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BE AGGRESSIVE WITH WIND ENERGY: BLOW AWAY THE DECOMMISSIONING FEARS

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Abstract

Wind energy is quickly becoming a renewable energy leader in both the United States and international energy markets as the need for alternative energy sources stagger to meet the demands of the marketplace. With this push for green energy, the technology utilized in wind energy production has developed at a rapid rate. This has allowed wind energy production systems, known as "wind farms," to cross the threshold from needing subsidization to earning profit. Wind energy is a clean, cost-effective energy source in seemingly indefinite supply. Even with these benefits, a concern remains that far too many state legislatures across the nation fail to address. This worry, a potential burden to the turbine-possessing landowners and nearby landowners who loathe the sight of these turbines, needs addressing: When, if ever, will these turbines come down and who holds that responsibility?

The technical term for deconstructing a wind farm is "decommissioning," which, as this article will discuss, can be costly and burdensome. Without proper regulations, a strong likelihood exists that these turbines will remain in place long after their useful lives have expired. The history of energy production reveals the high likelihood of this potential problem, considering the tens of thousands of abandoned oil and gas well sites across America.

* Second year student at the University of Oklahoma College of Law. Special thanks to my faculty advisor, Chris Tytanic, for providing assistance through this comment. Also, many thanks to Dr. Shannon Ferrell who is a mentor and the friend responsible for my interest in wind energy.

Even with the recent movement to clean and restore these sites to their pre-development status, the process comes with great expense. Years of fundraising and hard work by statewide organizations has paid off. Through intensive land restoration efforts—including removal of concrete pads, hunks of metal, and roadways from thousands of well sites to plant native grasses in their place—these state sponsored restoration organizations are turning what once was a dangerous and environmentally hazardous eyesore into a healthy part of the surrounding ecosystem. These restoration programs and other efforts have achieved astounding progress in mending the wounds left from improperly decommissioned energy production sites. This article encourages a bilateral proactive approach to ensure that when the need for decommissioning is realized, policies exist establishing the "who" and "how" and organizations operate ensuring standby-funding to aid in decommissioning.

I. Introduction

Few things in life can be analogized to having a monumental relationship like peas and carrots—Oklahoma and energy are among the select few.[1] The energy sector is historically the largest contributor to Oklahoma's economy,[2] and the composition of the energy industry in Oklahoma is starting to change, with a push toward renewable energy indirectly creating a race to capture much of Oklahoma's wind resource.[3] Since entering the wind energy production scene in 2003,[4] Oklahoma climbed the leaderboards, now ranking third nationally.[5] For a relatively small state with a developing renewable energy market, Oklahoma stands its ground

1. There is a very important tie to wind energy in Oklahoma, which has encouraged industry leading research on wind energy production systems. Because Oklahoma has produced some of the most comprehensive sets of data, this analysis includes Oklahoma references and numbers. The push for a proactive approach to decommissioning, however, should be nationwide.

2. State Chamber of Oklahoma, *January 2014, Economic Assessment of Oil and Gas Tax Policy in Oklahoma, Region Track, Inc.*, http://www.okstatechamber.com/files/MS_OilGasFacts.pdf.

3. American Wind Energy Association, *Oklahoma Wind Energy*, http://awea.files.cms-plus.com/FileDownloads/pdfs/Oklahoma.pdf.

4. Shannon L. Ferrell and Joshua J. Conaway, *Wind Energy Industry Impacts In Oklahoma*, State Chamber of Oklahoma Research Foundation Report Nov. 2015, 8.

5. American Wind Energy Association, *Oklahoma Wind Energy*, http://awea.files.cms-plus.com/FileDownloads/pdfs/Oklahoma.pdf.

against other wind powerhouses like Texas, Iowa, and California.[6] But like all new things, commercial wind production must face the old challenge of consumers fearing the unknown.

Articles discussing wind energy development largely address questions about setback issues, wind turbine syndrome, and wildlife impacts. This article aims to answer a relatively unexplored topic: regulations promulgated for decommissioning wind turbines individually and wind farms collectively and establishing a process for effective removal of these giants including restoration of the land on which they once stood.[7]

For years the energy industry has held the top seat of Oklahoma's economy with nearly one-quarter of all Oklahomans working in a job tied

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6. *Id.*; *Texas Wind Energy*, http://awea.files.cms-plus.com/FileDownloads/pdfs/texas.pdf; *California Wind Energy*, http://awea.files.cms-plus.com/FileDownloads/pdfs/California.pdf; and *Iowa Wind Energy*, http://awea.files.cms-plus.com/FileDownloads/pdfs/Iowa.pdf.

Oklahoma is now fourth in the nation for installed wind energy capacity, behind the three mentioned states, but is set to pass California in 2017. Oklahoma is third in the nation for actual wind energy produced, which is different from installed capacity. Installed capacity is how much electricity the turbine could generate if it were to run 100 percent of the time at optimal production. But 100 percent efficiency is not possible for wind, or any energy production systems for that matter. Every system has breakdowns or other issues inhibiting production, and as an added hurdle for wind energy, sometimes the wind fails to blow at a harvestable rate. According to a recent publication released from Oklahoma State University, Ferrell and Conaway, *Wind Energy Industry Impacts In Oklahoma*, Oklahoma's turbines have an efficiency factor of around forty percent. This is much higher than the national or global average. And this is how Oklahoma has been producing more wind energy than California, even with fewer megawatts of installed capacity.

7. I would be remiss in failing to mention that the Texas Law Review recently published a law review article on this topic. William S. Stripling wrote *Wind Energy's Dirty Word: Decommissioning*, 95 Tex. L. Rev. 123, an article that brilliantly discusses the differences amongst states' treatment of one of the most important, but often forgotten, topics of wind energy: the decommissioning of the wind farms. I began an analysis almost identical to the above-mentioned article, but upon that article's publication, I added an extra layer of protection to my proposal, encouraging the creation of a pseudo-state agency to assist with decommissioning where necessary. Even with this addition, some of my analysis will mirror Mr. Stripling's article. Mr. Stripling analyzed through three broad categories the current types of decommissioning regulations for wind turbines. He categorized these three as "naked" decommissioning requirements, no decommissioning requirements, and "security" regulations establishing decommissioning requirements. I believe these three broad categories adequately encompass the vast majority of state's decommissioning regulations. I will discuss them briefly in this article and recommend establishing an agency to fill the holes that inevitably pop up in even the most well-thought policies.

to the energy industry.[8] Without question, the oil and gas industry has created most of these positions.[9] And while the oil and gas industry has been essential to Oklahoma's successes, the industry has faced some downturns. The industry that has been a consistent contributor to Oklahoma's economy consequently littered the state with environmentally hazardous and dangerous well sites that, in total, left a clean-up bill of over one hundred million dollars.[10] Without a doubt, the benefits reaped from oil and gas exploration and development outweigh the costs.[11] The purpose of this article is not to emphasize the negative externalities affiliated with Oklahoma's oil and gas industry[12]—but a review of one's history can aid in the success of another's future. Even fools can learn from their own mistakes, but a wise man will learn from the mistakes of others.[13] It is safe to say that Oklahoma has a rich history of energy production with its fair share of mistakes. Other states and nations involved in energy production should look at the story of Oklahoma's oil and gas industry to learn from its mistakes—as well as its successes—when moving forward and advancing the global goal of producing more green energy. This is especially important for an infrastructure intense renewable resource such as wind.

The objective of this article is to show the current status of states' wind energy decommissioning regulations across America and to propose that states create a pseudo-state agency like the Oklahoma Energy Resources Board to assist with the decommissioning of those wind farms that might slip through even the best-developed decommissioning legislation. Part II of this article will discuss the historic and current state of and the future projections for the wind energy industry. Part III will discuss the process of decommissioning wind farms and the costs associated with that process. Part IV will analyze the current statutory frameworks governing the

8. State Impact, *What Oil and Natural Gas Mean to Big-Energy Oklahoma*, https://stateimpact.npr.org/oklahoma/tag/energy-industry.

