Wind Development in Pennsylvania

A Reflection on State Policy

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While other states have continued to add wind turbines in recent years, there has been no new wind development in Pennsylvania since 2012. This article considers how state energy policy as well as local land-use policies related to wind energy compare with other states as a way to understand how these policies may be impacting wind development in the Keystone State, especially in light of the geographical characteristics of the state's highest quality winds.

Background

In the past decade, the United States has seen exponential growth in the percentage of electricity that comes from renewable sources. In much of the country, this has meant a large surge in onshore wind energy projects. Pennsylvania is no exception to this trend. In 2000, the state boasted just 10MW of installed wind capacity—a single wind farm of eight turbines in Somerset County. By 2009, the state's total had risen to 748MW, a growth rate six times that of the United States as a whole (U.S. Department of Energy 2016a). Installed capacity in Pennsylvania ticked up again in 2012, when six new wind farms came online, bringing the total installed capacity to 1,340MW. Since then, however, while other states have added more than 14,000 MW of wind energy, wind development in Pennsylvania has flat-lined (see Figure 1).

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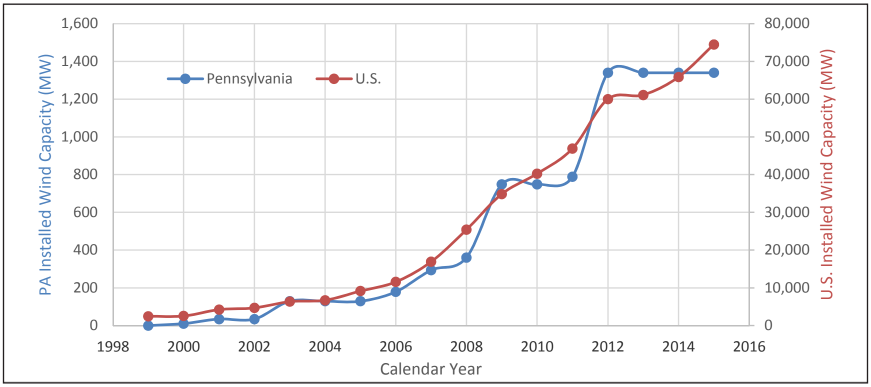

Figure 1. Cumulative Installed Wind Capacity in Pennsylvania Compared to the United States, 2000–2015. *(U.S. Department of Energy, "Installed Wind Capacity,"* WINDExchange, *2016, available at http://apps2.eere.energy.gov/wind/windexchange/wind_installed_capacity.asp, accessed June 10, 2016.)*

This article does not attempt to identify a single cause for the stalling of wind development in the Commonwealth. Indeed, as previous analyses have shown, a multitude of factors affect the deployment of wind energy within a particular state (Bohn and Lant 2009; Fischlein et al. 2014). However, this article aims to identify how Pennsylvania's policies related to wind energy compare with other states, as a means of identifying possible factors hindering wind energy development. In particular, I first consider how specific provisions in the state's renewable energy standard compare nationally. I then discuss Pennsylvania's decentralized regulatory regime for land-use decisions effecting the siting of turbines compared with policies that make siting decisions at the state level. I conclude by discussing how the geographical characteristics of the state's highest wind energy potential may warrant reconsidering these policies.

Renewable Energy Policy

At the state level, the most common policy for encouraging utilities to shift to renewable technologies has been the renewable portfolio standard (RPS). In general terms, this policy tool requires electric utilities operating within a state to increase the proportion of electricity that comes from renewable sources by a set deadline.

Currently 29 states plus the District of Columbia have a compulsory RPS in place, while eight more states have voluntary standards or renewable energy goals (National Conference of State Legislatures 2016). The specifics, however, vary from place to place, with respect to not only the overall required proportion of energy that must come from renewable sources and the deadline for meeting the goal but also which technologies are considered "renewable."

Pennsylvania is in the majority of states, having passed a compulsory RPS entitled the Alternative Energy Portfolio Standards Act of 2004. On its face, the law's 18% mandate by 2021 is in the middle of the pack compared both nationally and to its neighbors. Pennsylvania's RPS is not nearly as aggressive as neighboring New York's 50% by 2030 standards, but is higher than the 10% by 2015 standards of both Michigan and Wisconsin (see Table 1).

