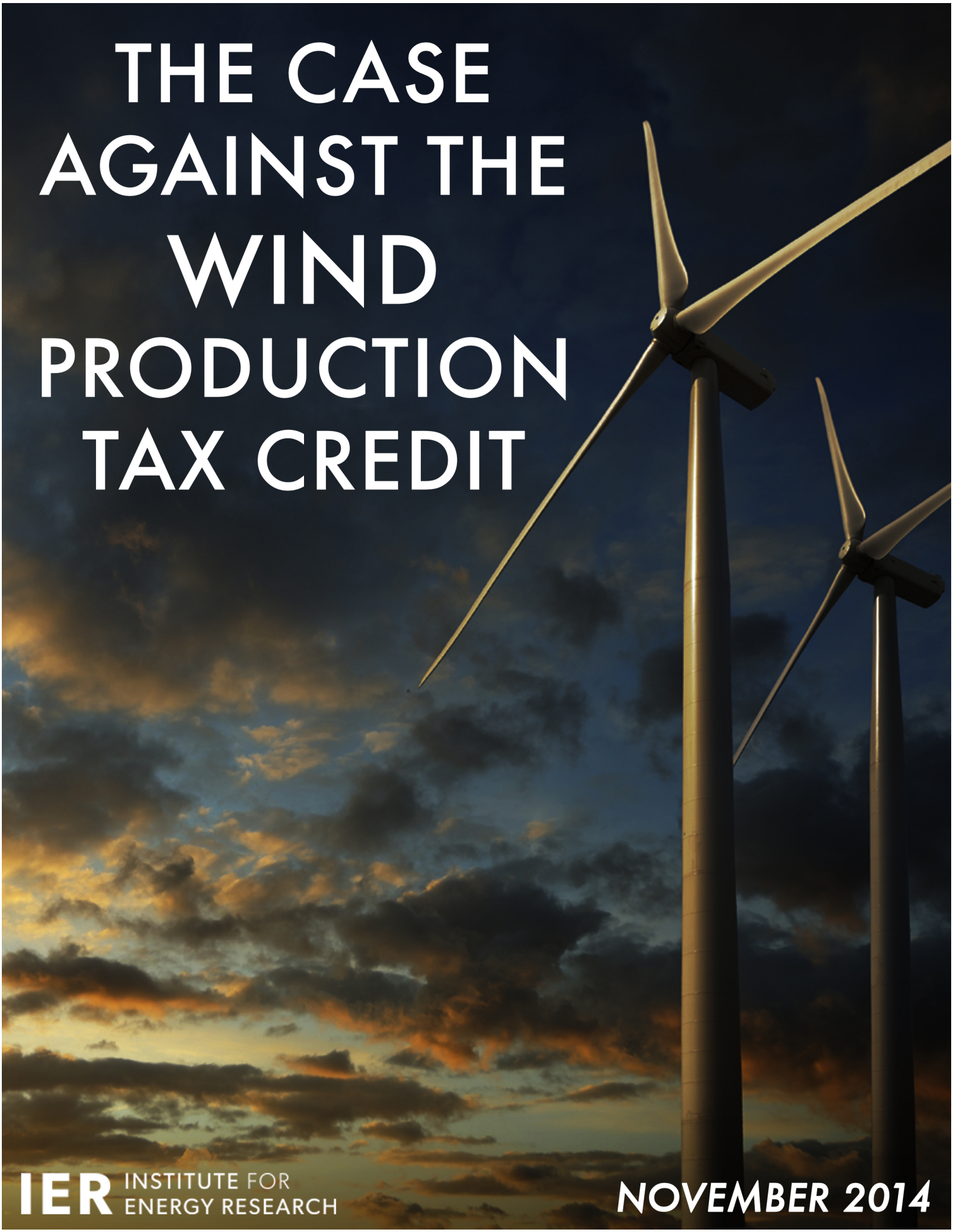
# THE CASE AGAINST THE WIND PRODUCTION TAX CREDIT



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# Executive Summary

The federal wind Production Tax Credit (PTC) is a substantial subsidy that has provided the wind industry billions of taxpayer dollars and is working to harm reliable, affordable sources of electricity generation such as natural gas, coal, and nuclear power. The PTC was first enacted in 1992 as a temporary measure to bolster the wind industry. From 1992 through today, it has been extended seven times. In its current form, the PTC provides owners of wind facilities a subsidy of $23 per megawatt-hour of electricity generated for the facility's first 10 years of operation.

The PTC technically expired at the end of calendar year 2013, but new facilities will still qualify through 2015 under new, expanded conditions. A new two-year extension, as is contemplated in a bill passed by the Senate Finance Committee, would cost American taxpayers more than $13 billion. For context, that amounts to **4.8 million families' entire federal tax bill in a single** year–or enough to buy the entire Mongolian economy and still have more than a billion dollars left over.

This report offers hard facts about the PTC. Another extension of the PTC would:

- Give tax breaks to politically well-connected investors at the expense of taxpayers
- Increase the overall cost of electricity
- Threaten the reliability of America's power grid
- Destroy more jobs than it creates
- Stifle innovation in energy technologies
- Provide a handout to a large, mature industry
- Add to a tangled web of over 80 different federal programs supporting wind power
- Do nothing to advance the environmental goals it was designed to address

In sum, the PTC is one of the most egregious subsidies that the federal government provides.

# Introduction

The wind industry in the U.S. benefits from many federal programs intended to make wind-generated electricity competitive with other sources. Chief among these federal programs is the wind Production Tax Credit (PTC). The PTC was first enacted in 1992 and has since been extended seven times. In its current form, the PTC provides owners of wind facilities a subsidy[1] of $23 per megawatt-hour[2] of electricity generated for the facility's first 10 years of operation.[3] To put the size of the subsidy in perspective, prices in wholesale electricity markets typically hover around $50 per megawatt-hour.[4]

Most recently, the PTC was extended in January 2013 and expired at the end of that year. In the last extension bill, however, Congress expanded the qualification criteria to include facilities that had commenced construction by the end of 2013 instead of requiring that facilities be complete.[5] The change in language enabled the Internal Revenue Service (IRS) to expand eligibility to projects that had not initiated physical construction but had merely secured financing, including many facilities that began or will begin operation between January 1, 2014 and January 1, 2016.[6] As a result, taxpayers will be on the hook for PTC payments through the year 2025.

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[1] Some analysts make a distinction between a tax credit (which reduces tax liability) and an explicit payment issued by the federal government, reserving the term "subsidy" for the latter. However, with the wind PTC the distinction is not crisp in practice, because the tax credit is so large that many wind operations cannot take full advantage of it. That is why they bring in Wall Street firms to effectively auction off the tax credit to outside financiers, and it also explains why so many renewable groups clamor to make the PTC a *refundable* tax credit. See http://www.renewableenergyworld.com/rea/blog/post/2012/04/refundable-federal-tax-credit-could-remove-barrier-to-community-wind. Throughout this report, for brevity we will express the financial outlays of the wind PTC being paid for by "the taxpayers," but the reader should keep in mind the subtlety explained in this footnote.

[2] The PTC distorts prices so that companies can bid as low as negative $35 per megawatt-hour: http://instituteforenergyresearch.org/press/study-evaluates-the-true-costs-of-wind-power-2/

[3] The first 10 years of operation represents 40 percent of the 25-year life of the average turbine (25 years is the best estimate of wind industry advocates). Source: http://www.aweablog.org/blog/post/study-on-turbine-lifespan-just-more-antiwind-propaganda

[4] The average of all daily weighted average wholesale prices in the EIA's wholesale market data set for 2014 through November 11th is $53.94. http://www.eia.gov/electricity/wholesale/

[5] Nick Juliano, *IRS guidance clarifying PTC eligibility seen as boon for developers*, E&E News Greenwire, August 11, 2014, http://www.eenews.net/greenwire/stories/1060004314/.

[6] Although the PTC has expired, developers can qualify for the tax credit without starting physical construction on a wind facility. The IRS released a guidance document stating that a project would be eligible for the PTC if it had either: (1) started "physical work of a significant nature" or (2) satisfied "the Safe Harbor with respect to a facility," as long as the developer made "continuous progress towards completion" once the construction phase had begun. Many facilities that are placed in service before January 1, 2016 will satisfy the continuous progress standards. http://www.irs.gov/pub/irs-drop/n-14-46.pdf

In April 2014, the Senate Finance Committee approved an $85 billion extension of roughly 60 expired tax provisions commonly referred to as "tax extenders."[7] The bill includes a two-year extension of the PTC—a retroactive extension for 2014 and a new extension through 2015. The PTC extension in the Senate bill would cost American taxpayers more than $13 billion over the next ten years.[8] The House has taken a piecemeal approach to the expiring tax provisions and has not put forward an extension of the PTC.

