Implications of Wind Energy Decommissioning and Repowering on Ad Valorem Taxation

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Many wind energy projects in the United States are reaching an age where the property owner must decide whether (1) the project will be extended through a repowering investment or (2) the project will be decommissioned and removed at the end of the project's useful life. These wind project investment decisions are affected by tax incentives, rapidly changing technology, and an evolving marketplace. However, the assumed investment decision at the end of the project's initial useful life affects the value of the wind project at any age. This discussion analyzes the current context of repowering versus decommissioning wind farms in the three generally accepted property valuation approaches. And, this discussion explains why the standard valuation assumption should be to decommission the wind project at the end of that project's useful life.

INTRODUCTION

Utility-scale wind power projects in the United States began in California in the 1980s, and some of the first projects have already been repowered or decommissioned. To date though, this repowering versus decommissioning decision has affected a relatively small proportion of the total installed capacity of wind farms. However, this investment discussion will be an increasing consideration—as a greater number of projects continue to age.

As of the end of 2016, there was over 80,000 megawatts ("MW") of installed wind capacity in the United States. Of this amount, over 70,000 MW of capacity was installed within the last 10 years.[1]

Despite the relatively young age of U.S. wind farms, the implications of repowering affect all wind farms, as it is critical to the valuation of any aged wind farm to consistently apply a scenario for the wind turbines at the end of their 20- to 25-year design life.

Near-term repowering and retrofitting investment decisions are currently made based on tax incentives that are set to expire in a few years. Because of this, it may seem appropriate to extend the remaining life estimate used in the wind farm valuation analysis beyond the initial 20- to 25-year investment period.

However, this may be a problematic valuation assumption. This is because the assumption of repowering or retrofitting investments as a probable outcome for property taxation purposes is speculative. Such an assumption risks the inclusion of property into the valuation that does not yet exist as of the valuation date.

This discussion will:

1. identify the features of decommissioning, retrofitting, and repowering;
2. provide an overview of the three generally accepted property valuation approaches as applied to the analysis of wind farm projects; and
3. explore how the three generally accepted property valuation approaches are affected by the investment decision of decommissioning, retrofitting, or repowering.

OVERVIEW OF THE INVESTMENT DECISIONS AT THE END OF DESIGN LIFE

There are three main end-of-design-life investment decisions for aging wind farm projects: decommissioning, retrofitting, or repowering.

Decommissioning is the full removal of the project with restoration of the land included in the retirement costs.

Retrofitting a wind farm requires the reuse of portions of the project, such as the foundations, towers, and electrical infrastructure, and the installation of new components for the nacelle and often the rotor. Retrofitting sometimes, but certainly not always, improves the nameplate capacity or efficiency of the project.

Repowering is the removal of older wind turbines and replacement with current technology.

Which investment decision is best for a wind project can be highly site dependent and, for newer wind farms, it is impossible to know which choice will make the most economic sense 10 to 15 years into the future.

Other factors complicating the end-of-design-life investment decision include the following:

1. The fact that certain tax incentives are set to expire in the next few years
2. Uncertainty as to what the competitive landscape will look like for existing wind farms going forward

Before discussing the impact of these end-of-design-life scenarios specifically, it may be useful to start with a high level overview of each property valuation approach as commonly applied to wind farm projects.

As with any other valuation topic, the laws in a particular state may lead to different treatment than is outlined below. The concepts discussed are intended to be generally applicable to valuing wind farm projects, but of course, exceptions exist.

SALES COMPARISON APPROACH

The sales comparison approach is seldom relied on for valuing a wind farm project. This is because sales of wind farms are scarce, and those sales that occur generally do not have adequate details available to ensure comparability.

Investments in wind farm projects often rely on front-loaded state and federal tax incentives that have different value depending on the tax appetite of participants or whether tax equity arrangements are established.

Given the lack of quantity and quality of sales in the market, analysts typically look to the cost approach and the income approach to appropriately value wind energy projects. In the event there is an increase in the number of sales, it is important to evaluate the context of each sale to identify where the buyer is placing value in order to determine if the sale is applicable to the general market.

COST APPROACH

The main issues with applying the cost approach to valuing wind projects are as follows:

1. Developing an appropriate starting point for replacement cost new (“RCN”)
2. Calculating any external obsolescence that may exist

In the past decade, there have been important improvements in technology, while costs of the turbines have decreased significantly since 2009. Thus, historical cost may be a difficult place to start. This is because it can be challenging to verifiably address all aspects of the changes in the cost trend factor.

