



The Texas Wind Power Story, Part 2

The Impacts of Texas Wind Power Siting

by Lisa Linowes

July 2018

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Texas Public Policy Foundation
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Executive Summary

In 1999, the state of Texas hosted 184 megawatts of installed wind energy representing 7.4 percent of the 2,473 megawatts (MW) of wind operating in the United States. Since then, project installations have ballooned to nearly 23,000 MW representing 25 percent of the total installed in the U.S. Most of the turbines are geographically concentrated in remote areas of the Panhandle and West Texas, which helped keep public opposition at bay compared to fights in other states. But that is not to say Texans universally embrace wind turbines. “Wind farms” are sprawling power plants that create a unique set of effects for nearby residents. This report presents the following findings after examining the effects of wind energy development on communities and the natural environment and responses by the Texas public:

- With roughly 13,000+ turbines operating in Texas, public opposition in the state is escalating as more projects are proposed close to where people live. Several lawsuits have been filed to stop projects but without success. Wind energy facilities create a unique set of impacts on nearby residents, the natural environment, and for those using the land and airspace between the turbines. Noise, shadow flicker, safety setback distances, aesthetics and property value impacts are the categories most frequently debated when considering project siting measures.
- The impacts of Texas wind projects on birds could have far-reaching effects for some species. Two of the four North American bird migration corridors, the Central and the Mississippi, converge along Texas’ coastal plains where millions of birds cross twice a year. Far less is understood about the impact on other wildlife displaced by wind development.
- There is growing concern that decommissioning provisions found in private land lease agreements are insufficient to protect the public from abandoned turbines. Estimated decommissioning costs for the state reach into the billions depending on the level of site restoration.
- The state of Texas took an important step with passage of SB 277 to protect flight operations at military installations in the state. The legislation eliminated Chapter 312 and Chapter 313 tax benefits for wind farms sited within 25 nautical miles of an installation with flight operations. The effectiveness of SB 277 is not fully known and will be situational. Projects that do not qualify for favorable property tax treatment can still proceed.

Wind Energy Siting

“Wind farms” are sprawling power plants using wind turbines to generate electricity that create a unique set of impacts for nearby residents. The visually dominating towers, which today can reach over 600 feet from base to blade tip,¹ cast dense,

¹ These heights were previously reserved for offshore wind facilities. To put in context, the Cape Wind project proposed off the Massachusetts coast in Nantucket Sound planned for turbines standing 440 feet tall (BOEM). The five wind turbines situated three nautical miles southeast of Block Island in Rhode Island stand 660 feet above the water (Hight).

KEY POINTS

- “Wind farms” are sprawling power plants that create a unique set of effects, including noise, shadow flicker, safety setback distances, aesthetics and property value loss, for nearby residents.
- The impacts of Texas wind projects on birds could have far-reaching effects for some species. Far less is understood about the impact on other wildlife displaced by wind development and the fragmentation of their habitat.
- There is growing concern that decommissioning provisions found in private land lease agreements are insufficient to protect the public from abandoned turbines.
- The state of Texas took an important first step with passage of SB 277 in rolling back wind subsidies, eliminating Chapters 312 and 313 tax benefits for wind farms sited within 25 nautical miles of a military installation with flight operations.

moving shadows (shadow flicker) on neighboring properties, raise the soundscape of rural areas to urban levels, and on occasion experience spectacular failures including total collapse, blade/component throw, and fire. In colder climates under normal operating conditions, ice can form on the blades that, when shed, could be thrown hundreds of meters from the tower as a result of the rotor spinning or wind blowing.

Large-scale wind turbines operating in the U.S. are generally located in remote areas away from where people gather, but this is changing. By 2016, nearly 1.4 million homes were within five miles of a wind project in the U.S., and in each of the years since 2005 turbines inched closer to residences ([Hoen et al. 2018](#)). Distance is the only certain mitigation for protecting people from the impacts of turbine shadows, noise emissions, or bodily harm and property damage related to catastrophic failure. After years of debate concerning safe siting, there is still disagreement and uncertainty over permitting standards.

Regulating Wind Impacts

While the impacts of siting wind turbines are better understood today than even a few years ago, many jurisdictions in the U.S. have little or no enforceable standards for siting. James Luce, chairman of the Washington State Energy Facility Siting Council, emphasized this point in the council's October 2011 order recommending conditional approval of the Whistling Ridge wind plant.²

In the order, Luce wrote:

... The Council is challenged by the fact that it has no rules for siting renewable resources. ... For guidance, we look to our previous decisions, organic statutes and regulations developed primarily for thermal projects. And we use our best judgment to "balance" competing considerations. Our laws and regulations presuppose a compelling need for energy resources, tempered by a requirement that the resource enhance the esthetic and recreational opportunities available to the public while providing abundant power at reasonable cost. All of this is to be done "in the public interest." And yet what is "the public interest?" Absent rules, the Council proceeds on a case-by-case basis and our decisions inevitably leave room for questioning whether the correct result was reached ([Luce](#)).

Efforts to set minimum setback distances, or limits on noise and shadow flicker, regularly are met with intense

objections by developers who view the ordinances as too restrictive or residents who fear the rules are not protective enough. Lawsuits are currently pending in Indiana, Michigan, and Missouri to name a few. With the wind production tax credit phasing down, project proposals have accelerated, which is intensifying the conflicts between project proponents and neighboring property owners ([Le Coz](#)).

Some jurisdictions regulate wind projects through state-level processes including Washington, Ohio, Vermont, Maryland, and New Hampshire. Others, like New York and Wisconsin, previously permitted project oversight by local governments but removed that authority after stakeholders complained of a patchwork of varying and at times incompatible regulations.³ New York towns also encountered unethical behavior between wind energy companies and town boards prompting the state to enact a Wind Industry Ethics Code of Conduct ([State of New York](#)). But generally in the U.S., permitting decisions for large wind installations fall to county commissioners and local land use boards, many of whom are poorly equipped to address the complex issues involving wind projects.