During the current lame-duck session to close out the 113th Congress, passing a tax extenders package will be a top priority.[9] In a final push to include the PTC in the coming tax legislation, wind industry lobbyists such as the American Wind Energy Association (AWEA) will likely repeat a variety of well-worn arguments about why the PTC should be extended for the eighth time.[10]

The PTC was never intended to be permanent, and even AWEA has recognized that the PTC should end soon.[11] If Congress chooses not to extend the PTC during the lame-duck session, the result will be a gradual 10-year phase-out of PTC payments, and new eligibility for the PTC will likely remain closed after 2015.[12]

## History

Using wind power to generate electricity is nothing new—the practice actually dates back to the late 1800s. In 1887, James Blyth, a professor at Anderson's College in Glasgow, Scotland, constructed the first known device that generated electricity from the wind. A few months later, in the U.S., Charles Brush built a custom 12 KW wind turbine to provide electricity to his home in Cleveland, Ohio.[13]

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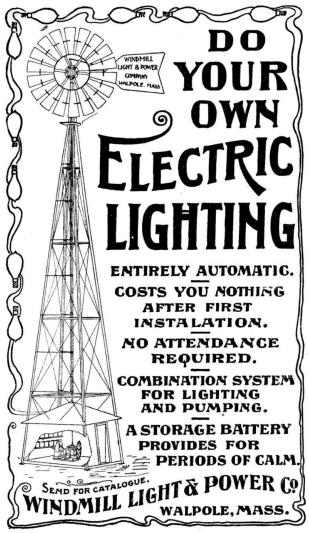
[7] Andrew Lundeen, *Senate Finance Committee passes $85 billion Tax Extenders Bill,* Tax Foundation, April 4, 2014, http://taxfoundation.org/blog/senate-finance-committee-passes-85-billion-tax-extenders-bill.
[8] Joint Committee on Taxation, "Estimated Revenue Effects of the Chairman's Modification to the 'Expiring Provisions Improvement Reform and Efficiency Act of 2014,' Scheduled for Markup by the Committee on Finance on April 3, 2014," JCX-32-14, April 3, 2014, http://www.finance.senate.gov/legislation/download/?id=68144306-aa10-44f6-be9a-c87ba450dfda
[9] Herman K. Trabish, *Lame Duck Preview: Will Congress extend tax credits for wind?,* UtilityDIVE, November 7, 2014, http://www.utilitydive.com/news/lame-duck-preview-will-congress-extend-tax-credits-for-wind/330655/.
[10] Joseph Bebon, *U.S. Senate Blocks Bill with PTC Extension—What Now?,* North American Windpower, May 16, 2014, http://www.nawindpower.com/e107_plugins/content/content.php?content.12980.
[11] American Wind Energy Association, *Analysis: Phase-out of wind energy Production Tax Credit would enable U.S. industry to become fully cost-competitive*, December 12, 2012, http://www.awea.org/MediaCenter/pressrelease.aspx?ItemNumber=4696.
[12] Keeping the PTC expired still allows for a phase-out of PTC subsidies. Under current law (with no extension) PTC payments will continue through 2025 and will gradually taper as qualified facilities age out of the program's eligibility.
[13] Sumeet Mohan Patil, *Green hybrid energy harvesting system for rotational motion,* Northeastern University, December 01, 2012, http://iris.lib.neu.edu/cgi/viewcontent.cgi?article=1093&context=elec_comp_theses.

Brush used the intermittent (off and on) energy from his wind turbine to charge a large bank of batteries in his basement, which in turn provided reliable power to his home.[14] At that time, power from the electric grid was still not an option in many U.S. cities.

***Despite some initial success, the market for off-grid power from wind turbines shrank after early utilities and rural cooperatives greatly expanded the power grid. Once farms were connected to the grid, large power plants were able to provide electricity much less expensively than the combination of on-site generation and storage.***

From the late 1800s through the 1920s, the use of wind power expanded in rural areas, as wind-powered turbine generators were increasingly used on farms for charging batteries that powered lights, pumps, and radios.[15]




Despite some initial success, the market for off-grid power from wind turbines shrank after early utilities and rural cooperatives greatly expanded the power grid.[16] Once farms were connected to the grid, large power plants were able to provide electricity much less expensively than the combination of on-site generation and storage.

In 1941, the first megawatt wind turbine was connected to the power grid in Vermont,[17] but the blades broke in 1945, and the turbine was never restarted.[18]

In the 1970s, the federal government began a coordinated push to make commercial, on-grid wind turbines competitive with other sources. In 1974, the precursor to the National Renewable

[14] Danish Wind Industry Association, *A Wind Energy Pioneer: Charles F. Brush*, updated July 23, 2003, http://www.motiva.fi/myllarin_tuulivoima/windpower%20web/en/pictures/brush.htm.
[15] Niki Nixon, *Timeline: The History of Wind Power*. The Guardian, October 17, 2008, http://www.theguardian.com/environment/2008/oct/17/wind-power-renewable-energy.
[16] Jacobs Wind Electric Co., Inc., *Original Company: Second Generation of Design (1932-1950s)*, http://www.jacobswind.net/history/original-company.
[17] Nixon, *Timeline: The History of Wind Power*.
[18] History Channel, *First Megawatt Wind Turbine Generates Electricity*, This Day in HISTORY, http://www.historychannel.com.au/classroom/day-in-history/885/first-megawatt-wind-turbine-generates-electricity.

Energy Laboratory (NREL) was created,[19] and in 1977, the Department of Energy (DOE) was established.[20] During this time, the National Aeronautics and Space Administration (NASA) also led the U.S. Wind Energy Program, which operated thirteen experimental turbines.[21] The Public Utility Regulatory Policies Act of 1978 (PURPA) mandated that utilities take wind power as it was produced, which forced utilities and grid operators to give wind facilities preference above other, more reliable, sources of electricity.[22]

Later, the Energy Policy Act of 1992[23] established the PTC as a temporary measure that was meant to expire in July 1999.[24] Since 1992, the PTC has been temporarily extended seven times.[25] Eligible facilities receive a tax credit for each unit of energy produced (per kilowatt-hour or megawatt-hour) for 10 years after the facility is placed in service.[26] The value of the tax credit was $15/MWh (megawatt-hour) in 1992, but it has increased with inflation to $23/MWh.[27]

# The Case Against the PTC

## 1. The PTC Puts Wealthy, Politically-Connected Investors Before American Families and Taxpayers

### Average Taxpayers Shoulder the Burden of the PTC

The Senate Finance Committee estimates that a two-year extension of the wind PTC would constitute a tax expenditure of $13.35 billion, an enormous implicit transfer from the general taxpayers to the wind industry and its financial partners over ten years.[28] For scale, that's

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[19] National Renewable Energy Laboratory, *25 Years of Research Excellence 1977–2002*, NREL/BR-30845, July 2002, http://www.nrel.gov/docs/gen/fy02/30845.pdf.
[20] Department of Energy, *A Brief History of the Department of Energy*, http://energy.gov/management/office-management/operational-management/history/brief-history-department-energy.
[21] NASA, *Glenn Responds to 1970s Energy Crisis*, Glenn Research Center, http://www.nasa.gov/centers/glenn/about/history/70s_energy.html
[22] Travis Fisher, *PURPA: Another Subsidy for Intermittent Energies*, MasterResource, https://www.masterresource.org/energy-efficiency/purpa-renewable-energy-subsidies/.
[23] The American Wind Energy Association (AWEA) takes credit on its website for coming up with the PTC originally. Source: American Wind Energy Association, "Turbine Timeline: 1990s," http://www.awea.org/About/content.aspx?ItemNumber=774.
[24] U.S. Department of Energy, *Renewable Electricity Production Tax Credit (PTC)*, http://energy.gov/savings/renewable-electricity-production-tax-credit-ptc/.
[25] Id.
[26] Id.
[27] Id.
[28] Senate Finance Committee, *Expiring Provisions Improvement Reform and Efficiency (EXPIRE) Act As Reported from Committee*, May 21, 2014, p. 11, http://www.finance.senate.gov/legislation/download/?id=d1ff5206-6941-47ae-9f3f-aa19d5b24875. As we

enough to pay 124 million Americans' average monthly electricity bill for a whole month.[29] Alternatively, this is the same as the total tax bill of 4.8 million families with median incomes for a single year.[30]

From the perspective of tax reduction, concentrating tax credits into inefficient energy sources is counterproductive at best. The only reason the wind PTC "stimulates" the wind sector is that the IRS still hobbles its competitors; if the same tax expenditure were instead returned more broadly through an across-the-board tax rate reduction, it would do far more to help average Americans and "create jobs." It is particularly ironic that many progressives favor increasing tax rates on upper-income earners to help reduce the budget deficit, while supporting the wind PTC—which itself effectively leads the federal government to finance its spending through more debt.[31]

## Wealthy Investors like Warren Buffett Come Out Ahead with the PTC

***Buffett's position demonstrates that the incentive is most beneficial to wealthy wind developers who are able to reduce their tax rate at the expense of the rest of taxpayers. In essence, the PTC allows the wind industry to allocate investment dollars based on political favors rather than carefully spend scarce financial resources by responding to market signals.***

The PTC primarily benefits wealthy, politically connected investors by giving them a legal way to shift their tax burden onto everyone else.[32] Although Warren Buffett retains assets in a number of different energy sources, he has made significant investments in renewable sources, including wind energy through a majority-owned subsidiary called Berkshire Hathaway Energy.[33]

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explained in footnote 1, the wind PTC lies in between the extremes of the spectrum of a pure tax credit (which merely gives back tax payments to a tax-paying entity) and an outright welfare check underwritten by the general taxpayers. Because the wind PTC is so large relative to the economics of the industry, many wind operations cannot take full advantage of it—their eligible tax credit is higher than their tax liability. Thus they structure complex deals with Wall Street investment banks, effectively auctioning off their tax credits to outside financiers.