Reproduction cost new (“RPCN”) is also problematic. This is because of significant changes in the size of equipment. Also, in many cases, the original type of technology is no longer being produced. Coupled with the cost trends in the industry, this means that RCN is generally the appropriate starting point in the cost approach analysis.

To obtain a relevant RCN, the following question needs to be considered: Is the replacement in the megawatt-hours (“MWhs”) that the project currently generates or is the replacement in the nameplate capacity with the latest technology?

For instance, if the subject property is a 150 MW nameplate capacity project built in 2009 with 100 turbines at 1.5 MW each with an average net capacity factor (“NCF”) of 30 percent, this means the wind project generally produces 394,200 MWhs annually.

To replace the installed capacity of 150 MW in 2017, one could install 50 turbines rated 3.0 MW each. This could yield significant savings in terms of plant infrastructure, such as the electric lines of the collection system and access roads to each turbine.

However, these replacement turbines are likely to be more efficient as well, and perhaps capable of achieving a higher NCF, of say 35 percent. On the other hand, to replace 394,200 MWhs in 2017, the equivalency would be 129 MW of installed capacity, or 43 turbines rated at 3.0 MW each.

If the objective is to replace the 150 MW of installed capacity, a functional (or technological) obsolescence adjustment needs to be made to account for the increased efficiency of the new turbines. This obsolescence adjustment can be developed, for example, as a present value adjustment for the increase in MWhs the new technology is expected to produce.

In either case though, a further adjustment may be needed to account for the excess operating costs of having to service 100 turbines in the subject wind plant versus only 43 or 50 turbines in the theoretical replacement wind plant.

With an appropriate starting point for RCN established, and after calculating physical deterioration and other forms of functional obsolescence, the final measurement needed in the cost approach is to check for economic obsolescence. Here, it is important to understand the context of the subject wind farm and the various tax incentives it has utilized.

State and federal tax incentives are often front-loaded in the life of a wind project and are not all available to a market buyer. It is also important to recognize the significant declines in the prices of wholesale electricity and power purchase agreements ("PPAs") in the last few years.

These factors mean that getting the economic obsolescence calculation correct is important to the valuation of the wind farm project and, although a wind farm project may be relatively new, the market value could be significantly lower than its historical cost and the RCN starting point.

Difficulties in calculating economic obsolescence for a cost approach valuation analysis means there may be an increased reliance on the income approach.

INCOME APPROACH

With a paucity of comparable sales and the number and complexity of adjustments in the cost approach, the income approach is likely to be the approach used for valuing wind projects. The income approach essentially values the future economic benefits that a hypothetical market buyer will receive.

In order to provide a credible value indication using the income approach, an analyst should have a clear understanding of electricity markets, renewable energy certificate pricing (if taxable), and operation and maintenance expenses, including major maintenance items.

The challenges in using the income approach include decisions of how long cash flow should be projected, the appropriate discount rates to apply, the scope and timing of retirement expenses, and as examined further below, how prospective repowering should be handled.

Because of the variable nature of cash flow for wind energy projects, and the fact that equipment is predicted to have a finite life, using the income approach discounted cash flow method is typically preferred to the income approach direct capitalization method.

END-OF-DESIGN-LIFE INVESTMENT DECISIONS AND THEIR IMPACT ON VALUATION APPROACHES

Decommissioning

Decommissioning is oftentimes the least risky outcome to expect for a wind farm at the end of design life. This is because the assumption underlying this investment decision is that the future economic benefits of the wind farm will stop in a relatively predictable time frame.

In some cases, decommissioning will occur prior to the typical 20-year project design life, and in others cases, decommissioning will occur long after the project design life. The Ponnequin facility in Colorado is an example of a project that was recently decommissioned; the turbines had an average service life of 18 years.[2]

Decommissioning is an economic decision as much as an engineering decision. With low power prices and many states already meeting current mandates for renewable portfolio standards, the returns from continuing to operate a wind farm may not justify its continued operation. This is true even if the wind farm is physically able to operate.

Wind projects may be covered by PPAs which currently insulate the project from prevailing low power prices, but as these contracts expire, wind farms continue to age, and if prices remain low, there could be an increase in the number of decommissioned wind projects in the near future. As aging equipment fails, the decision will need to be made whether the cost of replacing the failed component is supported by estimated future returns.

Another factor affecting the investment decision is technological change in the industry. Changes in technology mean that replacement parts may not be readily available for older technology, and a tiered approach to decommissioning may occur, where some turbines are taken out of service to serve as a source of parts for the portion of the wind farm that continues to operate.