Because of the longstanding commitment of its citizens to protect private property rights, Texas does not regulate the siting of wind energy facilities. Texas counties are subject to "Dillon's Rule," which prohibits commissioners courts from establishing any siting standards unless such authority is delegated through a vote of the Legislature ([CAPCOG, 2](#)). Project developers need only find interested landowners willing to negotiate land leases for turbine placement and the project can proceed without notice to local officials or the public.

Roughly 13,000 turbines are operating in Texas spanning 150+ project sites. Most of the turbines are concentrated in the CREZ areas in North and West Texas, which helped keep public opposition at bay compared to fights in other states. But that is not to say Texans universally embrace wind turbines.

Since 2006, several high profile lawsuits were filed to stop projects from proceeding including *Dale Rankin et al. v. FPL Energy, LLC* ([Rankin](#)) that opposed construction of FPL Energy's Horse Hollow Wind Farm in southwest Taylor County and Coastal Habitat Alliance's complaint against two large projects in the sensitive Laguna Madre area south of Corpus Christi⁴ ([Coastal](#)). Around the same time,

³ To assuage concerns over residents losing local authority over project siting, the New York process requires wind project applicants work to meet existing siting standards in effect for host communities ([NY Board, 53](#)).

⁴ A citizens group known as the Texas Wind Resistance Alliance produced the [video](#) "Protecting Texas" in 2007 to educate the public about turbines spreading in West Texas.

² The council ruled the project could proceed but ordered that any turbines that would be prominently visible from within the Columbia Gorge National Scenic Area be eliminated. The project has been the subject of several legal challenges and is still pending ([Gorge Friends](#)).

landowners were pushing back on T. Boone Pickens' plan to erect a massive \$12 billion, 2,700-turbine project in West Texas that was later downsized and eventually cancelled ([Blaney](#)).

Llano and Gillespie counties in Texas Hill Country were also fighting back against turbine projects and expansive new transmission rights-of-way. The counties issued strongly worded resolutions objecting to the developments and appealed to state Sen. Troy Fraser (R-District 24, now retired) who filed [SB 1226](#) that would have established setback distances between turbines and habitable structures, property lines, and federal or state natural areas. The bill also would have granted counties authority to establish other siting requirements. A related bill filed by Sen. Fraser, [SB 1227](#), prohibited wind projects in counties that adopted resolutions opposing such development unless and until the company publicly engaged with the county and established a decommissioning fund. Neither bill gained traction.

In the last few years, opposition to wind turbines has spiked around the state. In late 2013, 23 Willacy County landowners with lease agreements permitting turbines on their properties sued two different wind companies, Duke Energy and E.ON Climate & Renewables, over noise, property devaluation, and health effects due to living near the turbines. The plaintiffs asserted that company representatives "carelessly and negligently failed to adequately disclose the true nature and effects that the wind turbines would have on the community, including the plaintiffs' homes" ([Del Valle](#)). The suit, *Silva v. Degs Wind I, LLC et al.*, was moved to federal court and later dismissed. Residents in Clay and Hamilton counties also mounted aggressive campaigns to stop projects in their communities ([Hanna](#)). The Clay County project was ultimately built but in Hamilton the developer withdrew the project citing the commissioners court's unwillingness to grant property tax relief.⁵

Noise, shadow flicker, safety setback distances, aesthetics and property value impacts are the categories most frequently debated when considering project siting measures. This section provides a brief overview of the issues involved.

Noise

Turbine noise emissions are the most controversial issue surrounding wind turbine siting.

The total noise emitted by a turbine is comprised of two elements, the mechanical noise of the machine itself and the aerodynamic noise resulting when the blades pass through the air. Turbine manufacturers test each turbine

model to determine the maximum noise output under very specific meteorological conditions. In general, these tests show maximum noise levels ranging between 103 and 107 decibels. When erected at a project site where atmospheric conditions, temperature gradients, and wind shear gradients vary from the manufacturer's test conditions, the turbine noise could be much higher. As the noise radiates away from the turbine, it dampens, but even at 3,000 feet from a residence, the sound could be 40+ decibels (dBA), which is substantially louder than background levels found in most rural areas of the U.S. Nighttime background noise levels in unpopulated areas may be 25 dBA or less ([Punch and James](#)).

Turbine acoustics and noise propagation are complex topics that are difficult to explain. Decades of research show that the noise profile associated with modern turbines includes amplitude-modulated bursts of energy and pressure pulsations, which can lead to adverse impacts on humans including sleep disturbance, headaches, vertigo, and nausea ([Punch and James](#); [Schomer](#)).

During some periods of the day, the turbines may be quiet but meteorological conditions are not static. At night, in particular, when the winds are calm on the ground and turbulent at hub height, the movement of the blades creates a notable noise that cannot be ignored. In larger turbines, the noise profile shifts into the lower frequency range, which means it can travel further and is more likely to penetrate building walls. Under the right conditions, the sound can travel for miles, penetrate homes and roofs, and disturb sleep.

The level of turbine noise that reaches a home (as measured in decibels) is the focus of most project reviews, but the sound signature is also a key factor. In a study on wind turbine noise, researchers found that beats and strong amplitude modulation found in turbine noise were contributing factors in sleep disturbance "reflected by more electrophysiological awakenings, increased light sleep and wakefulness, and reduced REM and deep sleep" ([Smith](#)).

The only mitigation for turbine noise is distance. Yet as found in Hoen et al. 2018, turbines are moving closer to where people live. That same study found that 28 percent of residents living within one-half mile of the turbines, which were not compensated by the project, had very negative or negative attitudes toward the turbines.

There is limited research on the short- and long-term impacts of turbine noise on wildlife residing in or migrating through project sites. The state of Vermont is currently

⁵ Letter on file with author.

studying the effect of operating wind turbines on black bears to measure how bears might change their use of the project area. ([Weiss-Tisman](#))

Shadow Flicker

Wind turbines can create a visual phenomenon known as shadow flicker, which is defined as the alternating change in light intensity or shadows created by the moving turbine blades when back-lit by the sun. The location and occurrence of the shadowing effect depends on the time of year, time of day, and the position of the sun in the sky. The frequency of shadow flicker is related to the rotational speed of the blades.