9. *Id.*

10. Oklahoma Energy Resources Board, http://www.oerb.com/well-site-clean-up/restoration-process.

11. *Id.*, http://www.oerb.com/industry/impact/stats.

12. With the oil and gas industry annually contributing hundreds of millions of dollars to schools, creating higher salaries for many Oklahomans across the state, and effectively providing our country with a domestic supply of oil and natural gas while making up one-third of Oklahoma's gross state product, this article's intent is far from shedding poor light on the oil and gas industry. State Chamber of Oklahoma, *January 2014, Economic Assessment of Oil and Gas Tax Policy in Oklahoma, Region Track, Inc.*, http://www.okstatechamber.com/files/MS_OilGasFacts.pdf.

13. See *Proverbs* 12:15.

decommissioning across the nation and discuss the advantages of one over the others. Lastly, Part V will discuss a secondary measure of establishing a separate organization to serve as a "catch-all" for decommissioning, ensuring that all projects get decommissioned without burdening the state or taxpayers.

II. Wind Energy History, its Production, and Projections

The commercial harnessing of wind energy has erupted across America and different parts of the world over the past three to four decades.[14] As a result of the oil crisis in the 1970s, the United States began commercial wind production in 1980, where the world's first commercial wind farm went online in California.[15] Since erecting the first commercial wind farm less than forty years ago, America has rushed into a competitive stance in the wind energy race, with an installed 73,992 megawatts worth of capacity at year's end 2015.[16]

While the expansion of capturing the energy of wind has become a hot-topic recently, humankind has been harnessing wind energy for millennia.[17] As early as 7000 years ago, humans began moving across the water with sailboats propelled by the wind.[18] 2000 years ago, wind was utilized on land to grind grain and move water.[19] 1000 years ago, as the technology advanced in Europe, Holland started using wind power to pump water behind dikes, which freed lands for farming.[20]

More recently, wind has played a significant role in American's fulfilment of manifest destiny.[21] As Americans began moving westward, windmills were installed to pump water. It is estimated that more than six million windmills covered the western half of America for the purposes of

14. Office of Energy Efficiency & Renewable Energy, *History of U.S. Wind Energy*, https://energy.gov/eere/wind/history-us-wind-energy.

15. Wind Energy Foundation, *History of Wind Energy*, http://windenergy foundation.org/about-wind-energy/history/.

16. American Wind Energy Association, *Wind Energy Facts at a Glance*, http://www.awea.org/Resources/Content.aspx?ItemNumber=5059.

17. Wind Energy Foundation, *History of Wind Energy*, http://windenergy foundation.org/about-wind-energy/history/.

18. *Id.*

19. Office of Energy Efficiency & Renewable Energy, *History of U.S. Wind Energy*, https://energy.gov/eere/wind/history-us-wind-energy.

20. Wind Energy Foundation, *History of Wind Energy*, http://windenergy foundation.org/about-wind-energy/history/.

21. Ferrell and Conaway, *Wind Energy Industry Impacts In Oklahoma*, 7.

pumping water for agricultural and home use.[22] Wind, by serving as the power source for pumping water, enabled settlers to develop many parts of America that could not have been developed otherwise because of the dry and arid environment.[23] By the late 1800s, American businesses and homes began using the windmills to produce electricity for their personal use.[24]

In 1941, Grandpa's Knob, the first megawatt-plus capacity turbine, was installed.[25] The installation was part of the war effort, using its 1.25 megawatts to feed a local Vermont utility with power during World War II.[26] One of Grandpa's Knob's blades broke during the war and was never fixed due to a shortage of steel at the time.[27] And just like Grandpa's Knob, with low fossil fuel prices, the progression of commercial wind energy went offline until the market demanded energy alternatives.[28] Progress on wind energy lulled until the price of oil soared in the 1970s, which prompted the creation of the American Wind Energy Association in 1974 and the passing of the Energy Tax Act of 1978.[29] Supported by the need for new energy and the financial incentives presented by federal and state subsidies, the first wind farm of twenty turbines was installed in California—its operating capacity totaled a mere 600 kilowatts.[30] But oil prices dropped yet again in 1985, reducing the demand for wind energy.[31] By the 1990s, however, the push for renewable energy restarted the creation of wind projects that effectively brought about the modern day turbines now operating in forty of fifty states and across the world.[32]

Nearly 50,000 utility scale wind turbines exist in America today, with the capacity to produce seventy-five gigawatts of electricity.[33] With another

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22. TelosNet, *Wind Power's Beginning*, http://telosnet.com/wind/early.html.

23. Ferrell and Conaway, *Wind Energy Industry Impacts In Oklahoma*, 7.

24. Office of Energy Efficiency & Renewable Energy, *History of U.S. Wind Energy*, https://energy.gov/eere/wind/history-us-wind-energy.

25. *Id*.

26. Wind Energy Foundation, *History of Wind Energy*, http://windenergyfoundation.org/about-wind-energy/history/.

27. Office of Energy Efficiency & Renewable Energy, *History of U.S. Wind Energy*, https://energy.gov/eere/wind/history-us-wind-energy.

28. *Id*.

29. American Wind Energy Association, *Wind Energy Facts at a Glance*, http://www.awea.org/Resources/Content.aspx?ItemNumber=5059.

30. American Wind Energy Association, *Turbine Timeline: History of AWEA and the U.S. Wind Industry*, http://www.awea.org/history-of-wind.

31. American Wind Energy Association, *Wind Energy Facts at a Glance*, http://www.awea.org/wind-energy-facts-at-a-glance.

32. *Id.*

33. *Id.*

13.3 gigawatts of capacity either under construction or currently planned for development, wind is the fastest growing energy industry in the nation.[34] In 2015, wind production made up 4.7 percent of the total energy produced in the United States.[35] As the wind sector continues to grow, current forecasts expect it to surpass hydroelectricity as America's largest renewable energy source within the next few years.[36] Now, with wind moving toward the front seat of all renewable energy production and making a remarkable stand across the energy industry in the aggregate, there has never been a more vital time to review legislation currently governing America's wind energy infrastructure to ensure the turbines installed today are not rusty pillars of regret once the wind farm has reached the end of its useful life.

III. Decommissioning Wind Turbines/Farms

"Fly not, cowards and vile beings, for a single knight attacks you."[37] Decommissioning wind projects is not a new topic. Just as Don Quixote struggled to bring down the mighty windmills of the 17th century with his daunting words and lance,[38] most landowners today would struggle tremendously if left to their own means to deconstruct the 21st-century turbines transported to their property by dozens of semi-trailers, positioned upright with thousands of pounds of concrete, and assembled with industrial cranes.[39] And the turbine itself is not the only component with which landowners could be left.[40] Turbines are only one of the three main pieces of infrastructure used in a wind project to harness and utilize wind energy.[41] These projects also require roads for the construction and maintenance of the turbines and the circuitry system that contains all the electrical components, such as transmission and distribution lines, transformers, substations, and so on.[42]

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34. American Wind Energy Association, *U.S. number one in the world in wind energy production*, http://www.awea.org/MediaCenter/pressrelease.aspx?ItemNumber=8463.

35. Institute for Energy Research, http://instituteforenergyresearch.org/topics/encyclopedia/wind/.

36. *See* U.S. Energy Information Administration, http://www.eia.gov/renewable/.

37. *Don Quixote* Chapter 8.

38. *Id*.

39. We Energies, *Developing and Constructing Wind Energy*, https://www.we-energies.com/environmental/windenergy.pdf.

40. *Id*.

41. *Id*.