[29] EIA, "2012 Average Monthly Bill- Residential," http://www.eia.gov/electricity/sales_revenue_price/pdf/table5_a.pdf.
[30] See Appendix.
[31] Glenn Schleede, *Energy Tax Reform: Scrap the Baucus Proposal (Part IV: Negative Wealth Effects)*, MasterResource, January 22, 2014, https://www.masterresource.org/wealth-effectsredistributionism-wind/backus-energy-tax-reform-4/.
[32] American Energy Alliance, *Wind PTC Gives to the Rich at the Expense of the Taxpayer*, October 15, 2014, http://americanenergyalliance.org/2014/10/15/wind-ptc-gives-to-the-rich-at-the-expense-of-the-taxpayer/.
[33] Anupreeta Das, *Warren Buffett Puts Wind in Berkshire's Sails*, The Wall Street Journal, October 23, 2014, http://online.wsj.com/articles/buffett-puts-wind-in-berkshires-sails-1414084146.

According to Buffett, he has sunk "billions into wind-farm projects"[34] because tax credits provide a substantial incentive to invest:

> I will do anything that is basically covered by the law to reduce Berkshire's tax rate. For example, on wind energy, we get a tax credit if we build a lot of wind farms. That's the **only reason** to build them. **They don't make sense without the tax credit**.[35] [Emphasis added]

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Ironically, taking advantage of tax breaks for an industry at the expense of taxpayers cuts sharply against the sentiment of the Buffett Rule, which, according to the White House page explaining the rule, is "a simple principle of tax fairness that asks everyone to pay their fair share."[37] While the White House theoretically supports the idea that "for the 98 percent of American families who make less than $250,000, taxes should not go up,"[38] in practice, federal policies like the PTC promote a redistribution of resources to the wealthy.

## Americans Reject Special Interest Handouts like the PTC

While the wind PTC benefits special interests, the public is solidly opposed to the tax credit. According to a survey by the American Energy Alliance, "the majority of voters are skeptical of preferential subsidies like the two-decades old wind PTC" based on the following results:

- 65 percent believe that 20 years' worth of tax credits is long enough
- 77 percent do not trust Congress to hand out tax advantages in the most efficient and effective way
- 56 percent think that companies who are already turning a profit should not get tax breaks for using or producing that technology[39]

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[34] Id.
[35] Stephen Gandel, *Warren Buffett: We took a stand on Coke's pay package*, Fortune, April 28, 2014, http://fortune.com/2014/04/28/warren-buffett-we-took-a-stand-on-cokes-pay-package/.
[36] Travis Fisher, *Top Five Questions for AWEA's Tom Kiernan*, Institute for Energy Research, May 15, 2014, http://instituteforenergyresearch.org/analysis/top-five-questions-aweas-tom-kiernan/.
[37] White House, *The Buffett Rule*, http://www.whitehouse.gov/economy/buffett-rule.
[38] Id.
[39] Thomas Pyle, *Americans Skeptical of Federal Energy Dictates*, American Energy Alliance Energy Townhall, September 9, 2014, http://americanenergyalliance.org/2014/09/09/americans-skeptical-of-federal-energy-dictates/.

***…Americans overwhelmingly oppose tax credits, such as the PTC, that concentrate benefits among wealthy investors instead of providing savings to the majority of taxpayers. This is unsurprising, since a September Pew survey concluded that voters rank the economy, health care, and terrorism as the most important election issues.***

This survey reveals that Americans overwhelmingly oppose tax credits, such as the PTC, that concentrate benefits among wealthy investors instead of providing savings to the majority of taxpayers. This is unsurprising, since a September Pew survey concluded that voters rank the economy, health care, and terrorism as the most important election issues.[40]

## Some States are Hit Harder than Others

Taxpayers in every state have to finance the PTC, but only a few states with ample wind resources receive more tax benefits from the PTC than they pay in federal taxes. To understand the distributional impacts of the PTC and other wind subsidies such as the 1603 grant program, last year IER produced a study examining these impacts for 2012.[41] The distributional impacts of the PTC are striking. If all eligible wind facilities elected to take the PTC instead of the investment tax credit (ITC) and 1603 program, for 2012, 30 states and the District of Columbia would incur net tax losses due to the PTC, and a number of states received no tax credits at all. Conversely, 10 states reaped 72 percent of the tax benefits.[42]

On a state-by-state basis, the largest overall taker of tax benefits at $394.5 million in subsidies was Texas, which accounted for over 70 percent of the Southwest region's haul.[43] Despite California's significant installed wind capacity, it ended up paying more than it received—its taxpayers had the largest federal tax burden in the country, while many of California's wind

[40] American Energy Alliance, *It's Still The Economy, Stupid: Why Green Groups' Millions Can't Change Voters' Priorities*, November 4, 2014, http://americanenergyalliance.org/2014/11/04/its-still-the-economy-stupid-why-green-groups-millions-cant-change-voters-priorities/.
[41] Institute for Energy Research, *Estimating the State-Level Impact of Federal Wind Energy Subsidies*, December 2013, p. 1, http://instituteforenergyresearch.org/wp-content/uploads/2013/12/State-Level-Impact-of-Federal-Wind-Subsidies.pdf. For a detailed explanation of the study's methodology, please reference pages 5-6 of the study. In order to assess how federal wind incentives were dispersed, IER created a model, referred to as a "proxy PTC," that assumed all wind production built over the last 10 years in the United States elected to take the PTC, rather than the investment tax credit or a grant from the Section 1603 program. The model provided a one-year snapshot of the costs and benefits of the proxy PTC, using state-level wind generation data for 2012.
[42] Institute for Energy Research, *STUDY: Majority of States Losing Millions to Big Wind*, http://instituteforenergyresearch.org/studies/study-majority-of-states-losing-millions-to-big-wind/.
[43] IER, *Estimating the State-Level Impact of Federal Wind Energy Subsidies*, p. 13.

facilities are more than 10 years old, and thus not eligible.[44] California was not alone. Even though New York produced the most wind electricity in the Northeast in 2012, it also had a negative balance of $162.5 million, the second largest in the country.[45] In the Midwest, Ohio was the biggest loser, suffering $103.8 million deficit.[46]

Regionally, the Northeast (-$591.8 million) and Southeast (-$559.3 million) were the biggest "net payers," while the Southwest (+$551.4 million) and Midwest (+$426.9 million) were the most sizable "net takers."[47] This regional disparity is one of the clearest indications of the ineffectiveness of a one-size-fits-all policy that applies to areas with vastly distinct capabilities for wind generation. As a result, the majority of states provide the finances for the PTC, even though they generally lack the geographic characteristics and wind supply conducive to wind turbines.[48]

The impact of geographical limitations is particularly egregious in the Southeast. Considering the dearth of quality wind resources in the region, the PTC is a huge net drain. In fact, every one of the 11 states in the Southeast was a net payer under the PTC in 2012,[49] and 10 Southeastern states had no PTC-eligible MWh at all.[50] For example, Floridians received no tax benefits from the PTC, since the state had no wind generation in 2012, but due to its massive share of the national tax burden, Florida taxpayers paid the largest amount of any Southeastern state.[51]

Even for states that have a lower overall national tax burden, the cost is considerable. Kentucky did not generate any PTC-eligible MWh in 2012, yet it still paid nearly $30 million in order to fund wind developers in other states. Louisiana was hit with a $39 million bill.[52] North Carolina lost $69.6 million.[53] Burdening taxpayers in regions without viable wind potential with a substantial share of the PTC is both inequitable and inefficient. Taxpayers from states like Florida, Kentucky, Louisiana, and North Carolina end up paying for costly new energy sources but never reap any tax benefits.

[44] Id., p. 14.
[45] Id., pp. 9-10.
[46] Id., p. 11.
[47] Id., p. 9.
[48] Id., p. 8.
[49] Id., p. 10.
[50] Id., pp. 7-8.
[51] Id., p. 11.
[52] Id., p. 7.
[53] Id., p. 10.