To decommission a wind farm, significant costs are incurred for disassembly of the rotor, nacelle, and tower. The blades are not easily recycled, so that the experience in Europe thus far has largely been to shred the blades and send the material to a landfill.[3]

The tower and nacelle components likely have some scrap value which can help offset some of the other costs of decommissioning. Beyond this, the land usually needs to be reclaimed to at least 18 inches below the ground surface, meaning portions of the foundation and underground collection system will need to be removed, adding to the total decommissioning costs. Even offset by some salvage value, these costs should be factored into the decommissioning decision.

Decommissioning costs can be easily addressed in the income approach. Using an estimate for how long the wind farm will continue to operate, the costs of decommissioning can be added into the final year of operations.

It typically makes sense to ramp down production in the years preceding the final operating year to match the expectation that a wind farm will not suddenly cease operations, but instead will see increased downtime and perhaps a reduction in total nameplate capacity as individual units are retired.

Decommissioning assumptions also need to be included in the sales comparison and cost approaches, but these can be more difficult to specifically identify. In the sales comparison approach, assuming there are comparable sales, the costs and timing of decommissioning will be factored into the sale price.

In the cost approach, the costs of decommissioning can be incorporated into the economic obsolescence calculation. In performing this calculation, the analysis centers on whether the property will be able to provide sufficient return on replacement cost new less other forms of depreciation, and this return should include the costs of decommissioning.

Retrofitting

Retrofitting a wind farm has an advantage over the full repowering scenario in that some of the existing equipment and infrastructure can be reused. This advantage generally makes the investment required for retrofitting less than for repowering.

However, a retrofitted plant is probably not going to last as long as a repowered plant and a retrofitted plant also has limitations on how much of its technology can be upgraded.

An additional facet of the retrofitting decision analysis is the federal renewable energy production tax credit (“PTC”).

Under Revenue Ruling 94-31, the Internal Revenue Service (the “Service”) explains that each facility eligible for the PTC is defined as the “wind turbine, together with its tower and supporting pad.”

This definition means that a 50-turbine wind farm has 50 separate facilities. Each of these separate facilities can qualify for the PTC “provided fair market value of the used property is not more than 20 percent of the facility’s total value (the cost of the new property plus the value of the reused property).”

This requirement is known as the “80/20 test.” The 80/20 test requires that the retrofitting investment in new property, measured in actual cost, be four times greater than the fair market value of the facility’s reused property in order to qualify for the PTC.

The Service definition of “facility” is important here, since it includes only the pad, tower, nacelle, and rotor. Because of this definition of facility, the value of any nonfacility plant assets and any intangible assets are excluded from the 80/20 test.

The effect of this definition on determining the fair market value of a facility’s reused property is outside the scope of this discussion and is something that companies will be working through ahead of the PTC expiration date on January 1, 2020.

In order to qualify for the PTC, retrofitting construction needs to commence by December 31, 2019. Construction commencement can be met with a 5 percent investment safe harbor. This investment safe harbor will allow companies to achieve 100 percent of the PTC value, even though the PTC value is set to phase out, beginning in 2017.

The time frame to apply for the PTC is short, and the value of these tax credits can be a big driver of a company’s decision to retrofit. In some markets, the PTC is worth more than wholesale energy prices.

The PTC value is such that a company may choose to make a retrofitting investment before the end of a project's initial design life, the retrofit being pushed ahead of mechanical necessity in order to secure the PTC incentives.

With the PTC deadline in mind, it is probable that the wind industry will see a lot of retrofitting activity in the next few years. This is because companies have invested in retrofit equipment under the 5 percent safe harbor that will enable projects to qualify for the PTC at the full rate.

And, in some cases, companies may purchase wind farms with the specific intent of completing a retrofit. Accordingly, the number of wind farm sales may increase in the near term.

However, caution should be used before relying on these transactions as comparable sales data. This is because, from a property valuation perspective, the PTC is not always allowed to be assessed by state law. In those states, any comparable sales data would need to be adjusted to remove the value of any PTC, which will vary for each taxpayer depending on its tax appetite.

In other words, a buyer may pay higher than market value, as defined for property taxation, for a wind farm it can retrofit because of the ability to qualify and utilize tax incentives, such as the PTC.

Additionally, many wind farms currently are not, or will not be, able to qualify for the PTC under a retrofit. It may not be feasible to complete a retrofit within the PTC expiration time frame, or the condition of the wind farm may be such that a retrofit is not physically possible.