42. *Id.*

In a simplified fashion, before the construction of a wind farm begins, a project developer will negotiate with the landowners of parcels of land that fit the developer's needs. These wind projects will vary vastly in geographic size, number of turbines, capacity of turbines, and number of landowners affected.[43] Following negotiations, the agreement between the landowner and the project developer will be set forth in a contract, with an essential term being the length of the project. Oftentimes these projects will last up to fifty years, if not longer.[44] This is long enough to get the useful life out of two nacelles, the generator on top of the turbine tower.[45] And following the end of the lease, there is a high probability that the land will be leased again. This is because the wind resource was rich enough on that land for the original development and much of the infrastructure has already been installed. This greatly reduces the cost of production, and all other things equal, the advancement of the technology in the industry should make the turbine site even more profitable than it was under the original lease.[46] But there will eventually be an end to the project, and when it arrives, parties will need to address what is going to happen with the infrastructure. And now, more than ever, states should be sensitive to a discussion of protecting their lands from potential abandoned wind farms. The Obama Administration made an unprecedented push for renewable energy production.[47] It is uncertain what impact the Trump Administration will have on the wind energy industry, though the President has made clear his plans to push for more coal production—a direct competitor with wind.[48] This increase in competition can lead to a decrease in wind energy lease renewals, and consequently, an increase in decommissioning. While a downturn in the wind industry is not determinedly imminent, the fact that most states have either no or insufficient regulations when it comes to

43. *Id.*

44. National Wind Watch, *Five Questions to Ask Before Signing a Wind-Energy Lease*, April 2012, https://www.wind-watch.org/documents/five-questions-to-ask-before-signing-a-wind-energy-lease/.

45. *Id*.

46. *Id.*

47. The White House, *FACT SHEET: Obama Administration Announces Clean Energy Savings for All Americans Initiative*, https://obamawhitehouse.archives.gov/the-press-office/2016/07/19/fact-sheet-obama-administration-announces-clean-energy-savings-all.

48. Earl J. Ritchie, *How Bad Will Donald Trump Be For Renewable Energy?*, Forbes Energy (Dec. 1, 2016, 2:19 PM), http://www.forbes.com/sites/uhenergy/2016/12/01/how-bad-will-donald-trump-be-for-renewable-energy/#5a7a5cd540ba.

decommissioning is a problem.[49] With a problem this size, it will be much better to address it sooner rather than later.

A. Infrastructure Involved in Harnessing Wind Power

First, it is important to understand what the word "infrastructure" describes. Commercial wind energy production is still relatively new and thus provides a lesser quantity of reputable research compared to traditional energy sources such as coal, oil, and gas, or even other renewables such as hydroelectricity, which has existed for the better part of a century.[50] The spatial impact research needed to understand the importance of decommissioning the wind farms is tedious and costly because of the time consumed in measuring every piece of land that a wind farm has utilized.[51]

Oklahoma State University, however, recently completed a comprehensive mapping project, where the researchers attempted to measure every piece of land utilized by the wind projects across Oklahoma.[52] This study was the first of its kind; publications have relied on it and the American Wind Energy Association recognized it as containing accurate data over the wind energy industry in Oklahoma.[53] Without detailed data on wind systems in other states, references to the amount of land devoted to wind projects will use the numbers from this study. It contains a comprehensive spatial analysis of Oklahoma's wind projects, including the data from every turbine erected and captured in a Google Earth image at the end of 2014.[54] Due to the constraints on Google Earth imagery, the study included 1700 turbines and their support structures out of the 2100 erected at the time of the project.[55] This comprehensive measurement covered all the land used for 3126 megawatts of capacity, which varied from dry land wheat production, irrigated corn production,

49. Danielle Changala, Michael Dworkin, Jay Apt and Paulina Jaramillo, *Comparative Analysis of Conventional Oil and Gas and Wind Project Decommissioning Regulations on Federal, State, and County Lands*, http://www.contrib.andrew.cmu.edu/~pjaramil/pdf/The%20Electricity%20Journal%202012%20Changala-1.pdf Appendix A (2012).

50. American Wind Energy Association, *Turbine Timeline: History of AWEA and the U.S. Wind Industry*, http://www.awea.org/history-of-wind.

51. Ferrell and Conaway, *Wind Energy Industry Impacts In Oklahoma*, 2.

52. *Id.*

53. *Id.* and American Wind Energy Association, *Oklahoma Wind Energy*, http://awea.files.cms-plus.com/FileDownloads/pdfs/Oklahoma.pdf.

54. Ferrell and Conaway, *Wind Energy Industry Impacts In Oklahoma*, 25.

55. *Id.*

native grass grazing, and rocky foothills.[56] For this article, the Oklahoma State University study provides adequate numbers—if not the best numbers available—for this decommissioning analysis.

This mapping project was detailed enough to separate types of land uses into different categories, including turbine pads, support structures, and road segments.[57] In this article, for the sake of brevity, these categories will be aggregated and referred to as "roads". This will be more accurate than merely using the *Wind Energy Industry Impacts in Oklahoma*'s road segments. This is because, regarding decommissioning, the landowner will be interested in having all land that was converted during project development restored.

1. The Roads

Of the three aforementioned pieces of infrastructure, roads cover the most land (acreage).[58] For every megawatt of capacity in a wind project, 0.46 acres of land have been converted to roads.[59] While this is less than the industry-estimated three acres per megawatt of capacity, it is still a substantial piece of infrastructure that must be reclaimed after the wind project is through its useful life.[60] And, from a strictly economic standpoint, the roads bring with them the highest opportunity cost.[61] An opportunity cost is what economists call the forgone benefits when choosing to employ a resource in a certain way.[62] As an example, the opportunity cost of a road segment may be the profits forgone from growing wheat on the land now covered in laterite and gravel.[63]

Energy Ventures Analysis, Inc., an energy consulting company, completed an independent evaluation of the cost to decommission a ninety-seven turbine project in 2013 in Lee and Whiteside Counties in Illinois.[64] It found that removing the gravel used in the roads would cost more than two and a half million dollars.[65] This study shows just how burdensome the road

56. *Id.* at 30.

57. *Id.*at 25.

58. *Id.*at 26.

59. *Id.*

60. Clean Energy Resource Teams, *Wind*, http://www.cleanenergyresourceteams.org/files/FAQ_wind.pdf.

61. *See* Ferrell and Conaway, *Wind Energy Industry Impacts In Oklahoma*, 26.

62. *Opportunity Cost*, http://www.investopedia.com/terms/o/opportunitycost.asp.

63. *See* Ferrell and Conaway, *Wind Energy Industry Impacts In Oklahoma*, 30.

64. *Eva's Decommissioning Estimate for the Green River Wind Farm Phase I*, https://docs.wind-watch.org/Green-River-Decommission-EVA.pdf.

65. *Id*.

removal can be. Not only is it extremely expensive, but the truckloads of gravel and other materials must be dumped somewhere. The cost above was estimated under the cheaper of two options analyzed: this option required the county to rezone land, dedicating it solely for use as gravel storage site.[66] If the decommissioning company had to deliver the gravel to the landfill, the cost would hit nearly nine million dollars for road removal and land restoration costs.[67]

These costs, if allocated on a per-turbine basis, are $25,899 and $92,463 respectively per turbine, solely for road removal.[68] If the individual landowner decommissioned these turbines rather than the company, the number is likely closer to the latter, more expensive, cost because the individual does not have the advantage of an economy-of-scale discount or the negotiating power with the county to succeed in a rezoning effort, forcing it to utilize the landfill instead.[69] Not only are the roads extremely expensive to remove, they do not have a salvage value to offset the cost of removal. Roads are an essential part of decommissioning and must be tackled to prevent wasted lands, which would, in turn, lower property values and decrease the productivity of the state.