## 2. The PTC Raises the Cost of Electricity

Supporters of the wind PTC argue that new wind turbines are the cheapest way to generate electricity[54] and to replace the rapidly retiring fleet of coal-fired power plants.[55] However, adding wind power to the grid raises the total cost of delivering electricity in two important ways. First, wind is a more expensive source of electricity than new natural gas-fired power plants, or existing coal plants, nuclear facilities, and hydroelectric plants. Second, the unreliable nature of wind power imposes new costs on the grid and hurts current sources of electricity generation.

### The High Cost of Wind Power

PTC advocates often cite the levelized cost of energy (LCOE) to argue that wind energy is cheaper than alternatives. LCOE is an estimate of the cost of electricity from new electricity generators produced by both the Energy Information Administration (EIA)[56] and the National Renewable Energy Laboratory (NREL).[57] This method, however, fails to measure the true cost of wind energy on the grid for three main reasons: 1) Comparing the levelized cost of electricity from natural gas, coal, or nuclear to wind is an apples to oranges comparison, 2) LCOE ignores the low cost of existing sources of generation, and 3) the LCOE for wind power is based on unrealistic assumptions.

Comparing the cost of electricity from intermittent wind (a non-dispatchable source) to sources that can be controlled (dispatchable sources) is an apples-to-oranges comparison because there is a lot of value to being able to rely on electricity sources to help keep the lights on. Here's how EIA explains this issue:[58]

> Since load must be balanced on a continuous basis, units whose output can be varied to follow demand (dispatchable technologies) generally have more value to a system than less flexible units (non-dispatchable technologies), or those whose operation is tied to

[54] Denise Bode, *The Promise of Wind,* Indiana's Wind Energy Leadership, http://www.in.gov/oed/files/Denise_Bode_Presentation.pdf

[55] American Wind Energy Association, "Wind energy is one of the biggest, fastest, cheapest ways states can meet carbon pollution rule for existing power plants," Press Release, May 27, 2014, http://www.awea.org/MediaCenter/pressrelease.aspx?ItemNumber=6482

[56] Energy Information Administration, "Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2014," Annual Energy Outlook 2014, May 7, 2014, http://www.eia.gov/forecasts/aeo/electricity_generation.cfm.

[57] National Renewable Energy Laboratory, "Levelized Cost of Energy Calculator," http://www.nrel.gov/analysis/tech_lcoe.html

[58] Energy Information Administration, Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2014, Apr. 17, 2014, http://www.eia.gov/forecasts/aeo/electricity_generation.cfm.

> the availability of an intermittent resource. The LCOE values for dispatchable and non-dispatchable technologies are listed separately in the tables, because caution should be used when comparing them to one another.

Despite EIA's words of caution about directly comparing reliable sources and intermittent sources, frequently people make the comparison. The way to make an apples to apples comparison between wind and natural gas, coal, or nuclear would be to include the cost of backup power with other wind costs to make a valid direct comparison.

To the second point, most levelized cost calculations focus on the costs of new generation. It does not provide a useful comparison of the cost of existing coal, gas, and nuclear plants against wind power. Even if the EIA's estimate of wind power's LCOE—around $80 per MWh[59]—is assumed to be accurate, wind cannot supply electricity as cheaply as current wholesale electricity prices, which hover around $50 per MWh.[60] These low wholesale prices reflect the low cost of providing electricity using the existing infrastructure of natural gas, coal, and nuclear plants.

Further, a recent IER study shows that the EIA makes many questionable assumptions in formulating its LCOE for wind power. Using more realistic assumptions, the IER study found the following[61]:

> While expenses faced by wind project developers are an important element of the overall cost of wind power, addition of wind power to the power grid involves a number of other costs. If a more reasonable estimate of the installed cost of capital is $88 per MWh and operating costs are $21 per MWh, we can estimate a reasonable LCOE for wind power near $109 per MWh rather than NREL's estimate of $72—**a more than 50 percent increase.** [emphasis added]

A study by George Taylor and Tom Tanton found that, when factoring in a 20-year lifespan for wind turbines and a lack of subsidies, wind power costs $101 per MWh. When backup generation is accounted for, the cost goes up to $149-$153.[62]

Levelized cost estimates don't incorporate the full costs of long-distance transmission[63] associated with wind power.[64] Because high-quality wind resources are often located far away

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[59] http://www.eia.gov/forecasts/aeo/electricity_generation.cfm
[60] http://www.eia.gov/electricity/wholesale/
[61] Michael Giberson *Assessing, WInd Power Cost Estimates,* Center for Energy Commerce Texas Tech University, October, 2013, http://instituteforenergyresearch.org/wp-content/uploads/2013/10/Giberson-study-Final.pdf.
[62] George Taylor & Thomas Tanton, *The Hidden Costs of Wind Electricity,* American Tradition Institute, December 2012, http://www.atinstitute.org/wp-content/uploads/2012/12/Hidden-Cost.pdf
[63] http://instituteforenergyresearch.org/electricity-transmission/

from places where people use electricity, wind power is more expensive to transmit than conventional sources that can be sited closer to demand. The costly transmission investments needed to bring wind power to the grid factor into electricity rates and frequently translate into higher rates for customers.[65] According to Berkeley Labs researchers, transmission expenses range from $0 to $79 per MWh—the median cost being around $15 per MWh.[66]

One example of the high cost of new transmission projects is the Competitive Renewable Energy Zone in Texas (CREZ). This electricity transmission project linked the large wind facilities in west Texas to the population centers in east Texas. The CREZ project cost nearly $7 billion.[67]

Lastly, the cost of building new wind facilities and new transmission lines to get the electricity from the windy areas to the population centers of the United States also creates additional costs because total U.S. electricity generation has not increased in nearly 10 years.[68] This lack of an increase in electricity generation means that adding new sources to the generation system is duplicative in many cases.

## The PTC Imposes New Costs on the Grid

***In Germany, despite more than two decades of subsidies, solar and wind power only accounted for 11 percent of overall electricity generation in 2011. As the German government began pursuing aggressive green energy targets by closing reliable power plants, electricity costs dramatically increased.***

The levelized cost of electricity focuses on each source of electricity on its own (one at a time). As such, it fails to reflect the costs that wind imposes on other components of the power grid, including other sources of generation. In addition to the long distance between the best wind

[64] EIA's estimates for the transmission costs associated with wind are actually lower than the same costs for natural gas combustion turbines, which can be sited nearly anywhere. Source: http://www.eia.gov/forecasts/aeo/electricity_generation.cfm

[65] David E. Dismukes, *Removing Big Wind's 'Training Wheels'*, American Energy Alliance, November 1, 2012, http://americanenergyalliance.org/wp-content/uploads/2012/10/Dismukes-Removing-Big-Winds-Training-Wheels.pdf.

[66] Mills, Wiser, and Porter (2009). Transmission expenses are highly dependent on siting issues, distance to market, and existing transmission capability. For these reasons, the wide range in cost estimates is not surprising.

[67] Jim Malewitz, $7 Billion CREZ Project Nears Finish, Aiding Wind Power, The Texas Tribune, Oct. 14, 2013, http://www.texastribune.org/2013/10/14/7-billion-crez-project-nears-finish-aiding-wind-po/.

[68] *See* Energy Information Administration, *Monthly Energy Review, Table 7.2a Electricity Net Generation: Total (All Sectors)*, Oct. 28, 2014, http://www.eia.gov/totalenergy/data/monthly/pdf/sec7_5.pdf.

resources and population centers, the inherent variability and unpredictability of wind power necessitates additional (backup) generation resources.

We can see how adding more and more wind power to the energy mix has played out in the real world. Electricity prices are high and rising in countries that have aggressive policies subsidizing wind, like Germany, Spain, and Canada. It's the same story in many of the largest wind-producing states in the U.S.