Table 1. State Renewable Portfolio Standards, Sorted by Required Percentage of Renewable Energy

State	Goal	Nonrenewable Alternatives Allowed
Hawaii	100% x 2045	
Vermont	75% x 2032	
Oregon	50% x 2040	
California	50% x 2030	
New York	50% x 2030	
Maine	40% x 2017	
Rhode Island	38.5% x 2035	
Colorado	30% x 2020	yes
Connecticut	27% x 2020	
Minnesota	26.5% x 2025	
Delaware	25% x 2026	
Illinois	25% x 2026	
Ohio	25% x 2026	yes
Nevada	25% x 2025	
New Hampshire	24.8% x 2025	
New Jersey	20.38% x 2021	
Maryland	20% x 2022	
New Mexico	20% x 2020	
Pennsylvania	18% x 2021	yes
Arizona	15% x 2025	
Missouri	15% x 2021	
Massachusetts	15% x 2020	
Washington	15% x 2020	
Montana	15% x 2015	
North Carolina	12.5% x 2021	
Michigan	10% x 2015	yes
Wisconsin	10% x 2015	
Iowa	105MW	
Texas	5,880MW x 2015	

Sources: Database of State Incentives for Renewables and Efficiency, Renewable Portfolio Standards, Raleigh, North Carolina State University, 2016. Lawrence Berkeley National Laboratory, National Conference of State Legislatures.

However, like only three other states, Pennsylvania's RPS allows nonrenewable alternatives to count toward the total. Allowing these alternatives does not, in itself, reduce the deployment of wind or other renewable energy technologies. Michigan's RPS, for example, counts energy generated by municipal solid waste—a nonrenewable—toward the goal, but the 2015 standard was met nearly exclusively through adding additional wind and solar energy (Talberg, Quackenbush, and Saari 2016). However, distinct from Michigan and Colorado, which treat select nonrenewables as one of many technologies that may be used to meet the requirement, Pennsylvania has a two-tier system with separate goals for each tier. The first tier, which includes traditional renewable technologies, including wind energy, must make up just 8% of the electricity generated in the state by 2021. By contrast, the second tier must account for 10% of the state's generation mix by 2021 and must come from a separate list of technologies most of which are nonrenewables: waste coal, distributed generation systems, demand-side management, large-scale hydropower, municipal solid waste, and integrated combined coal gasification. As a result, among states with an RPS, Pennsylvania has the lowest standard strictly for renewable energy.

This comparatively low renewables mandate does not necessarily mean that Pennsylvania will lag other states in wind development. Indeed, Iowa has long surpassed its modest 105MW renewables mandate; it currently boasts 6,365MW of installed wind capacity (U.S. Department of Energy 2016a). Even so, while there has been significant study and debate about how much the national increase in wind energy development can be attributed to RPS policies (Menz and Vachon 2006; Shrimali, Lynes, and Indvik 2015; Staid and Guikema 2013), most energy analysts believe that a shift toward renewables would slow in the absence of robust RPS policies (U.S. Department of Energy 2015).

Land-Use Regulation

State energy policies such as the RPS are not the only regulations that may impact wind development in a particular state. Given the size of modern utility-scale turbines—commonly 400 to 500 feet from turbine-tip to ground—it should not be surprising that, like other large structures in the built environment, wind projects are also subject to land-use regulation. Most often, this regulation is aimed at ensuring that turbines are safely sited in case of a catastrophic failure (e.g., loss of a turbine blade) or shedding of ice, as well as to minimize the noise and visual impacts to neighboring landowners. Such regulations usually take the form of minimum setback distances from roads, property lines, or inhabited structures and requirements for vegetative screening to reduce both noise and shadow flicker (Andriano 2009).

While land-use regulations are applied to nearly every utility-scale energy facility, they can be particularly onerous on wind developments, given the geographic scale required for economic viability. While a traditional power plant might be sited on a single parcel of perhaps a couple thousand acres, modern wind farms often spread over hundreds of parcels and tens of thousands of acres, increasing the likelihood that they would extend beyond the confines of a local municipality. When turbine-siting rules are set at the municipality level, developers on a single wind project may need to comply with land-use regulations of multiple jurisdictions, a situation that is less common for other energy infrastructure.

As a result, it is not uncommon for states, when enacting an RPS, to also establish that all land-use regulation associated with wind facilities will happen at the state level (Heibel 2016). Centralizing land-use regulation not only simplifies planning for these large footprint wind projects but also frees wind developers to identify project sites where they can maximize energy output—and subsequently minimize the cost of electricity—rather than factoring in whether obstructionist local regulations will delay approval. Theoretically this should allow for the most efficient allocation of energy infrastructure within the state, based on energy potential rather than local politics, helping to minimize the cost of the renewable mandate. Indeed, after a decade-long experiment with local-level energy siting, in 2011 New York reinstated state-level control for land-use regulation of large (over 25MW) wind facilities to allow the state to stay on track to meet its aggressive RPS (Kass et al. 2011; Wind Energy Law Blog 2011).

By contrast, in Pennsylvania, wind turbine siting is regulated by each of the state's 2,500+ local governments. While the state, in collaboration with electric utilities, developed a model wind zoning ordinance as guidance (Pennsylvania Department of Environmental Protection 2006), localities are welcome to adopt alternate regulations.

