As of 1990, less than 1% of the electricity in the U.S. came from wind, and as of 2017, approximately 6% of the electricity generated in the U.S. came from wind.[8] Further, the incentives and RPS have sparked significant technological advances. The average nameplate capacity of installed wind turbines has increased; in 2015 it was 2.0 megawatts, a 180% increase from 1999. In 2015, the average hub height of installed wind turbines in the U.S. was 82 meters, a 47% increase from 1999. As recently as 2008, there were no turbines installed onshore in the U.S. with rotor diameters greater than 100 meters, but by 2015, 86% of rotors had diameters of 100 meters or greater with an average of 102 meters.[9] The greater hub heights and rotor diameters contributed to increased average capacity factors for onshore wind turbines across the U.S. From 2000 to 2005, the average capacity factor of wind farms in the U.S. was 30.3%, increasing to 31.8% from 2006 to 2010, and to 32.8% from 2011 to 2015.[10]

Valuation Analysis

The market value of a wind farm is determined by considering all three traditional approaches to value: the sales comparison approach, income approach, and cost approach. Each approach is analyzed to determine its applicability to the subject property being appraised and is dependent on the conditions of the market in which the subject property competes, the specific nature of the subject property, and the availability of pertinent information.

When developing a wind farm appraisal for ad valorem property tax purposes, the appraiser should be informed about the applicable statutes and laws in the subject taxing jurisdiction. Some taxing jurisdictions mandate the use of certain approaches to value and the methodology to apply within each approach which, in some cases, results in the need to apply a jurisdictional exception in the appraisal analysis. Further, for ad valorem wind farm appraisals, the appraiser should be advised as to what assets are taxable in the subject taxing jurisdiction. Each taxing jurisdiction is different, and many have different rules regarding the taxability of real versus personal property. Also, many jurisdictions exclude intangible assets from ad valorem taxation. Adding a layer of complexity, assets considered as intangible assets in one taxing jurisdiction might not be in another taxing jurisdiction. The aforementioned federal and state incentives associated with wind farms, RECs and PPAs, are perfect examples of what might be considered intangible assets[11] in one jurisdiction and not in another. Ultimately, the appraiser needs to consult the client and/or legal counsel involved in the engagement to verify the applicable statutes related to accepted valuation approaches and methodology as well as which assets are taxable in the jurisdiction of the subject property, as these factors will affect the methodology employed in the appraisal of the subject wind farm.

[8] U.S. Energy Information Administration, "What is U.S. Electricity Generation by Energy Source?" accessed January 11, 2019, https://www.eia.gov/tools/faqs/faq.php?id=427&t=3/.
[9] U.S. Department of Energy, *2015 Wind Technologies Report* (August 2016), vii.
[10] Ibid., viii.
[11] This list of intangible assets is not exhaustive and could include other contractual agreements as well as trained and assembled workforce, permits and operating licenses, technical drawings and manuals, software, and the like.

Sales Comparison Approach

The sales comparison approach focuses on the actions of actual buyers and sellers of wind farms in an established market and is used to determine value by analyzing recent sales of wind farms that are similar or comparable to the subject property. Although comparable wind farms may be similar to the subject property, they are rarely so similar as to be considered identical; thus, differences can be identified. The identified differences between the comparable wind farms and the subject property must be accounted for by making appropriate adjustments to the sales price in order to give an indication of what the comparable property would have transacted for if it were identical to the subject property. Factors that must be accounted for in the adjustments to the sales price include, but are not limited to, the assets that actually sold, financing conditions, rights conveyed, market conditions/time, physical condition/age, location/market, capacity or net generation level, and utility of the property. Further, complex industrial facilities like wind farms typically have so many unique physical attributes and operational characteristics that true comparability is highly difficult to determine. Wind farms are also commonly sold as part of a larger portfolio transaction consisting of multiple wind farms and/or other power generation assets which makes the sale nearly meaningless when using it in the sales comparison approach for valuing a stand-alone wind farm.