The wind industry has long held that the shadows cast by the spinning blades dissipate quickly beyond 10 rotor diameters of the turbine, which means that for a 100-meter (328-foot) rotor diameter, shadows would not be experienced beyond 3,280 feet. This standard may have been appropriate for shorter blades; however, the longer, wider blades on today's machines and different shadow profiles for different blade shapes have resulted in impacts extending well beyond the industry claim. Shadow flicker has been recorded at over 6,000 feet from a turbine ([Reilly](#)).

Over time, complaints from the public have compelled turbine manufacturers to address the issue. Today, turbines can be equipped with shadow flicker detection (SFD) systems. The technology tracks the sun's location relative to the blades to determine if any of the sensitive receptors (homes, playgrounds, etc.) are within the shadow's path. If the case, the turbine self-curtails until the sun moves in the sky. In several jurisdictions, ordinances have been adopted that prohibit turbines from casting shadows on any structures located outside the project land area. In other cases, ordinances limit the amount of shadow flicker to no more than 8-10 hours per year at any one location. This alternative is effective but it can create compliance concerns as the burden is likely to fall to the impacted residents to demonstrate whether shadow flicker exceeded the permitted time limits.

Safety Setbacks

Safety setbacks from turbines are established to minimize the risk of property damage or injury, resulting from ice throw or component failure. Setbacks are often defined as multiples of total turbine height (tower base to the upper tip of the blade in the 12 o'clock position) and measured from different points including property lines, occupied buildings, roads, or public gathering areas. A related concept of a safety "zone" around a turbine establishes an area of risk that is measured radially from the turbine base. Safety zones

are appropriate when turbines are situated long distances from buildings and roads but in areas where the public might gather such as ski and hiking trails, hunting areas, and farm fields.

For many years, the industry's setback standard has been 1.1x to 1.5x the height of the tower (including the blade), which is derived from the fall-zone of the tower. For example, a 500-foot turbine would have a fall zone between 550 and 750 feet. In general, this distance does not protect against noise emissions nor is it adequate against ice/blade throw, or fire. Simple math describing motion shows that ice or debris from a 100-foot long blade can be thrown over 1,000 feet from the base of the turbine where distance is dependent on the length of the blade, its angle at the time of the incident, the speed of rotation and the vertical distance from the ground ([Matilsky](#)). Turbine manufacturer Vestas has reported debris from its V90 turbine being thrown 1,600 feet ([Jensen](#)).

Texas has experienced recent turbine failures. In 2017, a turbine collapsed at the Shannon Wind facility in Clay County ([Klein](#)). Fire destroyed another turbine at the Salt Fork Wind Facility in Donley County ([Schmidt](#)). Other incidents have occurred in Texas, but project owners are under no obligation to report failures and no public database is available where failures are centrally tracked. Fire is of particular concern in remote, dry areas. Turbine manufacturers advise firefighters to stand clear of the burning machines and only approach when it is safe and only in order to extinguish flaming debris that falls to the ground.⁶ A recent turbine fire in Wyoming burned nearly 1,600 acres of land before it was put out ([Green](#)). In California, a turbine fire consumed 375 acres before it was contained⁷ and in Oklahoma firefighters put out a turbine fire that spread to five acres ([Prickett](#)).

Critics argue that safety zones or setback distances should be measured from the turbine to no further than the edge of the project site to eliminate unwanted effects on neighboring properties, but industry standards recommend measurements be taken at the wall of the nearest inhabitable building. Under the industry standard, protective zones can extend onto properties not under lease, which has led to legal challenges. In Indiana, two lawsuits are pending in separate counties where the local ordinances followed the

⁶ The state of New Hampshire requires wind project developers to prepare fire protection design plans pursuant to NFPA 850-2010 Section No. 10.5.3.1.3 ([Anstey](#)). In at least one instance, a project in the state was required to retrofit the turbine nacelles with fire suppression systems.

⁷ Riverside County Fire Department's report (11-12) is available at <http://www.eastcountymagazine.org/sites/eastcountymagazine.org/files/2012/July/ViewFire%20report.pdf>.

industry standard. The plaintiffs argued that the law bars them from building or expanding structures within the setback area and effectively “authorizes the taking of private property without compensation being paid” ([Kirk](#)).

In contrast, Ohio state law requires a minimum setback distance of 1,125 feet as measured from the blade tip in a 90-degree position to the nearest adjacent property line. For a turbine with 170-foot long blades, the setback distance would be 1,295 feet to the property line ([OPSB](#)). Prior to 2014, the setback distance was measured to the nearest home. The change in law has been the subject of statewide debate and blamed for the drop in wind energy projects in the state ([Seryak](#)).

Aesthetics and Visual Impacts

Arguments involving visual impacts of wind energy facilities tend to be more qualitative than quantitative and invariably raise the question of whether objectors have the right to preserve a view they do not own. At least three separate nuisance suits have been filed in Texas involving wind farms where aesthetics was cited as a primary element of the complaint. In each case, the courts either removed the issue or, in the case of *Rankin v. FPL Energy*, ruled that

a nuisance action could not be brought on the basis of aesthetic impacts ([Rankin](#)).

Still, the overwhelming presence of the turbines has influenced decision makers in other states. Maine, New Hampshire, and New York have all disapproved permits for turbines due to their dominance on the landscape. Wyoming state Sen. Cale Case, who supports a tax on wind energy, has argued that the tax is akin to a severance tax on oil and gas. In the same way the fossil industry removes (severs) nonrenewable products from the ground and are forever lost, Sen. Case argues “[w]ith wind, that viewshed is lost forever. It is severed” ([Hancock](#)).

Many in West Texas describe an alien landscape where turbines span for miles. Photo simulations prepared by developers prior to construction are intended to provide a sense of what a completed project will look like, but the two-dimensional photographs do not convey the true size and scale of an operating facility. One resident living within the Logan’s Gap wind facility in Comanche County, Texas, wrote:

When I recently downloaded the many, many pictures off my phone onto my computer, I began to notice how so



Wind turbines dominate the landscape. (Photo by Kevon Martis)

*many of the photos included wind turbines in the background – whether taken at the house or one of the barns or back pastures, the turbines were there in most photos of our children and/or grandchildren, baby animals, or new horses. I think it basically seals our fate as to how they are now a permanent part of our lives, and are being included or documented in family photos. How sad of a realization that has become.*⁸

While neighboring property owners may not own their views, some argue that as long as public monies are being used to enable a wind project to be built, those impacted should be allowed a more formal part in state and county actions that enable wind project development to proceed on properties near them.