In Germany, despite more than two decades of subsidies, solar and wind power only accounted for 11 percent of overall electricity generation in 2011. As the German government began pursuing aggressive green energy targets by closing reliable power plants, electricity costs dramatically increased. According to the *Wall Street Journal,*

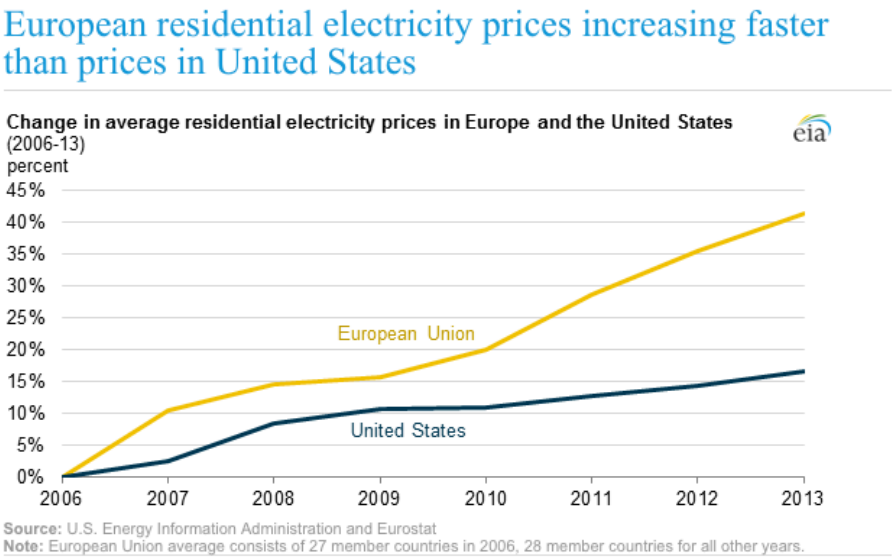
> Average electricity prices for companies have jumped 60% over the past five years because of costs passed along as part of government subsidies of renewable energy producers. Prices are now more than double those in the U.S.[69]

Due to theses price increases, as many as 800,000 citizens have been unable to pay their electricity bills and have had their power cut off.[70] The situation has gotten so out of hand that the International Energy Agency (IEA) has warned of consumer backlash if the government fails to contain energy costs.[71] Also, German industries such as BASF are curtailing investments in Germany as a result of the country's energy policies.[72]

***In the U.S., many states that have seen the greatest increases in wind power have also seen prices rise. In fact, with the exception of Oklahoma, every one of the top ten wind power states has had electricity prices increase by at least 14 percent. Given that this rise is five times faster than the national average, it is a trend that cannot be ignored by policymakers.***

[69] Matthew Karnitschnig, *German's Expensive Gamble on Renewable Energy,* Wall Street Journal, Aug. 26, 2014, http://online.wsj.com/articles/germanys-expensive-gamble-on-renewable-energy-1409106602.
[70] IER, *Energy Failure: A Lesson for U.S. Policymakers, April 2014, http://instituteforenergyresearch.org/wp-content/uploads/2014/04/German-Green-Energy-Study.pdf*
[71] International Energy Agency, *IEA Says Further Action is Needed if Germany's Energiewende Is to Maintain a Balance Between Sustainability, Affordability, and Competitiveness,* May 24 2013
[72] Matthew Karnitschnig, *German's Expensive Gamble on Renewable Energy,* Wall Street Journal, Aug. 26, 2014, http://online.wsj.com/articles/germanys-expensive-gamble-on-renewable-energy-1409106602.

The chart below from the U.S. EIA highlights the rapidly increasing electricity prices in Europe as compared to the U.S. The EIA explains that regulatory structures, taxes, and investment in renewable energy technologies influence electricity prices.[73]




In Spain, a program to subsidize renewable energy began in 2000 and was expanded in 2008. One consequence of these policies has been a large increase in rates—electricity prices have risen by more than 90 percent in the last 6 years.[74]

A similar story has unfolded in Canada, where government-subsidized wind power provides just under 4 percent of Ontario's power, but accounts for about 20 percent of the cost of electricity.[75]

In the U.S., many states that have seen the greatest increases in wind power have also seen prices rise. In fact, with the exception of Oklahoma, every one of the top ten wind power states

[73] Energy Information Administration, Today in Energy, November 18, 2014, http://www.eia.gov/todayinenergy/detail.cfm?id=18851.
[74] IER, *Spain's Green Energy Experiment: A Cautionary Tale,* August 27, 2014, http://instituteforenergyresearch.org/wp-content/uploads/2014/08/Renewables-in-Spain.pdf
[75] Ross McKitrick & Tom Adams, *What Goes Up…*, Fraser Institute, October 2014, http://www.fraserinstitute.org/uploadedFiles/fraser-ca/Content/research-news/research/publications/what-goes-up-ontarios-soaring-electricity-prices-and-how-to-get-them-down.pdf

has had electricity prices increase by at least 14 percent. [76] Given that this rise is five times faster than the national average,[77] it is a trend that cannot be ignored by policymakers.

Simply put, the framework used by wind PTC proponents to demonstrate the "low" price of wind power does not reflect reality. While we can see how wind power increases electricity prices, perhaps more concerning are its effects on grid reliability.

## 3. The PTC Threatens Power Grid Reliability

Subsidizing wind power on a per-megawatt basis threatens the reliability of our electric grid. The stability of the U.S. power system depends on the ability of electricity suppliers to match demand second by second, every day. Because wind power depends on the weather (and there is still no cost-effective way to store electricity for times when the wind isn't blowing), wind energy is not capable of continuously meeting demand.

Wind power also tends to be more available at night, when demand is low. Despite the low value of electricity overnight, the PTC gives wind developers the same tax credit to produce electricity at night as it does to produce it during times when electricity is the most valuable. This means that wind generators are not concerned about trying to produce electricity when demand is high and electricity is available, but rather to produce as much electricity as possible whenever the wind is blowing regardless of whether the electricity is needed or not. The unreliable nature of wind power, fueled by the PTC, threatens the reliability of our electric grid because it makes it more difficult to balance supply and demand. The PTC also makes affordable and reliable electricity sources less economical by allowing wind producers to pay utilities to take their power.

### Wind Provides Power at the Wrong Times

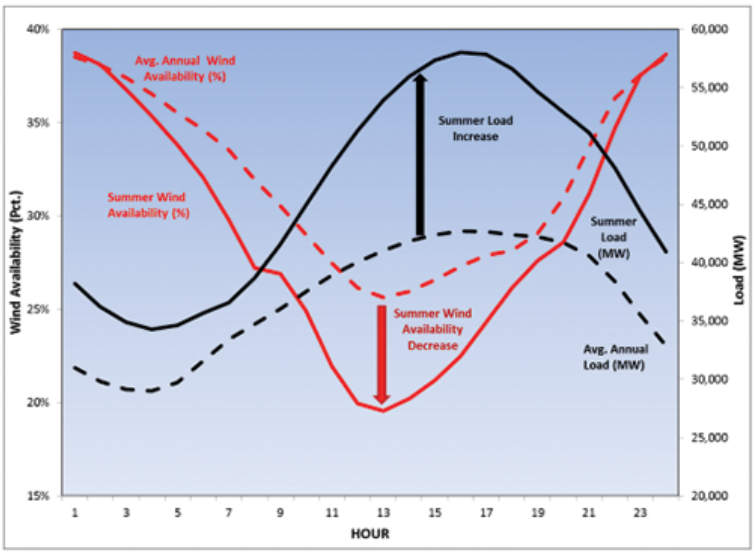
***Wind production tends to peak in the spring and the fall, when the need for energy is at its lowest, and it decreases in the winter and summer when heating and cooling needs drive up electricity use.***

[76] James Taylor, "Electricity Prices Soaring In Top Wind Power States," Forbes, October 17, 2014, http://www.forbes.com/sites/jamestaylor/2014/10/17/electricity-prices-soaring-in-top-10-wind-power-states/

[77] EIA, *Residential Electricity Prices are Rising,* September 2, 2014, http://www.eia.gov/todayinenergy/detail.cfm?id=17791

It is impossible to predict exactly how much wind will be blowing at a given location at a given time, but wind energy tends to produce the most power when it is needed the least, as Dr. Jonathan Lesser explained in detail in a 2012 study.[78] In the three regions he analyzed (the Electric Reliability Council of Texas, the Midwest ISO, and the PJM Interconnection—a huge amount of the power grid in America), he found that "over 84% of the installed wind generation infrastructure fails to produce electricity when electric demand is greatest."[79]

The graph below compares the average availability of wind with the average load (total demand for power) over a 24-hour period. The dashed black line shows the average annual load, while the dashed red line shows average annual wind availability, demonstrating that wind power availability peaks at times of days when the load is at its lowest and decreases when demand rises. The solid lines show the same relation but adjusted for just the summer season, when the contrast is even more extreme: less wind power is available and more power is demanded.




**2009-12, Summer and Annual Load and Wind Availability - ERCOT** [80]

Wind production tends to peak in the spring and the fall, when the need for energy is at its lowest, and it decreases in the winter and summer when heating and cooling needs drive up electricity use. The same problem occurs on a day-to-day basis: more wind energy is produced at night, when power demand is down, than during peak hours during the day. This directly threatens grid reliability: at times when demand for power is low, the grid is flooded with an

[78] Jonathan A. Lesser, *Wind Intermittency and The Production Tax Credit: A High Cost Subsidy for Low Value Power,* Continental Economics, October 2012, http://www.continentalecon.com/publications/cebp/Lesser_PTC_Report_Final_October-2012.pdf.
[79] Id., p. 4.
[80] Jonathan A. Lesser, *Wind Intermittency and the Production Tax Credit: A High Cost Subsidy for Low Value Power*, Continental Economics, October 2012, p. 7, http://www.continentalecon.com/publications/cebp/Lesser_PTC_Report_Final_October-2012.pdf.

excess of wind generated power which forces base load plants running on coal and natural gas to operate at inefficient levels. Plants running at these inefficient levels produce far more CO2 emissions than they normally do, which offsets much of the reduction in CO2 emissions to which wind power might lead. A 2011 report from BENTEK Energy revealed that any decreases in CO2 levels resulting from wind power were negligible in size or economically impractical.[81]

The chart below shows electricity demand and wind generation during one week in July 2012 for the PJM region. The black line details the total electricity load or demand on an hourly basis, while the green line follows the amount of wind generated per hour.