2. The Turbines

In addition to the roads, the turbines themselves are not an easy feat to decommission. The size of these machines makes it impossible for a landowner to safely and efficiently remove the turbine from the property.[70] Wind turbine sizes vary widely, with the biggest determining factors of the size being the megawatt capacity and the manufacturer of the turbine.[71] The smaller capacity commercial turbines, falling in the 1.3 to 1.5 megawatt capacity range, stand around 325 feet from the base to the blade tip.[72] The larger turbines commonly being installed today range in the 2 to 2.5 megawatt capacity.[73] These turbines can stand up to 400 feet in height.[74] The Oklahoma State University wind energy study found the average size

66. *Id*.
67. *Id*.
68. *See Id.*
69. *Id*.
70. National Wind Watch, *FAQ—Size*, https://www.wind-watch.org/faq-size.php.
71. *Id*.
72. Industrial Wind Energy Opposition, *Size Specifications of Common Industrial Turbines*, Eric Rosenbloom, http://www.aweo.org/windmodels.html.
73. Ferrell and Conaway, *Wind Energy Industry Impacts In Oklahoma*, 9.
74. National Wind Watch, *FAQ—Size*, https://www.wind-watch.org/faq-size.php.

of the turbines in Oklahoma to be 1.78 megawatts.[75] As technology advances, however, the sizes of the turbines are growing.[76] The most powerful onshore turbine ever built is in Germany, the Enercon E126, a 7.6 megawatt capacity turbine standing at an impressive 651 feet tall.[77] This turbine surpasses the height of the St. Louis Arch.[78] The only way to bring these machines down safely is by bringing cranes on-site and lowering the turbine one segment at a time.

In addition to the fact that turbines in most cases are taller than skyscrapers,[79] turbines weigh an enormous amount.[80] Traditional steel turbines weigh anywhere from 160 to 330 tons.[81] As previously mentioned, technological advances in this industry result in constant changes. One of these changes brought about the construction of the largest turbine in America at the time, which came online in the spring of 2016.[82] Standing as tall as the Washington Monument, there is something unique about this wind turbine.[83] Rather than using the traditional steel tower, this turbine tower is comprised mainly of concrete.[84] Using concrete in turbine towers significantly reduces the amount of steel needed to construct a turbine.[85] Furthermore, the concrete has a longer useful life and is much easier to transport.[86] This new turbine, built in Iowa, weighs over 1200 tons.[87] This is two and a half million pounds of material that would have to be removed—for just one turbine.[88] Concrete turbines manage to decrease the installation costs as the materials are cheaper and last longer, but, with the increased weight, the turbines will cost more to decommission and will have a lower scrap value.[89]

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75. Ferrell and Conaway, *Wind Energy Industry Impacts In Oklahoma*, 29.

76. *Id.*

77. Industrial Wind Energy Opposition, *Size Specifications of Common Industrial Turbines*, http://www.aweo.org/ windmodels.html.

78. *Id*.

79. National Wind Watch, *FAQ—Size*, https://www.wind-watch.org/faq-size.php.

80. *Id.*

81. *Id*.

82. MidAmerican Energy, *Wind Energy*, https://www.midamericanenergy.com/wind-energy.aspx.

83. *Id.*

84. *Id*.

85. Fabcon Precast, *Steel vs Precast Concrete for Wind Turbine Towers*, http://fabcon-usa.com/2013/05/steel-vs-precast-concrete-wind-turbine-towers/.

86. *Id.*

87. *Id*.

88. *Id.*

89. *Id*.

The cost of decommissioning turbines at every project is different, but many estimates have placed the costs well over $200,000 per turbine.[90] It is imperative to note the built-in value to decommissioning these projects.[91] When bringing down literal tons of steel, salvaging the scrapped steel from the turbine towers can offset the decommissioning costs.[92] However, the salvage value of a decommissioned turbine is very volatile, largely dependent upon the value of scrapped steel.[93] This can range from $20,000 per turbine to more than $100,000 per turbine.[94] Nonetheless, even in a best case scenario, reports show that the salvage value is enough to simply offset the costs of decommissioning.[95]

With the switch to concrete turbines, the decommissioning costs will increase substantially as the tonnage of materials that must be hauled away drastically increases. And at the same time, the concrete turbines do not have the scrapped steel to help offset the decommissioning costs, leaving the above salvage value cost of the concrete turbine much higher than that of the older, traditional steel towered turbines.

This presents a situation where, aside from complying with regulations or contract provisions, wind energy companies have no monetary incentive to deconstruct these wind farms. Quite the opposite, in fact, as numbers are showing a net loss resulting from the decommissioning efforts.[96] But even if it were profitable to decommission the turbines, landowners do not have the wherewithal to remove these kinds of machines. And many times, a landowner may not think of the difficulty or costs associated with trying to deconstruct a turbine, ultimately signing a contract that can be very costly to them.

3. The Circuitry

The last piece of infrastructure is the electrical components of the wind farms. "The circuitry" largely consists of transmission and distribution lines

90. Protect Richfield, *Decommissioning estimate: Vestas V3.0-112 Turbines on the Proposed Montecello Hills Project*, http://www.protectrichfield.com/documents/Decommissioning%20Estimate%20for%20Ridgeline%20Energy%20Monticello%20Hills%20Project.pdf and *Eva's Decommissioning Estimate for the Green River Wind Farm Phase I*, https://docs.wind-watch.org/Green-River-Decommission-EVA.pdf.

91. *Id*.

92. *Id*.

93. *Id.*

94. *Id.*

95. *Eva's Decommissioning Estimate for the Green River Wind Farm Phase I*, https://docs.wind-watch.org/Green-River-Decommission-EVA.pdf.

96. *Id*.

as well as on-site substations. There is very little data on the costs of circuitry separated from decommissioning costs of the roads and turbines. One could assume, however, that most of this cost ought to be recovered as the materials are easy to remove because they are above ground and are reusable. The insulators, cables, and other elements of the substation should be easy to transport to another location to continue to generate profits for the wind energy developers.

One exception to this rule exists where a decommissioning plan included the removal of all circuitry materials. This would greatly increase the costs as many times the circuitry between the turbines is buried deep in the ground and would require excavation. But with most decommissioning statutes and contracts keeping the removal of all subsurface materials within the first four feet, the circuitry should not be a large percentage of decommissioning expenses.

B. The Price Tag and Process of Decommissioning

With the decommissioning elements set forth, the last piece to analyze is the final tab after decommissioning. The costs mentioned above leave a total decommissioning cost that could easily be as high as $250,000 per turbine,[97] with $250,000 per turbine likely towards the more expensive estimates.[98] But estimates run the gambit, and any number chosen is simply as accurate as the old faithful choice-by-dart-throw. Once the company recovers the scrap value for the turbines, this cost will decrease. When applying the larger above mentioned $100,000 scrap value, this leaves a deficit of $150,000 per turbine in decommissioning costs.[99]

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97. This number comes from adding up the road removal costs and the turbine removal costs listed above. The most important thing to note is that numbers and estimates are all over the board. There have not been enough projects decommissioned to have reliable data about the actual costs of decommissioning.

98. Mr. Stripling's *Wind Energy's Dirty Word: Decommissioning*, included an average of ten different wind farm's decommissioning cost projections. 95 Tex. L. Rev. at 133. This average placed the cost of decommissioning at $129,000. But even these projections vary in cost widely with the lowest estimate being roughly $27,000 and the highest being over $650,000. This further supports the contention that there is not enough accurate data to know what it is going to cost to decommission these projects, only that it is going to be very costly.

99. It is imperative to note that these numbers, while based off of industry projections, are simply estimates that are likely to change over time and space. Externalities like inflation, the price of scrapped steel, labor costs, rental prices, and many other items will effect the costs of decommissioning and the scrap value of a turbine. $150,000 is used as the decommissioning cost above scrap value for illustrative purposes in this article. Research with a more limited temporal and spatial scope should be conducted to develop a more accurate estimate when negotiating contracts or drafting legislation.