Property Value Concerns

One area of concern raised by communities involves the potential impact of turbines on neighboring property values. The wind industry has long maintained that turbines, even within close proximity to residential properties, do not interfere with a homeowner's ability to secure full-market value when selling. Studies by the Department of Energy's Lawrence Berkeley National Laboratory (LBNL) and others appear to reinforce the industry's arguments, but actual cases of property value impact suggest the studies are not always applicable.

In [Sower v. Forest Hill](#), the Nevada Supreme Court unanimously upheld a lower court decision to grant a permanent injunction against construction of a personal wind turbine. The lower court cited the structure's "overwhelming impression of gigantism" within a quiet setting with panoramic views and found the proposed wind turbine would likely lower property values in the area ([Sower, 4](#)). The court also acknowledged the effect of turbine noise and shadow-flicker on nearby properties. It is not unreasonable to conclude that siting numerous industrial-sized turbines near properties could also lower values.

At the Lempster Wind facility in New Hampshire, two homeowners applied for and were granted property tax abatements owing to the visual dominance of the nearby turbines. In one case, the landowner also complained that turbine noise was akin to "living next to an airport" (Avitar Associates 2009; 2010).

A full discussion of available literature is beyond the scope of this paper, but it is instructive to understand how the methodology typically used in studies cited by the industry have documented weakness. Most of the studies that review

property value loss rely on a statistical method known as multi-site hedonic analysis, and their findings typically show that a majority of homes experience no impact. However, these same studies do not look closely at specific homes nearest to the project ([Walker, 425](#)).

LBNL has been at the forefront in examining property value impacts beginning with its 2009 study that looked at thousands of home sales near turbines to determine whether prices were impacted. LBNL researchers concluded there was no statistically significant evidence that views of wind turbines had a "measurable impact on property resale values, even among properties in relatively close proximity to wind turbines" ([Hoen et al. 2009](#)). But some real estate appraisers raised concerns with the methodology followed and the study's broad conclusion. A primary criticism of the study was its nationwide approach where widely differing real estate markets were consolidated and treated as the same with little consideration of basic differences. The failure to address the need for market homogeneity when using hedonic analysis is a common problem ([Wilson, 3](#)).

This issue becomes more pronounced by the fact that the study was dominated by transactions where no influence of the turbines was reasonably likely. The data show that less than 14 percent of the sales transactions examined had any view of turbines, and only 1.3 percent had a view rated greater than "moderate" ([Hoen et al. 2009](#)). While the authors state their analysis is "data-rich" the claim may be overstated because of this issue ([Wilson, 3](#)).

In a number of jurisdictions, wind project proponents have been asked to negotiate property value guarantees (PVG) with neighbors. Such guarantees would establish a fund or developer bond prior to construction to address legitimately affected homeowners who can show that their home's pre-project market value was lowered due to the project ([McCann, 6](#)).

Birds, Bats, and Wildlife

Bird mortality at wind energy facilities is not a new issue. Determining mortality at a site involves the tedious work of searching around the towers for dead carcasses. Yet, debate still persists regarding the adequacy of the searches and the accuracy of the final mortality estimates. National estimates of fatal collisions are disputed but research shows the number exceeds half a billion annually in the United States with greater risks at sites with taller hub heights ([Loss, 1](#)).

Federal statutes that protect migratory birds and eagles are on the books but rarely enforced. Only one wind company, Duke Energy Renewables Inc., has been prosecuted under the Migratory Bird Treaty Act (MTBA) for failing to

⁸ Letter on file with author.

“make all reasonable efforts” to avoid the deaths after being warned ([USAO](#)).⁹ The company pled guilty and agreed to pay \$1 million in fines, implement additional mitigation strategies to avoid/minimize collisions, and to apply for Eagle Take Permits at each of the two wind projects where the violations were found. Recently, a second wind project came under investigation in Arizona for bird and bat kills ([Davis](#)).

Wind proponents often insist that other sources of bird mortality, including cats, buildings (windows), and communications towers, are far more deadly to avian life than wind turbines. But the types of birds involved in turbine collisions are an important factor. According to [Evans](#), “the high mortality figures associated with cats and windows predominantly involve plentiful species that are common in suburban and residential neighborhoods or in the vicinity of farms, whereas the species killed at commercial wind turbine facilities and communications towers are largely neotropical migrant songbirds; species of conservation concern that nest in our wild lands.”

Bird fatalities caused by turbine collisions represent “direct effects.” Few studies have examined the “indirect effects” of wind project siting where bird habitats are permanently altered as a consequence of the project and related infrastructure including roads and transmission. Habitat fragment and nest destruction compound the stress on birds already affected by human activity.

The impacts of Texas wind projects could have far-reaching effects for some species.

For example, two of the four North American bird migration corridors, the Central and the Mississippi, converge along Texas’ coastal plains where millions of birds cross or travel along twice a year ([Seale](#)). This same area hosts hundreds of wind turbines built with essentially no oversight by the U.S. Fish and Wildlife Service nor the Texas Parks and Wildlife Department ([Moore](#)). Environmental studies at Texas project sites, either prior to construction or after, are voluntary by the wind companies, and no data is publicly available to adequately determine the immediate and cumulative impacts of the operating turbines. If Texas wind projects destroy large numbers of birds, the impact could affect continental, and potentially worldwide, populations of some species.

Bat mortality has also raised major concerns, particularly for migratory bats. A [recent study](#) found that bat fatalities due to wind turbines could realistically cause a substantial

decline in population and raise the risks of extinction ([Frick](#)).