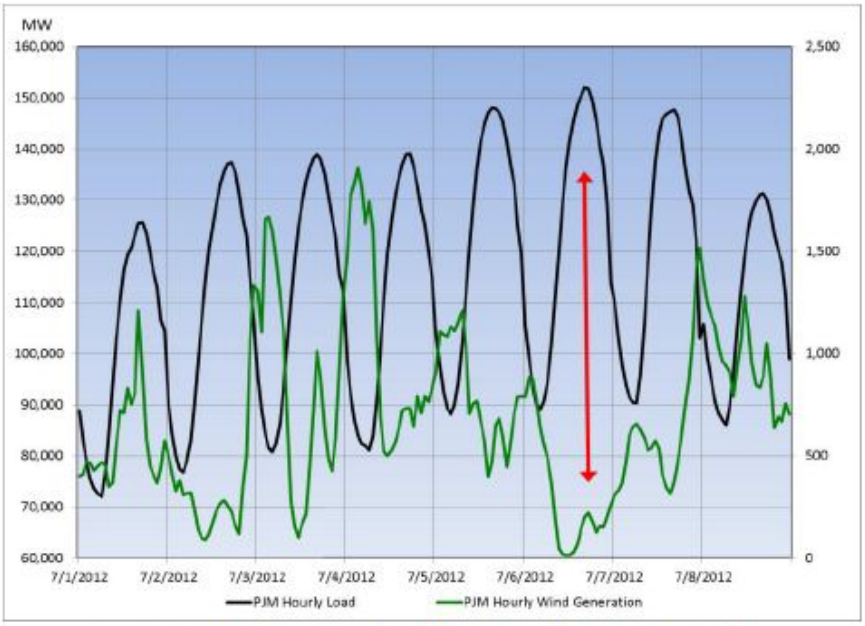



**Figure 3: PJM Hourly Load and Wind Generation, July 1-8, 2012** [82]

The figure illustrates, specifically through the red arrow, that when hourly load is higher, wind generation is frequently low. Lesser explains, "wind generation typically peaks during the night when the demand for electricity is lowest," but "when the demand for electricity is greatest in late

[81] Business Wire, *The Wind Power Paradox: BENTEK Analysis Shows CO2 Savings Through Wind Power Are Either So Minimal As To Be Irrelevant or Too Expensive To Be Practical,* July 19, 2011, http://www.businesswire.com/news/home/20110719007251/en/Wind-Power-Paradox-BENTEK-Analysis-Shows-CO2#.VGokQ1fF_Pk.

[82] Institute for Energy Research, *Study: Wind Generates Electricity When We Need it Least*, instituteforenergyresearch.org, October 24, 2012, http://instituteforenergyresearch.org/analysis/study-wind-subsidies-disproportionately-produce-electricity-when-we-need-it-least/. It should be noted that the scale for electricity load and wind generation is different. Even during times of high output wind does not meet the electricity demand in the PJM region.

afternoon, much less wind generation is available."[83] The gap between hourly demand and wind generation exemplifies the inherent problem with relying on wind turbines to reliably meet hourly load.

### Wind Energy Cannot Keep the Lights On

In order to supply electricity when people demand it, some power plants have to be ready to quickly increase and decrease production to match consumer demand in real time. To accomplish this feat, different plants provide varying amounts of power at different times of the day. Wind power does not fill any of the roles below because it is not "dispatchable" (a grid operator cannot "turn on" a wind facility because its output depends entirely on weather conditions). There are three types of power plants:

- **Baseload plants** are those which provide consistent power in an efficient and cost-effective manner, handling electricity demand at all times of the day or night. These plants are usually coal-fired or nuclear-powered.
- **Intermediate load plants**, such as combined cycle natural gas facilities, can ramp up and down in a relatively efficient way depending on electricity demand, but they are most efficient when they operate for extended periods.
- **Peak load plants**, which are usually simple cycle natural gas or oil-burning plants, are even more flexible and can increase or decrease output very quickly, but they operate less efficiently than baseload or intermediate generators.[84]

Wind power only produces electricity when the wind is blowing, so these other sources of electricity have to back it up to satisfy demand. When demand is low and winds are high, reliable power plants are sometimes forced to back off, as wind turbines generate unneeded power. It is inefficient for any plant to ramp up and down more than is needed to meet demand. Instead of helping utilities match supply and demand, wind makes it more difficult to operate the grid reliably.

### The PTC Makes Wind a "Cannibal" on the Grid

***In the absence of aggressive and expensive upgrades in the transmission grid, negative pricing will only increase as more wind capacity is installed. The New York Times referred to this as "clean energy's cannibal behavior."***

[83] Jonathan A. Lesser, *Wind Intermittency and the Production Tax Credit: A High Cost Subsidy for Low Value Power*, Continental Economics, October 2012, p. 6, http://www.continentalecon.com/publications/cebp/Lesser_PTC_Report_Final_October-2012.pdf.
[84] Institute for Energy Research, *Electricity Generation*, Story of Electricity, September 2, 2014, http://instituteforenergyresearch.org/electricity-generation.

The PTC is such a large subsidy that wind producers can *pay* the power grid to take their power—up to $35 per MWh—and still profit.[85] This is a well-documented problem called "negative pricing." It occurs when unwanted wind power floods wholesale markets, real-time electricity supply outstrips electricity demand, and prices actually drop below zero.[86] In other words, the electricity producers start paying the electricity grid to take their electricity. Because of the wind PTC, wind generators can actually make money during negative pricing while forcing their competitors, such as natural gas, nuclear, and coal to either cut production or lose money.

In the absence of aggressive and expensive upgrades in the transmission grid, negative pricing will only increase as more wind capacity is installed.[87] The New York Times referred to this as "clean energy's cannibal behavior."[88]

By encouraging unreliable wind power to produce electricity at times that hurt the grid and other sources of generation, the PTC creates a "biting the hand that feeds you" scenario.[89] This perverse incentive of the PTC is most evident in the case of nuclear energy. As baseload generators, nuclear plants are dependable, efficient, and designed to run without a lot of fluctuation of output. Both technical and cost recovery factors influence nuclear operators to continuously run their facilities at full output.[90] An excess of wind power at off-peak times forces baseload nuclear plants to sell their electricity at uneconomical, and sometimes negative, prices. Since the PTC encourages wind generators to sell their power for negative prices,[91] nuclear generators are adversely affected when they operate continuously.

***Negative pricing makes it difficult for nuclear plants to remain competitive and profitable and has already had consequences, with Dominion's Kewaunee Nuclear Plant closing two decades ahead of schedule and Entergy's Vermont Yankee Nuclear Plant slated to close soon.***

[85] Michael Giberson, *Assessing Wind Power Cost Estimates*, Center for Energy Commerce Texas Tech University, October 2013, http://instituteforenergyresearch.org/wp-content/uploads/2013/10/Giberson-study-Final.pdf.
[86] Frank Huntowski, Aaron Patterson, & Michael Schnitzer, *Negative Electricity Prices and the Production Tax Credit*, The NorthBridge Group, September 14, 2012, http://www.hks.harvard.edu/hepg/Papers/2012/Negative_Electricity_Prices_and_the_Production_Tax_Credit_0912.pdf.
[87] Travis Fisher & Alex Fitzsimmons, *Wind PTC Threatens Grid Reliability*, Institute for Energy Research, September 19, 2013, http://instituteforenergyresearch.org/analysis/wind-ptc-threatens-grid-reliability/.
[88] Matthew L. Wald, *New Energy Struggles on its Way to Markets*, The New York Times, December 27, 2013, http://www.nytimes.com/2013/12/28/us/new-energy-struggles-on-its-way-to-markets.html.
[89] Travis Fisher & Alex Fitzsimmons, *Wind PTC Threatens Grid Reliability*, Institute for Energy Research, September 19, 2013, http://instituteforenergyresearch.org/analysis/wind-ptc-threatens-grid-reliability/.
[90] Energy Information Administration, *Negative prices in wholesale electricity markets indicate supply inflexibilities*, Today in Energy, February 23, 2012, http://www.eia.gov/todayinenergy/detail.cfm?id=5110.
[91] Id.

This is a real problem: in 2013, the Quad Cities nuclear power plant experienced negative pricing 4.28 percent of the time, and fleet-wide it occurred just shy of 2 percent of the time.[92] That may sound like a small percentage, but the economic damage from even small amount of negative pricing can be significant. Particularly in the context of nuclear plants, negative pricing is evidence of broader market distortion, which is pervasive problem that exists even when prices are at or above zero.[93]

Negative pricing makes it difficult for nuclear plants to remain competitive and profitable and has already had consequences, with Dominion's Kewaunee Nuclear Plant closing two decades ahead of schedule and Entergy's Vermont Yankee Nuclear Plant slated to close soon.[94] Both Dominion and Entergy cited economic considerations, which are affected by the artificially low prices created by the PTC, as reasons for the premature closures.[95] Subsidized wind energy destroys some of the value of nuclear plants to the grid without creating value itself, and the PTC is to blame.