With these turbines being so large and decommissioning being so expensive, unless the owner of the turbines is required to decommission them, abandoned winds farms may become a problem. The Kamaoa Wind Farm is one example of a wind farm that stood long after it's useful life, which could have been prevented through the use of decommissioning statutes. In Hawaii, the Kamaoa Wind Farm was a profitable wind project containing thirty-seven turbines.[100] It was built in the 1980s and went offline in 2006.[101] Rather than being decommissioned soon after the farm went offline, the turbines stood idle, dotting beautiful Hawaii's landscape with giant rusting pillars, for six years before being torn down and sold to China for scrap metal.[102] Another example of poor decommissioning is a truly abandoned farm, the Tehachapi Wind Farms, in California.[103] The Tehachapi Wind Farm still stands inactive today.[104] Both of these farms were built before today's modern giants, meaning that they would be cheaper to decommission, yet they were still left abandoned—one for six years and the other indefinitely.[105]

Many interested entities may wish to weigh in on how the construction, maintenance, and decommissioning of a turbine is accomplished. Both the federal government[106] and state governments[107] have regulations in place protecting their interests. Further, local municipalities have been proactive in passing ordinances, making sure that wind farms meet the requirements their communities wish them to meet.[108] Lastly, the landowner who contracts for the turbine to be installed has an interest—arguably has the strongest interest—in decommissioning the turbine. The laws covering the harnessing of wind energy range from siting requirements, sound and

100. Tom Leonard, *Broken Promises: The Rusting Wind Turbines of Hawaii*, Hawai'i Free Press, Mar. 1, 2012.

101. Bill Ginderson, *My View: Wind Energy a Faith-Based Initiative*, Desert News, Mar. 19, 2013, http://www.deseretnews.com/article/765624901/Wind-energy-a-faith-based-initiative.html?pg=all.

102. *Id.*

103. Web Ecoist, *10 Amazingly-Abandoned Renewable Energy Plants*, http://webecoist.momtastic.com/2009/05/04/10-abandoned-renewable-energy-plants/.

104. William S. Stripling, *Wind Energy's Dirty Word: Decommissioning*, 95 Tex. L. Rev. 123, 127.

105. *Id*.

106. 42 U.S.C. §9201.

107. Institute for Energy Research, *Why Are States Reevaluating Wind Energy?*, Oct. 8, 2014, http://instituteforenergyresearch.org/analysis/states-reevaluate-wind-energy/.

108. David McGlinchey and Shelly Tallack Caporossi, *A Guide to Drafting Wind Turbine Regulation*, Manomet Center for Conservation Sciences, Sep. 2013.

shadow flicker issues, wildlife protection, and many others.[109] This analysis only looks at decommissioning, the demolition and removal of the infrastructure after the useful life of the turbines have been met.

When planning for the decommissioning of the turbines in a contract prior to the construction of the turbines, one important issue is the timeframe in which the decommissioning should occur following the dormancy of a turbine; otherwise, operators could leave turbines inactive for years before removal.[110] The parties should also discuss the requirements for the decommissioning project to be considered complete.[111] States with decommissioning statutes have answered these questions in a relatively uniform manner.

It is standard practice to give a wind company a full year or more to get an out-of-commission turbine running again before a statute requires decommissioning.[112] Maine's statutes, for example, state that "decommissioning is required if no electricity is generated for a continuous period of twelve (12) months."[113] Oklahoma's Wind Energy Development Act requires decommissioning "within twenty-four (24) months after abandonment or the end of the useful life of the commercial wind energy equipment in the wind energy facility."[114] While not all states have these provisions, those states that have considered the timing of the decommissioning have set it at twelve to twenty-four months of inactivity, and each turbine carries its own clock, rather than waiting for the whole farm to stop generating electricity before the twelve-month period starts.[115] This will ensure that the company who owns the turbines does not just keep one of the turbines in good repair to delay its obligation to decommission the rest of the turbines. As soon as a turbine goes inactive, the clock for that turbine starts.[116] And after a year or two of its being inactive, it must be decommissioned if not fixed.[117]

The extent of project removal and land restoration that must be accomplished for complete decommissioning typically requires the removal

109. *Id*.
110. *See* Okla. Stat. Ann. tit. 17, § 160.11.
111. Okla. Stat. Ann. tit. 17, § 160.14.
112. 38 M.R.S.A. s481-490.
113. *Id.*
114. Okla. Stat. Ann. tit. 17, §160.13.
115. *Id*.
116. *Id.*
117. *Id*.

of roads, turbines, and circuitry, within the first few feet of soil.[118] Typically, the roads are removed unless the landowner wants to keep them.[119] The turbines are removed and scrapped.[120] The above-ground transmission lines are removed, as are the transformers and inactive substations.[121] The underground lines and foundation of the turbine have to be removed when they fall within the first few of the soil's surface.[122] While these are reoccurring statutory schemes, these are the floors which the company must meet. It is possible for landowners to contract for more stringent decommissioning requirements.[123] While decommissioning to a depth of four foot will be more than sufficient for most landowners, some landowners, like Iowa farmers who require the use of tile drains in their land, may wish to contract that decommissioning be completed to a depth of up to eight feet so that it is out of the way of the drainage systems. However, these extra requirements are best left to the parties during contract negotiations so that the state does not straddle the wind energy companies with extra decommissioning costs that provide no real benefit to landowners.[124]

Another question that needs to be answered is who has the responsibility to bring the turbines down. Should this job be left to the landowner? Or is it a more practical approach to require the developer to decommission the turbines at the end of their useful life? Typically it is the developer/owner of the turbines with the responsibility to bring them down.[125] For those states that have passed legislation on the matter, it is unanimous that the developer of the wind farm is in the best position to decommission the projects.

The last question discussed is what, if any, funding should be set aside to ensure that decommissioning is possible. This is not as easily answered, and a wide variety of methods are practiced to fund the decommissioning of the

118. Okla. Stat. Ann. tit. 17, § 160.14.

119. *Id*.

120. *Id*.

121. *Id*.

122. *Id*. Oklahoma's statutory requirement is thirty inches. Because Oklahoma's agricultural industry does not usually plow deeper than the thirty inches, this regulation is sufficient for Oklahoma. Other states that grow more soil invasive crops like corn and soybeans need deeper requirements, such as four feet.

123. *Id*.

124. Institute for Energy Research, *Why Are States Reevaluating Wind Energy?*, Oct. 8, 2014, http://instituteforenergyresearch.org/analysis/states-reevaluate-wind-energy/.

125. Okla. Stat. Ann. tit. 17, § 160.14.

wind turbines.[126] With the average turbine costing at least tens of thousands of dollars to decommission, it may be important to obtain financial surety that the turbines will come down.[127] With changes in markets and subsidization policies, wind energy companies may not be able to stay afloat to the end of these projects useful lives.[128] If this is so, companies charged with the responsibility to decommission wind projects may no longer be solvent to decommission the wind farms.

When faced with these market uncertainties, it is easy to urge states to require the decommissioning funds up front. However, it will be critical to keep each state's renewable energy goals in mind when enacting these statutes. Any given option chose may carry undesirable consequences to the expansion of the wind energy industry in that state. If one state were to mandate an upfront payment for decommissioning costs, it could encourage wind production companies to cross borders, entering into a neighboring state without as high a cost of entry. For example: A 100 turbine project, which is not an irregularly large project, in a state requiring $150,000 upfront per turbine to cover decommissioning and inflation for when they are to come down in twenty years creates a fifteen million dollar barrier to install the wind farm.[129] This may incentivize the developer to construct its wind farm in another state, or at the minimum, this policy will create a pool of inefficiently used funds. Setting fifteen million dollars in an escrow account waiting to be employed in decommissioning turbines will not be nearly as productive as if it were to be used in putting up more wind turbines. Below is an analysis of some routes states have taken regarding funding the decommissioning of wind turbines.