Different theories have tried to explain why bats are attracted to wind turbines. Attempts to identify methods that discourage the creatures from project areas have not been fruitful. A breakthrough came in 2009-2010 when bat experts, led by Bat Conservation International, found that most bat mortality occurred under low wind conditions particularly at night during the summer and fall months ([Arnett](#)). By raising the wind speed at which turbines start spinning to 5.0-6.5 meters per second, researchers recorded significant drops in mortality ranging from 44-93 percent without a corresponding reduction in annual turbine generation. Some states, including Vermont and Maine, now mandate that all projects follow this protocol. Generally, the wind industry has acknowledged the problem but developers are less willing to make operational adjustments claiming the loss in project output can be more significant and varies from site to site.

While birds and bat fatalities have been directly attributed to working wind turbines, far less is understood about the impact on other wildlife displaced by wind development, the fragmentation of their habitat, and the stress of human activity at an industrial level near where the animals live and migrate. There is evidence that turbine noise drives wildlife away. But meaningful pre-construction studies to record baseline activity are rarely prepared. These would be needed in order to compare changes in species behavior after the project is operational.

In a high-profile case in U.S. District Court ([Bundorf v. Jewell](#)), federal permits granting Apex Clean Energy permission to construct the Searchlight Wind Project in Southern Nevada were vacated after the judge found the environmental analyses prepared by the Bureau of Land Management (BLM) and U.S. Fish & Wildlife Service were inadequate and failed to address project impacts on desert wildlife including golden eagles, desert tortoises, and species of bats.

Farming and Dual Land Use

Farmers who lease sections of their crop land for wind energy development can continue working the soil near the towers and earn extra revenue for farming expenses. But several issues have arisen that deserve mention.

After extensive land moving and excavation needed to build roads and erect the turbines, soil around the towers is typically mixed with subsurface earth and compacted, resulting in lower crop yields. Depending on the lease terms, developers may compensate landowners for crop reductions. Since compaction is assumed to be a construction-related

⁹ Fourteen golden eagles and 149 other protected birds were discovered at two of Duke Energy’s wind projects in Converse County, Wyoming.

impact, crop-loss payments are often time-limited up to five years. However, every time turbines require maintenance, the access crane is brought back to the site making compaction an ongoing concern throughout the life of the project. Turbine maintenance crews also prefer to travel across fields—flattening crops and ground—for quicker access to turbines needing service.

If drainage tiles are cut or damaged during construction, farmers may be working around ponds that were previously nonexistent. Adjacent fields not under lease can also flood.

The ability to secure aerial spraying services may be limited in areas near turbines. The Illinois Agricultural Aviation Association (IAAA) adopted a [resolution](#) stating that, “in the interest of pilot safety, we will refuse to make an aerial application of any product inside a grouping of wind generators, or to farm land immediately adjacent to a grouping of wind generators, should that proximity be considered hazardous by the pilot of the agricultural aircraft” ([IAAA](#)).

Experienced pilots have reported the wake effect of the towers up to a mile away and perhaps further. Such turbulence is dangerous to fly through, particularly for light aircraft ([CAA, 31](#)).¹⁰ Helicopters may be recommended because they travel at slower speeds and can work in more confined spaces but they cannot carry the same loads, meaning more trips at higher costs. Some farmers may try ground applicators, but aircraft can cover crops faster and more efficiently than any ground rig. As more wind farms are erected, the cumulative effect will lead to fewer fields that can be sprayed, making crop loss a real possibility.

Since crop insurance will not cover farmers in cases of insects or plant disease where damage is “due to insufficient or improper application of pest control measures or disease control measures,” crop loss could lead to significant financial losses for farmers ([Alexander](#)). Appendix B contains the section of a wind lease pertaining to aerial spraying and restrictions.

There have been at least [four fatalities](#) involving aerial spraying and collisions with wind-related meteorological (MET) towers including one in Texas ([Linowes](#); [NTSB](#)). MET towers are erected at proposed wind energy sites for assessing wind speed and direction data. The towers are made from galvanized tubing 6-8 inches in diameter and secured with guy wires and can be erected in a matter of hours, in many cases, without notice to the local aviation

community. Their rapid deployment means the navigable airspace of an area can quickly become hazardous for low-flying aircraft. In the Texas fatality, the MET tower was installed less than three weeks prior to the crash. Generally, the towers stand under 200 feet, which is below the threshold for requiring FAA notification, are unlit, and are usually devoid of any markings, so they are difficult to see.

In May 2015, Texas joined 13 other states in enacting [SB 505](#), a MET Marking Law that requires MET towers located in rural areas to be marked.

Decommissioning

In 2017, Texas House Rep. Terry Canales (District 40) filed [HB 1717](#) that would, in part, take steps to require decommissioning funds be set aside for the removal of wind energy facilities in the event a project is abandoned. In general, concerns have been raised about wind turbines akin to the state’s struggle with orphan oil and gas wells. News reports have examined the high potential costs of removing thousands of idle towers at the end of their life cycle ([Kelley](#)).

The cost of decommissioning a project is not well-known and depends on the level of site restoration. A decommission plan filed in New Hampshire put the cost to dismantle nine turbines at \$3,158,000, or \$351,000 per turbine ([Ant-rim](#)). The plan required the project be restored to a depth of four feet below the surface and all project components be hauled away offsite. Economies of scale will apply for Texas-size projects with hundreds of turbines, but the cost could easily reach tens of millions per project.

At a hearing before the Texas House Committee on Energy Resources on [HB 1717](#), wind industry representatives insisted the added regulation was unnecessary since agreements signed between participating landowners and wind companies ensure turbines are removed when they reach their end of life, at no expense to the landowner ([Texas House](#)). But very little data is available to reassure lawmakers. Only two wind projects in Texas have been decommissioned. Most of the turbines operating in Texas are less than 10 years old ([Micek](#)).

Further, the decommissioning clauses found in separate lease agreements on file with the author widely vary. Language from three lease agreements is provided in Appendix A.¹¹

In Lease 1, a decommissioning surety is not implemented unless the landowner asks, but not before the project’s

¹⁰ The same wake effect has been shown to reduce the efficiency of wind turbines downstream from other turbines. By extracting the energy, the air moves at a lower wind speed with higher turbulence. As turbines increase in size, the separation between them must also increase ([Diamond, 199](#)).

¹¹ The lease agreements on file with the author appear as first presented to potential landowners. Landowners could negotiate different terms prior to the contracts being signed.