The problem is evident with natural gas as well. Because of artificially low prices for wind power, natural gas plants cannot rely on consistent demand for their power. These prices in turn drive down the incentive to invest in natural gas technology and infrastructure—infrastructure that, ironically, is necessary to back up the intermittent output of wind facilities. This phenomenon was examined in a 2012 article in the Energy Journal, which found that increases in wind generation in Texas discouraged investment in natural gas. As the article states:

> …rising wind generation…can discourage natural gas-fired generation investment…. Even though CCGT and CT [combined cycle gas turbine and combustion turbine generation] are required to integrate large amounts of intermittent wind energy into an electric grid, there may not be sufficient investment in CCGT and CT to maintain system reliability.[96]

[92] Michael Goggin, *The Facts About Wind Energy's Impacts on Electricity Markets*, AWEA, March 2014, http://awea.files.cms-plus.com/FileDownloads/pdfs/AWEA%20white%20paper-Cutting%20through%20Exelon%27s%20claims.pdf
[93] Daniel Simmons, *AWEA's Spin Machine*, Institute for Energy Research, May 1, 2014, http://instituteforenergyresearch.org/analysis/aweas-spin-machine/
[94] Travis Fisher, *AWEA's Bold Push for More Wind Welfare*, Institute for Energy Research, April 23, 2014, http://instituteforenergyresearch.org/analysis/aweas-bold-push-for-more-wind-welfare/
[95] Id.
[96] Chi-Keung Woo, Ira Horowitz, Brian Horii, Ren Orans & Jay Zarnikau, *Blowing in the Wind: Vanishing Payoffs of a Tolling Agreement for Natural-Gas Fired Generation of Electricity in Texas,* Energy Journal, 2012, http://warrington.ufl.edu/centers/purc/purcdocs/papers/1124_Woo_Blowing_in_the.pdf

## 4. The PTC Destroys More Jobs than it Creates

***The question isn't whether the PTC "creates jobs"—it's whether it creates more jobs than it takes away from the rest of the economy.***

The wind PTC does not create jobs on net, compared to an alternative policy in which the federal government refrains from using the tax code to pick winners and losers. Although the American Wind Energy Association claims that failing to reauthorize the tax credit would "kill jobs,"[97] the money used to subsidize those jobs comes from taxpayers, not from thin air.[98] Rather than arbitrarily limiting tax credits to wind producers, generally returning the money to taxpayers would have "created jobs" as well—jobs that produce goods and services that Americans actually want. As we have pointed out:[99]

> At the end of last year [2012], the federal wind production tax credit was extended for another year. According to the Joint Committee on Taxation, this **one-year extension of the PTC would cost $12.1 billion**. The American Wind Energy Association, the lobby for the wind industry, claims that 37,000 jobs would have been lost if the PTC was not extended. This means that **each job "saved" cost the U.S. Treasury $327,000**. While the PTC...might "create" some identifiable jobs, they do not create jobs "on net." **The money to pay for the...PTC, has to come from somewhere**. In other words, if taxpayers had been able to keep the money instead of it going to subsidies, the taxpayers would have spent the money and **that spending would have created other jobs.** [Emphasis added]

The question isn't whether the PTC "creates jobs"—it's whether it creates more jobs than it takes away from the rest of the economy. In Spain, for example, where the government pushed "green energy subsidies" aggressively, **2.2 jobs were lost for every "green job"** that the

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[97] AWEA, *Federal Production Tax Credit for Wind Energy*, http://www.awea.org/Advocacy/content.aspx?ItemNumber=797

[98] Strictly speaking, there is an important distinction to be made between a business receiving a reduction in its tax liability versus receiving an explicit subsidy check funded by other taxpayers. However, in practice this distinction is not very relevant for the PTC, because many projects use sophisticated financial maneuvering in order to offload the tax credit from the actual operation onto outside investors, effectively auctioning off the tax credit. This type of maneuvering is necessary because the operation in question doesn't have a high enough tax liability to take full advantage of the PTC. That's why so many environmentalists are pushing to make the PTC *refundable*, which would turn it into an outright welfare program for renewable power. See http://www.renewableenergyworld.com/rea/blog/post/2012/04/refundable-federal-tax-credit-could-remove-barrier-to-community-wind.

[99] Daniel Simmons, *Testimony before the Ohio Senate Public Utilities Committee*, American Energy Alliance, November 13, 2013, http://americanenergyalliance.org/wp-content/uploads/2013/11/Simmons-Testimony-for-Ohio-Public-Utilities-Committee-SB-58.pdf.

subsidies supported.[100] For the reasons above, it is completely disingenuous for AWEA to sell the PTC as a job creator.

## 5. The PTC Stifles Innovation

***The PTC hides the traditional profit and loss signal that drives other industries and causes industrial wind producers to miss an important component for market maturation.***

As we note in the History section, Charles Brush built a wind turbine in the late 1880s and used it to charge batteries to provide electricity for his house. In doing so, Brush innovated to deal with the unreliability of wind power. The PTC, however, does not provide any incentive to deal with wind's intermittency in creative ways—it merely throws federal tax dollars away by funding a well-known technology with a well-known fatal flaw.

The PTC provides no incentive to conduct research and development into helping wind power add value to the grid by keeping the lights on. Instead, the main incentive for wind producers receiving the PTC is to generate electricity whenever the wind is blowing—not when people need electricity. Even if some advocates and lawmakers are convinced the federal government needs to promote the wind industry, the PTC is a bad way to do it.

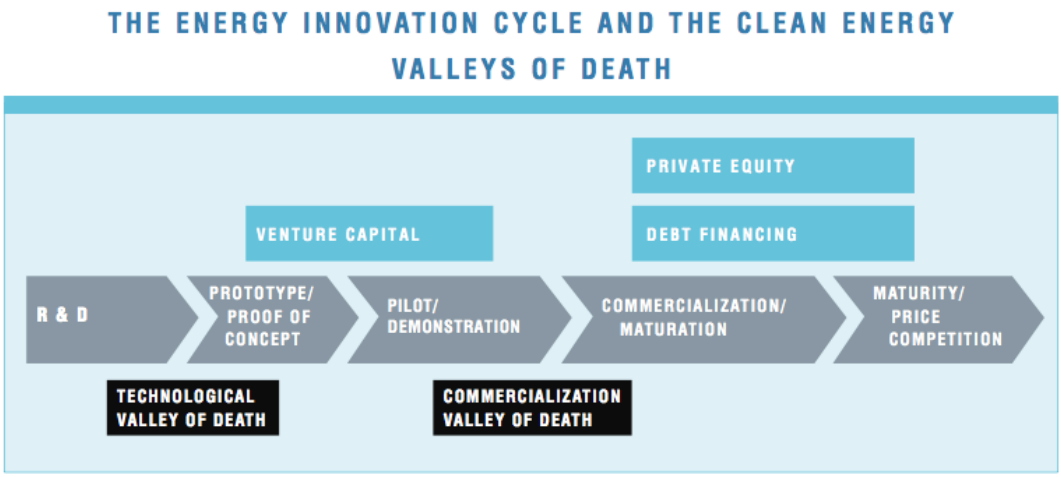
The PTC is a "deployment" subsidy, meaning that it emphasizes building or "deploying" existing technologies rather than developing new technologies. According to a report by the Information Technology & Innovation Foundation, this deployment approach is misguided because

> existing [wind and solar] technologies still cost more, often substantially more, than fossil fuels, while exhibiting sub-optimal performance. Only when clean energy is cheaper than fossil fuels will it be massively deployed globally…[101]

Focusing on deployment ahead of innovation is backwards—like trying to reap a harvest before sowing the seeds. Technological development takes time and often requires trial-by-fire on the open market to determine how mature a given technology has become. The Breakthrough Institute Energy and Climate Program identifies five necessary steps for the maturation of

[100] Gabriel Calzada Alvarez, *Study of the effects on employment of public aid to renewable energy sources*, Universidad Rey de Juan Carlos, March 2009, http://www.juandemariana.org/pdf/090327-employment-public-aid-renewable.pdf.
[101] Megan Nicholson & Matthew Stepp, Challenging *the Clean Energy Deployment Consensus, Information Technology & Information Foundation, October 2013, http://www2.itif.org/2013-challenging-clean-energy-deployment-consensus.pdf*.

renewable energy technologies: Research and development, proof of concept/prototyping, pilot/demonstration, commercialization/maturation, and maturity/price competition.[102]




*Source: The Breakthrough Institute*

The model above illustrates these five steps and shows what the Breakthrough Institute refers to as "valleys of death" for new energy technologies. The first of these valleys occur between the research/development stage and proof of concept. The second occurs between demonstration and commercialization.