IV. Statutory Approaches to Ensure Projects are Decommissioned

Decommissioning regulations and statutes play an important role in protecting landowners from abandoned turbines. At the same time, they carry the power to hinder the development of wind projects. State legislatures and agencies should strongly consider how policies can protect landowners without placing an undue hardship on the wind energy companies. The wind farms that now cover America are creatures of

126. William S. Stripling, *Wind Energy's Dirty Word: Decommissioning*, 95 Tex. L. Rev. 123, 141-44.

127. *Id*. at 133.

128. Institute for Energy Research, *Why Are States Reevaluating Wind Energy?*, Oct. 8, 2014, http://instituteforenergyresearch.org/analysis/states-reevaluate-wind-energy/. Combs, Texas Comptroller, states that it is time for Wind to stand on its own two feet.

129. $150,000 multiplied by 100 turbines equals $15,000,000.

government regulation.[130] Without the industry being heavily subsidized, the wind industry would not be as healthy as it is today.[131] Both the federal and state governments have an interest in the expansion of wind energy, evidenced by their supporting the wind projects with tax dollars.[132] However, states also have an interest in preventing turbines from being abandoned, leaving behind, as one Ohio justice described, "relics, 492-foot-tall white elephants, monuments to our quixotic quest for alternative energy."[133]

In recent years, many statutes attempt to establish safeguards against leaving behind turbines that can no longer harness energy. Federal, state, and local governments have systems to ensure that the turbines are brought down. Aside from regulations, another approach guaranteeing decommissioning is to place contractual provisions in the original agreement between the landowner and the project developer.[134] The goal is to find a balance between the interests of those wanting to ensure the turbines are brought down and those that are wanting to get the turbines put up. Some methods present a potentially inhibiting effect on the development of these projects, while others leave room for the turbines to be abandoned with no decommissioning in sight.

A. Leave Decommissioning Negotiations Solely in the Hand of the Landowners

To determine what policies best serve decommissioning needs requires a determination of which interests need protecting. The individual most affected by the installation of the turbine is the owner of the land on which it sits.[135] Often developers construct wind farms on agricultural land in rural

130. Through the use of tax credits, corporate structures, renewable energy standards, favorable transmission policies and siting regulations, the federal government has played a large role in the advancement of the wind energy industry. http://www.awea.org/federal.

131. Institute for Energy Research, *Why Are States Reevaluating Wind Energy?*, Oct. 8, 2014.

132. *Id.*

133. In re Application of Buckeye Wind, L.L.C., 966 N.E.2d 869, 879 (Ohio 2012).

134. Black Oak Wind Farm, *Black Oak Wind Farm Decommissioning Plan*, http://www.blackoakwindny.com/wp-content/uploads/Appendix_E_Preliminary_Decommissioning_Plan.pdf, at 1. and William S. Stripling, *Wind Energy's Dirty Word: Decommissioning*, 95 Tex. L. Rev. 123, 140.

135. Offshore turbines are the exception. The federal government regulates offshore turbines and turbines built on federally-held public lands. American Wind Energy Association, *Public Lands and Wind Energy*, http://www.awea.org/public-lands.

and sparsely populated areas.[136] With this being the case, a limited number of individuals are interested in the decommissioning of the wind turbines. The person with the largest stake in getting the turbine off their property is, without question, the landowners.

With landowners having the most to gain from the installation of the turbine and the most to lose with an abandoned turbine not being decommissioned, it is not inconceivable for a state to leave the decommissioning up to the landowner. While the landowner is negotiating the royalty payments and other contractual provisions, they could easily include in the contract a decommissioning provision that is suitable to his or her liking. In fact, many wind energy companies automatically include decommissioning provisions in their contracts with the landowners, stating that the company will decommission the turbines.[137] One example of this is the Chapman Wind Ranch.[138] The Chapman Wind Ranch promises to pay for the decommissioning and will even purchase bonds or provide a letter of credit to ensure the turbines' decommissioning even if the company goes insolvent.[139]

With this initial overview, it may seem that there is no need for states to regulate the decommissioning of wind turbines. After all, if one state imposes heavy regulations on a wind energy company while the state next door has a much lower threshold for the company to operate, the wind company will logically wish to go to the neighboring state to save on the costs associated with meeting the stringent regulations.[140] However, companies are not required to be as altruistic as Chapman Wind Ranch. As long as money is involved, people have an incentive to take advantage of one another. And even a contract that provides the wind company will take on decommissioning costs, the company may go insolvent before the date of decommissioning. If the bottom falls out of the market for wind energy, companies could declare bankruptcy well before the decommissioning date and even before the established bonding or letter of credit date.[141] If this

136. Office of Energy Efficiency & Renewable Energy, *Advantages and Challenges of Wind Energy*, http://energy.gov/eere/wind/advantages-and-challenges-wind-energy.

137. Chapman Wind Ranch, http://www.chapmanranchwind.com/decommissioning.

138. *Id*.

139. *Id*.

140. This is, of course, given that the neighboring state has as good or better a wind resource.

141. According to the Chapman Wind Ranch website, its contract states that they receive the funding in year fifteen of the wind farm's operation. *Id*. In a fifteen-year period, a company can lose the credit required to get funding for the decommissioning, or even go bankrupt.

were to happen, the landowner would be stuck with a wind turbine on his or her property until the costs of decommissioning the turbines were paid for by someone else, likely the taxpayers.

Further, if the landowners did have the forethought to place provisions in the contract as to who was to decommission the project, they likely still would not know or address everything that needed to be included in the contract to complete the decommissioning. For example, the contract should include an agreement about removing subsurface materials, replacing the soil that was removed to install the turbine, and replanting vegetation after the decommissioning is complete. Some aspects of decommissioning, such as grinding the concrete down to a specified depth and removing underground transmission lines, if not properly addressed, could cause serious issues in the future when the landowner attempts to recultivate that land. With the variety of lands used for wind projects, each landowner will have different needs in the decommissioning process, be it leaving the road structures behind or decommissioning at a greater depth into the soil. These examples may be easy to overlook in contract formation but could cost or benefit the landowner tremendously following decommissioning depending on the forethought placed into the lease.

Additionally, leaving the decommissioning decisions entirely in the hands of the landowners would put the wind energy developers in the position to negotiate away its responsibilities. For example, if the projected location for the wind farm were to cross either Farmer A or Farmer B's land, but not both, the wind energy company could work back and forth on either of them until the company eventually fully negotiated away any responsibility of decommissioning. This is an easily conceivable possibility when looking at the financial advantages of having a wind turbine installed on farmland. According to the Oklahoma State University study, a wind turbine installed on an agriculturalist's land would profit them anywhere from 184 to 1390 times more than the prior agricultural use of the land .[142] While it varied depending on the agricultural use of the land, in Oklahoma, for every megawatt of installed energy capacity on a farmer's land, annual profitability increased by over $5,500—roughly $200,000 or more over the life of every turbine.[143] This is arguably more than enough for a landowner to agree to waive decommissioning provisions.

142. *See* Ferrell and Conaway, *Wind Energy Industry Impacts In Oklahoma*, 30.

143. *Id.* Note that this is largely dependent upon the size of turbine and wealth of wind resource in the developed area. These numbers are based off of Oklahoma's wind energy projects.

Further, the current landowners may not be in control of the land when the contract ends. The average age of a farmer in 2012 was 58.3 years old.[144] This means the majority of today's farmers are contracting their land beyond their expected life, leaving the decommissioning of the wind farm for a future owner to worry about.[145] These farmers can, in regards to the future well-being of the land, throw all caution to the wind. While many farmers pass land to the next generation and would not find leaving the problem for a future owner is an acceptable practice, it is a potential mindset that could prove to be problematic.

Because it is extremely easy for landowners to be taken advantage of, baseline protections through state or local regulations are important so that the turbines are not left on the property for any extended period of time following their entering a dormant state.