10th year of operation. No language addresses whether the salvage value of project components is netted out, but generally industry standard encourages salvage value to be deducted from the estimated costs.¹² Lease 2 offers no provision for a decommissioning surety, and Lease 3 allows for a fund after the 15th year of operation and salvage value is explicitly cited as being deducted from the fund value.

None of the leases address the question of abandonment. The terms of the decommissioning leases notwithstanding, each lease also includes a provision enabling the company to assign the agreement to another party without the landowner's consent. As with the oil and gas energy business, large companies can sell declining wells and infrastructure to smaller operators who might disappear, go bankrupt, or further assign to others who disappear or go bankrupt. If the wind lease is assigned to a party that is not equal in ability to operate and maintain the project, both financially and operationally, then enforcement of the decommissioning provision could prove impossible.

Military Readiness, Air Navigation, and Flight Safety

The military presence in Texas is second only to California and serves as an important economic engine generating \$136 billion in economic activity and supporting nearly 900,000 direct and indirect jobs in the state ([SB 277](#)). Wind turbines built close to air traffic control and military radars pose potentially serious flight safety hazards in terms of false weather depiction, actual weather masking, planes dropping off radar, flight tracks on radar different from actual tracks, and "false targets"—planes the radar sees but are not actually there ([Texas House 2010, 5](#)).

The problem is easy to explain but difficult to resolve. Since radar technology is designed to detect moving objects, spinning turbine blades create interference, which degrades the signal. Wind towers carry a signal strength greater than a Boeing 747, so when the radar repeatedly sees the large return it cannot detect actual aircraft in the same area.

Military services and federal agencies have conducted numerous studies on the radar question, as have multiple international military and private interests. The extent and nature of the degradation are site-specific and can seriously impair air traffic services including increased aircraft separation commensurate with the loss of radar coverage and changes to aircraft routing, impacting both efficiency and effectiveness.

¹² New Hampshire, Vermont, and other jurisdictions require the full cost of decommissioning be assured without consideration of the anticipated salvage value of facility components or materials.

The impacts also extend to long-range radar systems managed by the departments of Defense (DOD) and Homeland Security. By 2008, nearly 40 percent of long-range radar systems in the U.S. were already compromised by wind turbines ([Kingsmore](#)). Installed wind capacity has increased nearly fourfold since 2008 and the problem of radar interference persists.

DOD Clearinghouse

In 2011, Congress created the Department of Defense Siting Clearinghouse (DOD CH) to serve as a single point of contact at the DOD for reviewing construction projects that might interfere with air commerce or national security. The clearinghouse helps mediate land use conflicts between the military and renewable energy projects ([Public Law 111-383](#)), but holds no police power over whether a project can or cannot proceed.

Under the clearinghouse, base commanders, who arguably are the most knowledgeable of local project impacts, were removed from the decision chain, and the secretary of defense or his designee(s) were the only individuals who could determine "unacceptable risk." The review standard was also realigned from aviation safety to national security. Under the new standard, the secretary of defense *was expressly* prohibited from objecting to energy projects unless, after all other technical mitigations were considered, a project was still shown to be "an unacceptable risk to the national security of the United States." In cases where the military objects, the developer can still proceed.

Critics complained that the threshold for objecting to projects was too high making it likely that no wind application would rise to the level of being "unacceptable." Those worries have proven legitimate. Since its creation, the clearinghouse has agreed to a number of projects that would have been deemed hazards under the prior process. The following are three public examples including two from Texas.

Vista and Payne Mountain Wind, Texas (2017)

The FAA issued "no hazard determinations" (NHDs) for each of the 126 turbines proposed within 25+ nautical miles of Fort Hood's digital radar system. In order for NHDs to be issued, the secretary of defense would have had to review the turbine locations and find they did not pose an unacceptable risk to national security. The clearinghouse, at no time, notified Fort Hood of its decision to not object nor were Fort Hood's garrison commander, deputy garrison commander, director of aviation operations and/or director of public works informed that the turbines could be erected.¹³ In September 2017, Fort Hood independently

¹³ Phone meeting with Fort Hood personnel.

issued a position paper detailing the adverse impact the turbines would have on Fort Hood's mission in the Western Training Area (WTA) (Gogas). Most of the 126 turbines were slated to be built in Training Area 110, one of the most important areas of the WTA, and would effectively remove the area from use. Fort Hood saw the loss of this area as having a direct impact on national security and military readiness. EDF Renewables cancelled the project in early 2018 reportedly over Hamilton County's decision to not grant property tax relief under Texas Chapter 312.

The Naval Air Station in Kingsville, Texas (NASK) (Ongoing)

Training Air Wing TWO at NASK trains 50 percent of the Navy and Marine Corps' jet/strike pilots each year, with the remainder trained at Meridian, Mississippi. By 2011, hundreds of turbines were operating in the Kingsville area and more than 500 more were proposed within 5 and 25 miles of NASK.¹⁴ A study by the Navy found that electromagnetic interference from the spinning blades would materially reduce the Navy's ability to safely train aviators and predicted the Navy would graduate fewer pilots annually, raising military readiness concerns (Vitale, 4). NASK radars in the south quadrant of the base have already been detuned to eliminate the adverse effects of the existing turbines. Further radar optimization to account for other wind turbines will degrade target sensitivity and could result in NASK operations closing. Nonetheless, the clearinghouse negotiated mitigation agreements with two additional wind facilities that would add 202 new turbines. One project (101 turbines) has since been built. A second was withdrawn.

Great Bay Wind Energy Center, Maryland (2014)

The Great Bay Wind Energy Center proposed constructing 25 575-foot-tall turbines across the Chesapeake Bay from the U.S. Naval Air Station Patuxent River ("Pax River"). Under the DOD CH standard, the Navy needed to convince the DOD that the project was a risk to national security or accept negotiated mitigations that might lessen but not eliminate the impacts. Maryland's General Assembly, fearing harm to Pax River's mission, passed HB 1168 that would impose a 13-month moratorium on construction of wind turbines that exceeded certain heights and were located within 56 miles of the base. Maryland Gov. Martin O'Malley vetoed the bill claiming it worked against the state's clean energy policies (Wagner). U.S. Sen. Barbara

Mikulski (D-MD) responded by adding language¹⁵ to the 2015 Defense Appropriations bill directing the Navy to refrain from executing any agreement until a more detailed assessment of project impacts on base operations was finalized. The project was cancelled shortly after.