As previously discussed, transactions of wind farms typically include not only tangible real and personal property assets, but also intangible assets and working capital. Depending on the taxing jurisdiction in which the subject wind farm is located, certain groups of assets may not be taxable for ad valorem tax purposes. Without being directly involved in the transaction, it can be almost impossible to discern what portion of the compensation was paid for the tangible real and personal property assets versus intangible assets and working capital. Thus, it is pragmatically impossible to determine, or make necessary adjustments to arrive at a purchase price for a plant that is comparable to the subject property and representative of the actual assets being appraised.

Thus, while the sales comparison approach should be considered when valuing wind farms, it should only be used to develop an opinion of value if the necessary information is available to make appropriate adjustments to comparable wind farm transactions.

Income Approach

The income approach is the primary method buyers and sellers use to make an investment decision. This approach measures value as the present worth of future cash flows expected to be available to the owner of the stand-alone asset. For a wind farm, cash inflows are typically forecasted from revenues resulting from the sale of electricity, capacity, and RECs. Cash outflows are forecasted from costs associated with fixed and variable operating expenses, future capital expenditures, and any required influxes of working capital necessary to support growth.

Typically, forecasts for electricity, capacity prices, and RECs are available from various publicly and privately published sources. Future operating expenses can be forecast through analyzing historical operations as well as budgeted operating expenses, when available. Depreciation is calculated using a modified accelerated cost recovery system (“MACRS”) or straight-line schedules. Future capital expenditures for a complex property such as a wind farm are typically budgeted by the facility owner who will develop a short- to mid-term capital expenditure budget. The forecast period is determined by the level of confidence and accuracy of the projected cash inflows and outflows to develop a debt-free net cash flow. This reflects what a potential investor in the facility would consider when making a decision regarding a possible purchase and represents the income stream that both debt and equity holders would realize.

The projected income streams are discounted at a rate commensurate with the risk perceived by a prospective investor. A weighted average cost of capital ("WACC") analysis is used to derive an appropriate discount rate by analyzing other market participants in the renewable power generation industry that have a significant amount of installed wind capacity. The level of debt and equity of the guideline companies is used to develop a typical capital structure and non-diversifiable risk, typically represented by beta, associated with each guideline company is analyzed to establish a typical beta for the entire renewable power generation industry. The capital asset pricing model ("CAPM") and/or the bond-yield-plus-risk-premium, or build-up method, are used to develop an equity investor's required return on an investment in the subject property. Necessary adjustments must be made to the cost of equity by the addition of additional risk factor components to account for inherent risk in owning a single wind farm. The cost of debt is developed by considering bond ratings for the guideline companies and the general financial rating status of the renewable power generation industry. Typically, the cost of debt is high and can be represented by Baa bond yields, which also capture the inherent risk associated with owning a single wind farm. After developing the cost of debt and equity, the WACC is calculated by weighting the cost of debt (tax-affected to reflect the tax deductibility of interest expenses) and the cost of equity by the concluded industry capital structure indicated in the analysis of the guideline companies. The WACC is then applied to the forecast annual debt-free cash flows to appropriately discount them to the appraisal date.

This discounted debt-free cash flow establishes the market value of the subject's operating business, also known as the business enterprise value ("BEV"). The BEV includes all tangible assets (property, plant, and equipment), working capital, and intangible assets of a continuing business.[12] Depending on the subject of the appraisal, certain deductions may need to be made to the BEV. For example, if the subject of the appraisal is only tangible assets then any working capital as well as intangible asset value included in the BEV must be deducted or eliminated altogether. As previously discussed, intangible assets associated with wind farms that may be inherent in the BEV could include, but are not limited to, federal and state incentives, RECs, PPAs, other contractual agreements, trained and assembled workforce, permits and operating licenses, technical drawings and manuals, software, and the like.