B. No State Legislation and Insolvency Threatened Legislation

Many states do not regulate the decommissioning of wind turbines at all.[146] And others have passed legislation but have no guarantees that the company will be able to afford decommissioning the wind turbines when needed. Notably, Texas, the largest wind producing state in the nation and a state which—on its own—ranks globally amongst other nations with its installed wind energy capacity, is amongst the states that do not have any decommissioning statutes.[147] Other states that have a large wind energy footprint without any decommissioning statutes include the second largest wind energy producing state, Iowa, as well as Kansas, Colorado, Montana, and Michigan.[148]

When a state chooses not to regulate the decommissioning of the turbine erected within its borders, they are choosing to let the lease negotiated between the landowner and the wind developer determine what will happen when it comes time to decommission the wind farm. (Refer to Part IV(A).) If the landowner managed to get the decommissioning provision in the lease, it would be an enforceable contract, requiring the wind company to

144. USDA Census of Agriculture, *Farm Demographics – U.S. Farmers by Gender, Age, Race, Ethnicity, and More*, May 2014, https://www.agcensus.usda.gov/Publications/2012/Online_Resources/Highlights/Farm_Demographics/#average_age.

145. National Wind Watch, *Five Questions to Ask Before Signing a Wind-Energy Lease*, April 2012, https://www.wind-watch.org/documents/five-questions-to-ask-before-signing-a-wind-energy-lease/.

146. William S. Stripling, *Wind Energy's Dirty Word: Decommissioning*, 95 Tex. L. Rev. 123, 139-41.

147. Id. at 139.

148. Id. at 140.

take down the turbines. However, this approach takes a blind leap, hoping that both the wind companies and the landowners work together for the future good of the land and state rather than their own present interests. Even if the landowner succeeds in getting a contractual provision mandating the decommissioning of the lease, this contract may only establish who is responsible for decommissioning without any surety that funds are available for decommissioning. If a wind energy developer agrees to decommission a project but declares bankruptcy before bringing the turbines down, the landowner is out of luck on getting the turbines removed.

This same issue presents itself in states where there is no guarantee that decommissioning will take place. These statutes are useful for establishing who needs to decommission the turbines, but they are extremely vulnerable to an obligee becoming insolvent. If the wind developer who is statutorily responsible for decommissioning the wind farm is insolvent or has already declared bankruptcy, there will be no funds remaining to pay for the decommissioning expenses. This is a potential issue that can readily be cured with a little bit of forethought.

C. Bankruptcy Proof Decommissioning Schemes

A better alternative to ensure the decommissioning takes place is for the state to mandate a kind of financial surety held for the sole purpose of decommissioning the wind farm. This can be done in multiple ways, but knowing where the funds necessary to decommission the project are and that they are safe is the best way to guarantee the decommissioning of the turbines. Multiple methods could fund the decommissioning.

One way to reserve the resources necessary is to place the funds in an escrow account at the time of construction. Riley County in Kansas has proposed something along these lines. The county's proposal to the Kansas Energy Board requires the owner of the turbine, thirty days before the commencement of construction, to give to the county a security to cover at least 100 percent of the decommissioning costs.[149] The principle of time value of money makes this very expensive. If the company were to retain the funds and earn a modest five percent interest, whatever was required to be placed into the fund would have doubled prior to year fifteen and nearly

149. Kansas Energy Council, *Wind Energy Siting Handbook: Guide Options for Kansas Cities and Counties*, April 2005, http://www.kansasenergy.org/Kansas_Siting_Guidelines.PDF.

quadrupled before the end of the lease when the company needs the decommissioning funds.[150]

Another option adopted by some states as well as the federal government requires those companies responsible for decommissioning of wind projects to bond the decommission costs.[151] This presents a less stringent solution than having to fully fund the escrow account as, even with a modest return on the investment, the funds will grow to fully cover the decommissioning costs of the turbines. The Bureau of Land Management ("BLM") has set a minimum bond requirement for both meteorological towers, which are used in wind energy production, and wind turbines.[152] BLM requires a $2,000 bond on the towers and a $10,000 bond on the wind turbines placed on federal lands.[153] BLM will also review the bonds every five years to ensure that they will cover the full cost of decommissioning.[154] This is a fair and safe way to guarantee that funds are available. By reviewing every five years, the government has the option to increase or decrease the amount of required funds set aside if market changes increase or decrease the cost of decommissioning.

A third possibility to obtain the funds is to "siphon," or pull out and reserve, some of the revenues from the energy sales coming from the turbines. Maine conducts a savings approach similar to this. In *Concerned Citizens to Save Roxbury v. Board of Environmental Protection*, the Supreme Court of Maine upheld an interpretation of the Wind Energy Act of 2008 where there should be no consideration of the financial solvency of the company responsible for the decommissioning when determining the funding required for decommissioning.[155] The Concerned Citizens to Save Roxbury filed suit after the Board decided that the current decommissioning plan of Record Hill did not meet the requirements of the Wind Energy Act.[156] The Board of Environmental Protection held that the company

150. Based off the Rule of 72. At five percent interest, whatever was invested will have doubled in year 14 (72/5 percent = 14.4 years). And under the same rule, by year 29 the funds would have doubled again, resulting in nearly four times the original escrow amount at the end of the useful life, around 25 years.

151. BLM Has Limited Assurance That Wind and Solar Projects Are Adequately Bonded, GAO-15-520, Jun, 5, 2015.

152. Sonja Nowakowski, *Letter to Energy and Telecommunications Interim Committee*, Dec. 2009, http://leg.mt.gov/content/Committees/Interim/2009_2010/ Energy_Telecommunications/Meeting_Documents/January10/wind-bonding-decommissioning.pdf

153. *Id.*

154. *Id.*

155. 15 A.3d 1263, 1273 (Me. 2011).

156. *Id.*

needed to start saving for the decommissioning as soon as the project was complete.[157] Once the project was running, the company had an obligation to fund the decommissioning account, and the Board had a duty to review the costs of decommissioning and require adjustments to the account in years seven and fifteen.[158]

The revenue siphon ensures that decommissioning funds are available without adding a severe burden to the wind energy developer. Under this plan, the construction of the turbines is the only expense that the wind company incurs in getting the wind farm operational. A possible example of a statutory requirement could be to mandate that ten percent of all decommissioning costs are pulled out of that year's energy sales to be saved for decommissioning. This would continue for years one through ten. This is not a percentage of the revenues but a percent of the decommissioning costs. So no matter how much revenue the wind farm generates, 10 percent of the estimated decommissioning expenses are still put into a separate account.

While the revenues could be siphoned off during years ten to twenty, the front loading helps to make sure that if something happens, like the price of energy drastically dropping or a natural disaster impacting the turbines, it would not have a significant effect on funding the decommissioning. Further, the funds should be invested into state approved investments, but the investments should still be managed by the wind company. They can choose where the funds are invested so that they can control the rate of return, but retaining state oversight is key to ensuring safety of the principle. Once decommissioning is fully funded, the wind company ought to be allowed withdraw the profits above the estimated decommissioning costs. The decommissioning costs may need to be reevaluated throughout the life of the project so that increases in costs of decommissioning or decreases in the scrap value of the turbines is not overlooked. With the cost estimates listed above, there was a $150,000 deficiency per turbine in decommissioning costs. Under this proposed plan, $15,000 would be siphoned out of each year's gross energy sales for the first ten years.[159] Then, once the fund reaches $150,000 per turbine, or whatever the estimated decommissioning deficit may be, the revenue siphon would stop,

157. *Id.*

158. *Id.*

159. The siphon would not have to last ten years assuming the company received a rate of return on its siphoned funds for the first several years. If they kept a six percent rate of return, the decommissioning account would be fully financed by the end of year seven.

and the company would be allowed to pull out any interest profit out of the decommissioning fund, but the capital would have to remain.