Legislative Action, TX SB 277

The risk of turbine encroachment reached a tipping point in 2016-2017 when Congress and several states took steps to protect military installations where it was believed the clearinghouse did not or could not go far enough.

In late 2016, Sen. John Cornyn (R-TX) introduced the Protection of Military Airfields from Wind Turbine Encroachment Act (S 201) that would remove all eligibility for the federal production tax credit and investment tax credit for new wind turbines sited within 30 miles of an active military airfield, a military air traffic control radar site, or a weather radar site. Congressman Chris Collins (R-NY) introduced a sister bill in the House (HR 649). Inherent in these bills was the recognition that federal subsidies aimed at enabling renewable energy development were working at cross-purposes with other public funds expended to build and maintain military assets. Ultimately, the Senate and House bills led to the repeal and replacement of the clearinghouse law at the end of 2017. The new law still tasks the secretary of defense with determining "unacceptable risk to national security," but the process now mandates a broader review of the impacts, engages base commanders and other state and local stakeholders, and lowers the threshold on what it means to be an unacceptable risk (HR 2810).

Texas was the first state to take action that would protect its military installations with passage of SB 277. The law prohibits property tax consideration (Chapters 312 and 313) for wind generators located "within 25 miles of the boundaries of a military aviation facility." The overall impact of SB 277 is not fully known and will be situational, based on the expected financial return on any project if not granted tax relief. Wind projects might still proceed and be profitable, but just less profitable.

Also in 2017, North Carolina's governor signed HB 589, which included an 18-month moratorium (initially offered as a four-year ban) on issuing permits for wind energy facilities in order that the state have time to study and identify

¹⁴ The 196 turbines operating at the Papalote Creek wind facility about 30 nautical miles northeast of NASK have already negatively impacted air navigation radar near the Sinton airport and resulted in Sinton's runway 32 being decertified. Sinton has since been recertified but with higher minimums, which has reduced its availability for general aviation.

¹⁵ Language added to the 2015 Defense Authorization Bill: "Patuxent Naval Air Station.—The Committee is aware that the Department of the Navy commissioned the Massachusetts Institute of Technology's Lincoln Laboratory to conduct a study to determine the effects and a potential mitigation plan between the operation of the proposed wind energy project and the Patuxent Naval Air Station. The study is not yet completed. Therefore, the Committee directs the Navy to refrain from executing any agreement with respect to the operation of the proposed wind energy project until the study is provided to the congressional defense committees."

how and where wind turbines might co-exist with military uses. At the time the moratorium was adopted, the clearinghouse had already signed two mitigation agreements for wind projects in the state and was in negotiations with a third. The Oklahoma Legislature recently passed HB 3561, which enforces at the state level the requirement that wind projects obtain approval from the military before they can be constructed or expanded. Finally, a New York bill that would halt state subsidies for wind projects built near Fort Drum moved out of the Assembly Energy Committee with a positive 11-4 vote ([Molongoski](#)).

Conclusion

Texas has witnessed a boom in wind energy development over 15 years that put the state on the map as a leader in renewable energy. The state remains attractive for further development due to federal subsidies, public-funded infrastructure expansion, and the low barriers for wind power siting and construction. State policies to expand wind power and related infrastructure, including subsidized transmission and tax abatements, have advanced the wind industry, with the result that residents and wildlife are often negatively affected by turbines that would otherwise not have been built. The Texas electric grid operator, ERCOT, is reporting that wind power capacity could more than double by 2020 ([ERCOT, 3](#)). State policymakers need to be more proactive in balancing this development against the concerns of those living near the projects. ★

Appendix A – Sample Decommissioning Provisions

Decommissioning Provisions	
Lease 1 - Texas	EDF Renewables
Decommissioning Language	<p>Removal and Restoration. No later than ninety (90) days prior to the expiration of the Term, Lessee shall present a decommissioning plan for the Wind Farm to Lessor. The decommissioning plan shall include the removal of all physical material related to the Wind Farm to a depth of thirty-six (36) inches and restoration of the surface of the land to substantially the same condition it was in at the Effective Date (reasonable wear and tear, condemnation, casualty damage and acts of God excepted), including returning the land to the same grade as of the Effective Date (reasonable wear and tear, condemnation, casualty damage and acts of God excepted) (all hereinafter referred to as "Restoration"). The decommissioning shall be at Lessee's expense and shall be completed within nine (9) months after presentation of the decommissioning plan to Lessor. Lessee shall continue to have rights of access to the Property until such Restoration has been completed in accordance with the decommissioning plan.</p> <p>(a) In the event Lessor requires a decommissioning surety, Lessor shall give Lessee written notice no earlier than ten (10) years after the Wind Farm Operations Date that Lessor requires Lessee to provide Lessor with a bond or letter of credit in the amount of the estimated Restoration Costs. Within no less than one hundred eighty (180) days after the receipt of the written notice, Lessor and Lessee shall determine the amount of the Restoration Costs</p>
Lease 2 - Texas	Renewable Energy Systems (RES)
Decommissioning Language	<p>Definitions</p> <p>The Term "Decommissioning" or "Decommissioning" means the removal of all towers and Turbines, the removal of all other above -grade facilities to not less than three (3) feet below grade or as otherwise required by any government authority with jurisdiction, the burying of all tower foundations, and the reseeded of areas where the tower pads were located with grasses and/or natural vegetation.</p> <p>The term "Decommissioning Term" means the period within twelve (12) months following the expiration or earlier termination of the Operations Term of this Lease. (The Operations Term is a period of 30 years plus the opportunity to extend the lease two times by ten years each.)</p> <p>8(b) Decommissioning of Windpower Facilities. During the Decommissioning Term, Tenant, at its sole cost and expense, shall Decommission the Windpower Facilities that Tenant or its employees, contractors or agents constructed or installed on the Premises. However, Tenant may leave all roads, and all facilities in existence prior to the Effective Date, in their condition existing at the time this Lease expires or terminates.</p>
Lease 3 - Michigan	APEX Clean Energy
Decommissioning Language	<p>Security for Decommissioning. Commencing on the fifteenth (15th) anniversary of the Commercial Operations Date, Tenant shall, subject to the provisions of this Section 4.8, obtain and maintain one of the following: (a) a cash escrow in an amount equal to the estimated Net Removal Cost (defined below); (b) a performance bond, letter of credit or similar financial instrument selected by Tenant in its reasonable discretion, issued by an issuer whose debt securities are rated investment grade or better by Standard & Poor's, Moody Investors Service of Fitch, Inc. or whose financial strength is rated B+ of [sic] better by A.M. Best Company, Inc., in an amount equal to the Estimated Net Removal Cost; or (c) a guaranty in such form and substance as the local municipality may permit.</p> <p>For the purposes of this Section, "Estimated Net Removal Cost" means an amount of money estimated periodically as provided herein by a Michigan licensed professional engineer mutually agreed upon by Landowner, Tenant, and first established between the fourteenth and fifteenth anniversaries of the Commercial Operations Date to be sufficient to pay for removal of the Generating Units on the Landowner's Property and restoration of the Property at the scheduled termination of this Lease as required herein, less the estimated value at such time of any equipment or material which may be salvaged from the improvements.</p>