This local control of wind siting is relatively common in states that have a tradition of home rule, and in particular where there is no state-level utility siting board (Rynne et al. 2011). Further, this is the regulatory model in Texas, the nation's top wind energy producing state. The rationale for local siting is that it affords communities the power to set standards for wind projects so that any wind development helps meet the land-use goals of that community. While this may lead to restrictive local standards that effectively block (i.e., "zone out") wind development in communities with high wind potential (Devine-Wright 2011), it also provides opportunities for less-windy localities keen on accepting wind development to entice wind developers by enacting comparatively lax regulation (Rynne et al. 2011). Which of these scenarios is more likely to play out in any state, though, largely depends on the geography of a state's viable wind resources, and how the land is currently used in those locations.

Geography and Public Acceptance

While the literature on community acceptance of wind energy is still growing, there have been some studies on factors that influence an individual's attitude toward wind development. In particular, individuals' attachment to the landscape has been shown in number studies to increase their opposition to wind energy (Jacquet 2012; Otto and Leibenath 2014; Park and Selman 2011). By contrast, landowners who value their land more for its utility (e.g., as a working landscape) and less for its scenic value are more likely to support wind energy (van der Horst 2007; Veelen and Haggett 2016). The logical extension is that when a state's windiest places are also valued for their scenery—such as vacation destinations, recreational areas, or suburbanizing communities on the urban fringe—local communities are more likely to oppose wind development. By contrast, when the state has viable wind resources in working landscapes—such as farmland, ranchland, or mining areas—local communities are more likely to support wind development, largely for the economic benefits it brings to individual landowners and local governments (Kahn 2013).

Pennsylvania's best wind resources are concentrated in three areas: in Erie County in the extreme northwest of the state, following the ridgeline of the Allegheny Mountains through the central part of the state, and along scattered ridges in the northeast corner (U.S. Department of Energy 2016b). To date, Pennsylvania's wind development has been exclusively in the Alleghenies and mountains of northeastern Pennsylvania, largely in areas with a history of energy extraction and distant from large population centers. While there are still undoubtedly viable sites along more remote ridgelines (particularly in the western Alleghenies), most of the untapped wind potential lies in areas closer to recreational or residential communities. And these sites are being met with fierce opposition both in the Lehigh Valley (Radzievich 2016) as well as in Erie County (Myers 2015), where projects have been cancelled due to restrictive local ordinances or public opposition.

As mentioned previously, though, local control also provides an opportunity for communities in less-windy locations to attract wind development to their community. However, this works only where there are ample locations with viable wind speeds. Pennsylvania, in comparison to states to its north and west, has relatively modest wind resources (U.S. Department of Energy 2016b), with the best second-tier wind resources in the state available in isolated pockets in the counties along the northern border with New York State, and in Lancaster and York Counties in the southeast. And there does appear to be at least some interest in wind energy in both of these regions. A township in Potter County in north-central Pennsylvania has cited community-level economic benefits of wind development—specifically payments by the wind developer to the township government—in its review of a proposed wind farm (Davis 2016). Meanwhile, farther south, in Lancaster County, the Frey Farm Landfill currently operates two utility-scale wind turbines. There might also be opportunities to discuss how wind energy might complement this region's long-standing goals of preserving farmland (Mulvaney, Woodson, and Prokopy 2013; Union of Concerned Scientists 2003), but there is little evidence that such discussions are underway. Absent a greater push for wind development in these locations, the prospects for substantial future wind development in Pennsylvania under its current land-use regime are likely limited.

Conclusion

Taken in isolation, nothing about Pennsylvania's energy or land-use policies would explain why the state has seen a four-year drought of wind development while the nation as a whole has increased its wind capacity 24% in this time. The state does have a policy in place mandating an increase in renewable energy, and the state's policy to delegate land-use authority for wind development to local units is not uncommon. However, given the state's relatively modest wind potential and the geographic location of the state's best wind resources in areas that may be predisposed to oppose wind development, without changes to state policy, it is likely that wind development will be limited in the state. Strengthening the state's RPS to either exclude nonrenewable alternative energy sources or increase the percentage that must come from renewables would put Pennsylvania on par with the mandates set by other states, but it might also increase the price of electricity if utility companies are unable to find communities willing to accept wind development. Altering land-use regulation to give the state more power to overrule local governments that wish to completely block wind development would help to overcome this problem, but it would likely be a difficult sell in a state that so values local land-use control.

Shifts to state policy, though, may not be the only ways to increase the deployment of wind energy in the state. Increased governmental or nongovernmental, proactive outreach (to communities with more modest wind potential that may be predisposed to support local wind development for its attendant local economic benefits) may lead to local land-use regulations that favor wind development and help entice wind developers to these communities. Additionally, technological advances in wind energy technology may increase the number of communities across the state where utility-scale wind turbines can be viably sited. As a result, there is no reason to believe that wind development in Pennsylvania has hit its peak; it just may need a nudge to break from its current plateau.

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