Given this variety across the market, any sale made with the buyer planning a PTC qualifying retrofit should not be used as a comparable sale for the industry.

Despite the expected increase in retrofits for the next few years, this should not be viewed as the probable outcome for wind farms at the end of the initial design life. This increase in activity is driven by an incentive that has an established sunset date.

Without knowing what future tax incentives will look like (if any) and given the lack of support for renewables by the current U.S. president's administration, it is unknown what the demand will be for retrofit investment beyond the near term.

From the market buyer's perspective, it is difficult to imagine investing under a retrofit assumption outside of the next few years. Otherwise, there is too much speculation regarding future energy prices, hypothetical tax incentives, and capital cost of retrofits to place much weight on this scenario.

Repowering

Repowering a wind farm may be an attractive option for wind farm operators, especially in the current industry environment where tax credits such as the PTC and the Investment Tax Credit ("ITC") still exist.

Under a repowering scenario, as opposed to a retrofitting scenario, the entire wind farm is upgraded. The advantage of repowering is that it allows for the installation of the latest technology without any question of whether the upgrade qualifies for federal tax credit incentives.

Certain wind plant assets such as the meteorological tower, operating and maintenance ("O&M") building, and electrical infrastructure may potentially be reused, but in most cases the repowering will include the installation of new foundations, a new energy collection system, and probably new access roads to new turbine sites.

Additional advantages of repowering an existing wind farm site include having practical knowledge of environmental impacts, wind speed, and relationships with local permitting agencies.

There have been several wind project repowers to date, involving the removal of hundreds of turbines at a lower nameplate capacity, often below 1 MW, and the installation of the latest technology turbines that may have nameplate capacities above 3 MW per turbine.

A repowered wind farm project can provide a variety of benefits. These benefits include the following:

1. A smaller number of turbines for the same overall energy capacity
2. Decreased O&M costs
3. Environmental benefits from having a smaller footprint

Many of the first wind farms in the United States were built on some of the best wind sites. The repowering of these wind farms means that they will benefit from positive locational attributes, perhaps leading to greater returns than the development of new sites.

From a valuation perspective, a repowering project could be considered an independent investment decision. An investor will analyze the cost of the repowering project compared to its expected future benefits. This analysis is nearly identical to an analysis of developing a new wind farm on a new site. In general, the level of due diligence required for both of these analyses would typically be the same.

In the near term, the expected future benefits of repowering will include qualification for either the PTC or the ITC which, as with retrofitting, will be a significant factor in the amount of repowering activity that occurs during the phase-out of these important tax incentives.

Potential sales of wind farms may occur with the buyer expecting to repower, especially in the next few years in order to utilize tax incentives. If this is the case, the buyer paid for the expected cash flow of the old equipment prior to repowering, as well as the intangible assets that make repowering feasible.

These intangible assets could include wind data, lease rights, permits, the present value of growth opportunities, and other intangible assets.

The repowering investment itself will primarily include all new tangible assets that don't yet exist. And, the repowering investment will need to meet the investor's required rate of return before the additional investment is made. A sales price can be divided into an estimated cash flow for both the current project, plus the option to repower the project.

But the repower option most often will not have any value for property tax assessment purposes, with few exceptions, and it will require an allocation of the purchase price to the respective assets, tangible and intangible, in order to properly utilize a sale for this purpose.

Once properly allocated, the use of the sales comparison approach should produce values close to the income approach, where the future benefits of the existing property drive the taxable value.

VALUING OLD EQUIPMENT ASSUMING NEW INVESTMENT IN THE INCOME APPROACH

To incorporate a retrofitting or repowering option in the income approach, one would show a large capital expenditure at the end of the initial project's design life, followed by cash flow from the new property going forward. This is problematic for two reasons.

The first reason is that a repower/retrofit option is not assured, so the same discount rate used for the initial project investment may not be appropriate for the repower/retrofit investment project. Typically, a higher discount rate would be applied to the repower/retrofit project cash flow to represent the greater risk of more uncertain returns.

In addition, the expected return on the repower/retrofit investment is from future tangible property. Assigning this expected return on "potential" investments, possibly made 15 to 20 years into the future, inflates the present value of the wind farm project.

For example, the cash flow expected on 3 MW machines should not be used to estimate the fair market value of a 750 kilowatt machine. To be clear, though, certain capital investments need to be included in the income approach analysis in order to reflect the project design life of 20 to 25 years. These capital investments include major maintenance items, such as replacing gearboxes, generators, and blades. They are expensed for income tax purposes.