Cost Approach

In the cost approach, an analysis is made of the capacity and utilization, physical condition, and operating characteristics of the actual wind farm being appraised in comparison with a modern replacement wind farm. This approach requires an analysis of the economics of the wind power generation industry as well as technological advances in the industry. The appraiser must be familiar

[12] American Society of Appraisers, *Valuing Machinery and Equipment: The Fundamentals of Appraising Machinery and Technical Assets*, 3rd edition (2011), 137.

with the physical attributes of the wind farm being appraised as well as its capabilities, technical attributes, and economics.

The cost approach typically develops value based on the replacement cost new ("RCN")[13] of the subject asset, less allowances for depreciation or loss in value from physical deterioration, functional obsolescence, and economic obsolescence. When developing the RCN of the subject facility, it must be verified that the modern equivalent wind farm has the same utility as the subject being appraised.

When determining depreciation, a deduction for physical deterioration is applied first. This deduction represents a loss in value due to typical wear and tear experienced by the wind farm as a result of usage, maintenance practices, and exposure to natural elements. Estimates of physical deterioration are developed through discussions with wind farm operations managers, a personal inspection of the facility, and a consideration of age and life expectancies.

The next deduction is functional obsolescence, which is sometimes referred to as "operating obsolescence." Functional or operating obsolescence accounts for the technological shortfalls of the subject property as compared to the modern replacement facility. For a wind farm, such technological shortfalls can be attributed to the fact that new modern wind turbines generally have higher tower heights, larger rotor diameters, better diagnostics sensors, and overall greater operating efficiencies than older vintage turbines—even those from five to 10 years ago. These technological advances have resulted in increased capacities and capacity factors for wind farms across the U.S.

Economic obsolescence, the next deduction, is defined as a form of depreciation, or an incurable loss in value, caused by unfavorable conditions external to the property. Economic obsolescence associated with wind farms may be caused by one or multiple factors, such as reduced demand for electricity, capacity, or RECs in the market; overcapacity in the market; and prices for electricity, capacity, or RECs.

Finally, a deduction is made for necessary capital expenditures, which are a form of functional and/or economic obsolescence. Necessary capital expenditures comprise expenses mandated by a government entity for continued operations. For a wind farm, typical major necessary capital expenditures could include turbine hazard lighting upgrades to comply with Federal Aviation Administration ("FAA") standards or condition-based monitoring for light flickering curtailment to comply with local regulations. Typically, necessary capital expenditures amount to significant invested capital but do not contribute any added utility to the wind farm or increase cash flows. In fact, necessary capital expenditures typically result in higher operations and maintenance costs and negatively affect the cash flows. Necessary capital expenditures simply allow the wind farm to legally continue operating.

After all forms of depreciation are developed and deducted from the RCN for the subject wind farm, the value of the land owned in fee simple is added. The result is an indication of value for the wind farm by the cost approach.

[13] Reproduction cost new can also be used as the starting point in the cost approach. However, if the reproduction cost new and replacement cost new are materially different, the RCN becomes the true starting point. The difference in the reproduction cost new and RCN is a form of functional obsolescence from excess capital costs.

Correlation of the Approaches

After considering and developing (as appropriate) the sales comparison, income, and cost approaches, the three indicators of value are correlated to a final opinion of value. Each approach must be analyzed for its strengths and weaknesses in application to the specific assets appraised. Even if all approaches are developed, more weight should be given to the indicator of value from the approach(es) concluded to be most reliable.

Conclusion

Wind farm development in the U.S. has grown significantly over the past two decades and is projected to increase in the coming years. Property tax abatements offered to the owners of new wind farms, by taxing jurisdictions, have contributed to development but also have spurred many property tax disputes as they expire. The result has been a need for independent and unbiased appraisals for ad valorem tax purposes. This requires an appraiser who is current with the ever-changing energy markets and, specifically, the state of the wind power generation industry. Equally important, appraisers must be knowledgeable of all the caveats and nuances associated with the valuation of wind farms for ad valorem property tax purposes and how such factors affect appraisal analysis, methodology, and final opinions of value.