Appendix B – Aerial Restrictions (Lease Document)

EXHIBIT C-2 TO WIND ENERGY GROUND LEASE

AERIAL RESTRICTIONS

A COPY OF THIS EXHIBIT SHALL BE PROVIDED TO ANY PERSON PROVIDING CROP DUSTING SERVICES OR OTHER SERVICES INVOLVING THE OPERATION OF AIRCRAFT OVER THE PREMISES.

The electrical power windmills, wind turbine generators and wind machines located on the Landlord's property and the wires and equipment attached thereto ("*Windpower Facilities*") are very expensive and can be easily damaged. In accordance with insurance requirements, the cause of any damage to this equipment may be investigated and damages recovered from the responsible party. In addition, damage for collisions or the dispensing of items from the air could injure the personnel that regularly service such equipment (who may be on or inside the equipment and may not be readily visible).

Therefore, particular caution should be taken when operating any aircraft at low altitudes or otherwise in the vicinity of any of the Windpower Facilities.

Kindly be cautious not to dispense any items in the direction of this delicate equipment, and report any damage to the equipment that you observe, and any potential violations of this restriction, to the property owner and **Texas Land Partners, LP, whose address for the purposes hereof is 9050 North Capital of Texas Highway, Suite 390, Austin, Texas 78759.**

Thank you.

AERIAL SPRAYING WAIVER AND RELEASE

In this Aerial Spraying Waiver and Release, the terms "I", "me", "myself", "my" refer to ______. In consideration for the right to enter the property described as _____ (the "Property"), I, for myself, my executors, administrators, heirs, next of kin, my child (if my child is the recipient of services), or anyone else who might claim or sue on my behalf, agree as follows:

1. **ACKNOWLEDGMENT AND DISCLAIMER OF LIABILITY AND WARRANTIES.** _____, as owner of the Property ("Landlord"), and _____, as owner and/or operator ("Operator") of certain facilities for the conversion of wind energy located on the Property ("*Windpower Facilities*") disclaim all liability to me with respect to any aerial spraying, crop dusting or similar activities on or above the Property (each activity, an "Aerial Activity") and I agree that Landlord or Operator are not responsible for any goods or services provided by any third party for or in connection with any Aerial Activity. I acknowledge that it is my responsibility to comply with applicable laws and to take adequate safety measures with respect to each Aerial Activity.
2. **ASSUMPTION OF RISK.** Aerial spraying and crop dusting are inherently dangerous activities and carry the potential for serious injury, death, and property loss. I HEREBY FULLY ASSUME THE RISKS OF PARTICIPATING IN ANY ASPECT OF ANY AERIAL ACTIVITY WITH FULL KNOWLEDGE OF THE INHERENT RISKS INVOLVED (such risks including, but not limited to, negligent acts or omissions of third parties, natural causes (such as inclement weather or other acts of nature) or any condition or occurrence (such as defective equipment)).
3. **WAIVER AND RELEASE FROM LIABILITY.** I hereby knowingly, intentionally, and voluntarily release and forever discharge Landlord, Operator, and their respective shareholders, directors, officers, employees,

Appendix B (cont'd)

representatives, agents, and affiliates (the "Released Parties") from any and all claims, losses, or liability for death, personal injury, temporary or permanent disability, property damage, medical or hospital bills, or other loss or damage of any kind (including, without limitation, indirect, special, general, incidental or consequential damages, including, without limitation, loss of wages), which may at any time arise out of or relate to my participation in any Aerial Activity on or above the Property, regardless of whether such claims, losses, or liability were foreseeable or unforeseeable or caused by the negligent acts or omissions of any of the Released Parties or by any other person. I agree not to sue any of the Released Parties and waive any rights with respect to any of the Released Parties for any claims, losses, or liability arising out of or relating to my participation in any Aerial Activity on or above the Property.

4. **INDEMNIFICATION; AGREEMENT TO REIMBURSE.** I hereby agree to indemnify and hold harmless any and all of the Released Parties for any claims, losses, or liability incurred by any Released Parties arising out of or relating to my participation in any Aerial Activity, including, but is not limited to, attorneys' fees. Without limiting the foregoing, I hereby agree to reimburse Operator for any and all damage to any Windpower Facilities resulting from my Aerial Activities.

5. **REPRESENTATIONS.** I am at least eighteen years of age. I have carefully read and clearly understand this document, its contents, and the effect of its execution. I enter this Waiver and Release freely and of my own will, and I understand I am waiving certain legal rights.

6. **INTERPRETATION; VENUE.** This Aerial Spraying Waiver and Release shall be construed and enforced in accordance with the laws of the state in which the property is located. To the extent this Aerial Spraying Waiver and Release is deemed overbroad, it is my intent and understanding that this Aerial Spraying Waiver and Release will remain valid in all applications that are not deemed overbroad.

Date: _____

Signature

Printed Name

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About the Author



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