Although these capital expenditures are for replacement property, they are distinct from the major overhaul of a retrofit or the full property replacement through repowering.

To the extent that a retrofitting or repowering investment is assured, there may be value assigned to the specific property that will be reused.

However, in order to develop credible appraisal results, the repowering or retrofitting project should have a high degree of certainty, the value should be limited to those components that will contribute to the project cash flow, and the discount rate should accurately reflect the additional risk of the retrofitting or repowering project.

PREDICTING THE FUTURE

Beyond the short-term outlook, where a substantial number of wind farm builds will occur before the federal tax incentives roll-off, there is uncertainty for the U.S. wind industry.

Wind energy is cost competitive now with other forms of energy generation. However, without the implementation of a carbon tax or an energy plan that recognizes the importance of addressing climate change, the scope and rate of advancement of this industry is unclear.

Increases to state renewable energy portfolio standards will also be an important driver of industry growth. New forms of energy generation are being explored, and in the long-term may prove to be commercially viable.

In 2016, the first U.S. offshore wind farm began operating off Rhode Island. These wind energy machines are much larger and more efficient than their onshore counterparts. If the cost curves for offshore wind farms come down as expected, these projects may become a substantial part of the U.S. energy mix.

As with onshore wind farms, Europe is much farther ahead in offshore wind energy development, and is proving the viability of this renewable energy source.

Further sources of renewable energy will include increased utility and residential solar development, exploration of wave energy, and a whole range of earlier stage technology that may become competitive on longer time scales. Onshore wind energy will have an important place in the U.S. energy industry, but the disposition of existing equipment at the end of its useful life is very much in question.

Given the age of the U.S. wind farm fleet, in the near term, there should be a significant number of wind farms that initiate at least one of the three end-of-design-life scenarios summarized in this discussion.

Several of these wind projects could be a retrofit or repowering. Both of these scenarios are largely dependent on the characteristics of the wind farm site, specific to wind speeds, physical viability of reusing the existing equipment, and changes to capital costs and technology.

Another consideration to keep in mind is that a valuation should be based on reasonable and supportable assumptions. For example, if the lease rights or local permits to a specific site are only for 25 or 30 years, one cannot reasonably assume a retrofitting or repowering scenario that depends on a longer time scale.

Most valuation assignments deal with uncertainty. And, handling this uncertainty is where the art of valuation meets the science of valuation. In dealing with the uncertainty of what happens to property at the end of the initial investment period, there is a tremendous amount of due diligence required to pursue a repowering or retrofitting scenario.

For a retrofitting scenario, that due diligence may include an inspection of the foundations and towers to be reused, and engineering studies to confirm the viability of this scenario.

For both the repowering and retrofitting scenarios, analysts should consider if the economics of the market make further investment feasible by incorporating available incentives, the prevailing electricity prices, capital expenditures, and required returns.

Importantly, not all property of a wind farm is assessable for property tax purposes, so care should be taken to allocate value appropriately.

TELLING THE STORY

Similar to other valuation assignments, the assumptions employed in the wind farm valuation tell a story. Do the physical, economic, and legal conditions exist to permit future investment at the site that will extend the life of some of the existing property? Are there tax incentives that drive the investment decision? How do estimates of wholesale electricity prices support the story?

Looking at the history of the periodic lapses of the PTC and the effect of the PTC on wind power installations shows how these tax incentives have shaped investment in the industry. However, beyond the expiration date of the current tax incentives, the story becomes less clear and needs to be treated as uncertain within each valuation approach.

The eventual decommissioning of a wind project needs to be incorporated in the determination of the fair market value of a wind project. If the conditions for a particular project, and the investment environment are such that a retrofit or repower is highly probable, then the story will be about which components will be reused in the next investment cycle and the value of those components.

However, barring a compelling reason to assume otherwise, a wind farm valuation should assume market participants buying and selling on the presumption that the wind farm will not last beyond its initial 20- to 25-year project design life.

Given this assumption, and the suitability of the income approach in valuing wind farms, using a discounted cash flow analysis that incorporates decommissioning costs in the final year will likely provide the most reliable indication of the fair market value for a subject wind property.

Notes:

1. AWEA 4Q 2016 report.
2. http://www.opb.org/news/article/where-do-wind-turbines-go-to-die/
3. http://www.windpowerengineering.com/design/mechanical/blades/recycling-wind-turbine-blades/

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