Above are three possibilities to ensure a state has access to decommissioning funds, but at least one state has taken arguably the wisest approach of them all. Oklahoma has passed the Oklahoma Wind Energy Development Act that just requires a showing of financial responsibility to pay for the decommissioning.[160] In the fifth or fifteenth year of the project, dependent upon when the farm began commercially producing, the developer is to submit to the Corporation Commission evidence of its ability to decommission the project.[161] The state does not limit the form of funds to decommission the project.[162] It can be in the form of bonds, a guarantee from a corporate parent, or even a line of credit.[163] As stated in the Oklahoma Wind Energy Development Act's Legislative Findings, Oklahoma stresses the importance of finding a balance between its interest in developing the wind resource in the state while protecting the public from abandoned wind projects that have not been properly decommissioned. By allowing the wind energy company to decide what form of financial surety it will provide, Oklahoma has adopted a regulatory scheme that ensures financial ability to decommission a project while allowing the development company to use the option that works best for it.

V. Pseudo-State Agencies Will Be Able to Assist Decommissioning Efforts

Coming full circle, this paper concludes with possible lessons that the oil and gas industry can teach the wind energy industry. The Midwest and other oil producing parts of the country are covered with abandoned well sites. These well sites are hazardous and need to be removed, but in many situations, the company that drilled the well and reaped the profits is no longer around to clean up the site. And further, much like a wind farm, the decommissioning of an oil and gas pad costs thousands of dollars, which inhibits most landowners from restoring the sites.[164] Abandoned well sites leaking crude oil or covered in sharp-edged, rusted metal are certainly not the postcard-quality landscapes that most states wish to maintain. Many states took action to prevent any more well sites from being abandoned and

160. Okla. Stat. Ann. tit. 17, § 160.15.
161. *Id*.
162. *Id.*
163. *Id.*
164. Oklahoma Energy Resources Board, *Restoration Process*, http://www.oerb.com/well-site-clean-up/restoration-process.

to restored the current abandoned sites within their borders. A success story worth mentioning, and the state-created agency this article recommends mirroring, comes from Oklahoma.

The Oklahoma Energy Resources Board ("OERB") is an agency that was created in 1993 by leaders in the oil and gas industry requesting action by the legislature.[165] They joined together with a "mission to use the strength of Oklahoma's greatest industry to improve the lives of all Oklahomans through education and restoration."[166] The restoration of abandoned and orphaned well sites is at the heart of the organization.[167] Within twenty-four years after formation, the organization has spent over one hundred million dollars on the restoration of Oklahoma's abandoned well sites and collateral cleanup.[168] This averages more than four million dollars a year solely for clean-up efforts.[169] In addition to cleaning up the well sites, the OERB has put forth many educational efforts, teaching over a million students about the benefits of the industry.

Passed by the Oklahoma Legislature, the law that created the OERB is unique and a true leader throughout the nation.[170] Other states have looked to the Oklahoma Energy Resources Board as a model and have tried to mimic it, some with more success than others. The OERB has managed to restore over 15,000 well sites across the state and has shown that an organization created with a state mandate and funded by the industry it was formed to support can do amazing works toward decommissioning abandoned energy production sites.[171] Thus, states concerned with the decommissioning of turbines, including Oklahoma, should look at creating a pseudo-state agency like OERB to assist their wind energy industries. However, this organization should only be a backup and should not be relied upon as the state's primary decommissioning plan. Every company should be required to decommission its own turbines. But in the case that

165. Oklahoma Energy Resources Board, *About Us*, http://www.oerb.com/about/about-us.

166. *Id*.

167. *Id*.

168. Oklahoma Energy Resources Board, *Restoration Process*, http://www.oerb.com/well-site-clean-up/restoration-process, ("Collateral cleanup" refers to things like saltwater scars, road structures that need to be removed, combatting erosion caused by the well site, etc.).

169. 100 million divided by 24 years.

170. Okla. Stat. Ann. tit, 52 § 288.

171. Oklahoma Energy Resources Board, *About Us*, http://www.oerb.com/about/about-us.

some turbines manage to go without decommissioning, this organization would stand in the gap.

With an organization like OERB spending millions of dollars a year, an important piece of the analysis is determining where the funding is coming from. It would arguably be counterproductive to form a separate agency funded solely with tax dollars to perform what the state would have had to do in the event of an energy site being abandoned anyway. The creators of OERB must have had similar thinking and established a funding system that is intuitively fairer. The OERB charges a voluntary but automatically assessed, like a tax, one-tenth of one percent charge on the revenues from the sale of oil and gas.[172] It is voluntary as the paying party can retrieve the contribution they made to the OERB by applying for a refund every year.[173] This form of funding effectively comes out of the pockets of the companies and royalty earners alike as it is assessed on sales. This is a fair way to fund an organization dedicated to serving one industry as it is only that industry that is funding it. And OERB's funding system has fantastic results, retaining over ninety-five percent of all the payments assessed.[174]

Correlating this to the wind energy industry, any company receiving the benefits from operating the turbines will pay into the fund, as will the royalty earners, namely landowners with turbines on their property. This method of funding is excellent as the companies who fail to decommission the turbines have contributed to the organization as have those landowners who are benefitting from the turbine being taken off their land. In a state like Oklahoma with mass amounts oil and gas production, the funds generated from the same one-tenth-of-one-percent contribution on wind energy sales will not bring in nearly as much money as the oil and gas sector. Other states may see this reversed, but either way, the effectiveness of the organization should remain substantial.

Continuing with Oklahoma as an example, the Oklahoma State University study figured that the average annual royalty payment to a landowner per turbine was $9,979.[175] With this payment being figured from a four percent royalty payment and having 3394 turbines across the state of Oklahoma, the total value of wind energy produced in the state can be estimated to be $846,718,150.[176] This would mean that under the same one-

172. Oklahoma Energy Resources Board, *Funding*, http://www.oerb.com/about/funding.

173. *Id.*

174. *Id.*

175. Ferrell and Conaway, *Wind Energy Industry Impacts In Oklahoma*, 30.

176. *Id*. and American Wind Energy Association, *Oklahoma Wind Energy*, http://awea.files.cms-plus.com/FileDownloads/pdfs/Oklahoma.pdf

tenth-of-on-percent charge, the annual revenues for the wind energy counterpart of the OERB would be roughly $850,000.[177] Under this article's projections, that should give the wind organization enough funds to decommission several turbines per year. Because this organization's role is not to decommission every turbine, but just those turbines that fall through the cracks, this should be more than enough of a fund to decommission farms that go offline with nobody to decommission them, or, more realistically, to decommission the last few turbines of a farm that were left after the decommissioning funds set aside ran out.

However, the wind energy industry cannot view and use this organization merely as a scapegoat, or else the funds that come in will not be enough to decommission all turbines without an increase to the contribution rate. Statutory schemes should be passed so that the turbines that are decommissioned in this way are far and few between. This would leave much more of the funds collected to educate individuals about the benefits of wind energy, the advancements the industry has made, and the newfound efficiency of these projects. This could be extremely helpful in conservative states that may currently be treating wind energy with more hostility than it deserves.

VI. Conclusion

Through adopting new or adapting current regulations, states can create sufficient protections for landowners regarding the decommissioning of wind projects while preventing an increased burden on wind energy companies. This will enable more wind farms to installed and begin harnessing energy without leaving a great risk for abandoned turbines to be left standing without purpose. Furthermore, by forming a pseudo-state agency for the purpose of serving the wind energy industry, states can proactively ensure the existence of funding already set aside for the decommissioning of turbines that may remain standing in spite of comprehensive statutory protections.

177. *Id*. These calculations assumed a 100 percent contribution rate. Realistically, ninety-five percent is what this organization should count on. A five percent reduction in those collections would result in annual revenue around $807,500. These figures were calculated with a forty percent efficiency factor, a four percent royalty payment, and a 0.04 percent purchase price, all of which were industry averages in Oklahoma in 2015 when the Oklahoma state article was published. The number of turbines came from AWEA, which had accurate numbers for turbines in 2016. But Oklahoma is climbing the ranks in the nation, having more capacity scheduled for installation, which means that the revenues generated by Oklahoma wind energy are set to increase.