The takeaway here is that the PTC has (wastefully) dumped money into the far right end of this spectrum for 22 years while ignoring the very real obstacles standing in the way of wind power's technological and commercial development. The PTC therefore encourages the promotion of an unready, immature product against time-tested and reliable power sources. Alternatively, if wind power is truly ready to go toe-to-toe with coal, nuclear, hydro, and natural gas as a fuel source, surely there is no need for a production tax credit.

Additionally, the PTC does not distinguish between competitive wind facilities and uncompetitive ones. While the tax credit generates artificially lower prices for all large-scale wind projects, it does not promote projects that are actually more competitive (and does not allow those that would otherwise fail to do so). In other words, if there are wind facilities that can actually compete with coal-fired or natural gas-fired power plants, it is unclear which ones they are. The PTC hides the traditional profit and loss signal that drives other industries and causes industrial wind producers to miss an important component for market maturation.[103]

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[102] Jesse Jenkins & Sara Mansur, *Bridging the Clean Energy Valleys of Death: Helping American Entrepreneurs Meet the Nation's Energy Innovation Imperative,* Breakthrough Institute, November 2011,http://thebreakthrough.org/blog/Valleys_of_Death.pdf.

[103] Daniel J. Smith, *The Price System, Part 2: Profits & Losses*, June 29, 2011, http://www.learnliberty.org/videos/the-price-system-part-2-profits-losses/

## 6. The PTC Never Protected an "Infant" Industry

Modern wind turbines have been used for electricity generation more than 125 years, and the wind PTC has existed since 1992. In 1995, wind expert Paul Gipe wrote about the wind industry's maturity in his book *Wind Energy Comes of Age*:

> Although wind energy suffered severe growing pains and struggled through a stormy adolescence during the 1980s, it has matured. Wind energy is now ready to take its place alongside fossil and nuclear fuels as a conventional source of electricity.[104]

Gipe is not alone in arguing that the wind industry is mature. Senator Chuck Grassley, the original author of the PTC,[105] stated in 2003 that "we're going to have to [subsidize wind] for at least another five years, maybe for 10 years. Sometime we're going to reach that point where it's competitive." Senator Grassley's statement was eleven years after the PTC was enacted. Now, eleven years after that, the Senate is grappling over Grassley's recent addition of a two-year extension of the PTC to a broader tax extenders package.[106]

***According to data from the BP Statistical Review of World Energy 2014, installed wind turbine capacity increased 3,705 percent from 1997 to 2013, jumping from 1,611 MW to 61,292 MW. If the wind industry was mature before it saw such rapid growth, why does it still need the PTC now?***

A 2012 study by David Dismukes, professor, associate executive director, and director of Policy Analysis at the Center for Energy Studies at Louisiana State University, notes that wind energy is far from an "infant industry":

> Contrary to popular rhetoric, the wind industry is not an "infant industry" in need of continued training wheels, but one that is comprised of 50,000 megawatts ("MWs") of nameplate capacity, representing close to a **five-fold increase since 2006** and a **1,300 percent increase** in riskier merchant wind **over the last ten years**.[107] [Emphasis added]

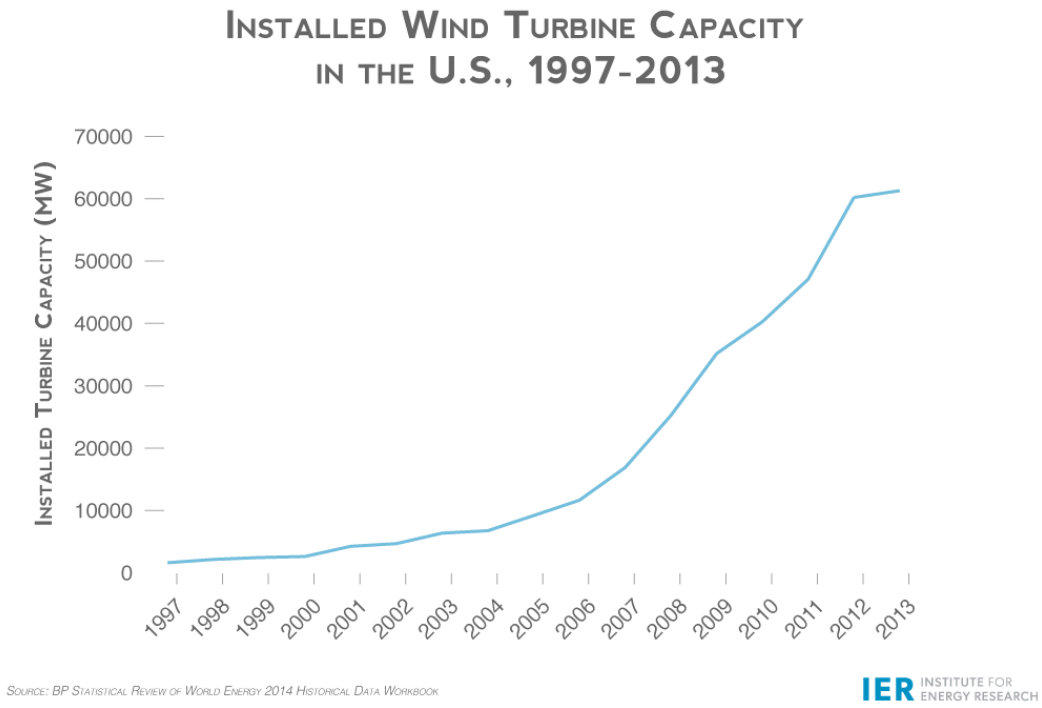
[104] Paul Gipe, Wind Energy Comes of Age, John Wiley & Sons, Inc. 1995

[105] Chuck Grassley, "Wind Energy Production Tax Credit," Press Release, May 15, 2008, http://www.grassley.senate.gov/news/news-releases/wind-energy-production-tax-credit

[106] Travis Fisher, "Top Five Questions for AWEA's Tom Kiernan," Institute for Energy Research, May 15, 2014, http://instituteforenergyresearch.org/analysis/top-five-questions-aweas-tom-kiernan/.

[107] David E. Dismukes, "Removing Big Wind's 'Training Wheels': The Case for Ending the Federal Production Tax Credit," Louisiana State University - Center for Energy Studies, November 1, 2012, http://americanenergyalliance.org/wp-content/uploads/2012/10/Dismukes-Removing-Big-Winds-Training-Wheels.pdf

The "infant industry" rationale[108] for supporting wind power thus has little basis in reality. According to data from the BP Statistical Review of World Energy 2014, installed wind turbine capacity increased **3,705 percent** from 1997 to 2013, jumping from 1,611 MW to 61,292 MW. If the wind industry was mature before it saw such rapid growth, why does it still need the PTC now?[109]




If AWEA is correct when it says, "Wind power in good wind resource areas is now very cost-competitive with any other new generating plant,"[110] then there is no need to continue propping up the wind industry with taxpayer subsidies. If AWEA is wrong, and the wind industry still isn't competitive after twenty-two years of heavy subsidies, then the PTC amounts to a failed experiment and a waste of taxpayer funds.

[108] Sergey Mityakov and Margarita Portnykh, "The Infant Industry Argument and Renewable Energy Production," George C. Marshall Institute, 2012, http://marshall.org/wp-content/uploads/2013/09/The-Infant-Industry-Argument-and-Renewable-Energy-Production.pdf

[109] BP, Statistical Review of World Energy 2014, June 2014, http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy.html

[110] AWEA, *Utilities and Wind Power*, https://awea.org/Issues/Content.aspx?ItemNumber=5310&navItemNumber=679

## 7. The PTC Is One of Many Overlapping Wind Subsidies and Mandates

The wind industry receives many forms of federal and state support besides the PTC. Even though the PTC expired at the end of 2013, many policies at the federal and state level still provide incentives for wind power through the use of grants, loans, initiatives at federal agencies, regulations and direct mandates such as renewable portfolio standards (RPSs). All of these policies together drown out market signals about the real costs and benefits of wind. They also force ratepayers to pay for other peoples'—or even other states'—electricity. Eliminating the PTC would be a good start in untangling this complicated patchwork of policies.

***…wind project developers have in many cases combined the support of more than one Treasury initiative and, in some cases, have received additional support from smaller grant or loan guarantee programs at DOE or USDA.***

In March 2013, the Government Accountability Office (GAO) released a report that examined federal wind-related activities and found 82 initiatives implemented by nine agencies in FY 2011.[111] Five agencies carried out 73 of the initiatives: the Departments of Energy (DOE), Interior, Agriculture (USDA), Commerce, and the Treasury. The initiatives cost about $2.9 billion directly and provided additional subsidies to the wind industry totaling $1.1 billion in 2011 alone.

According to GAO, not only did these programs cost the government a substantial amount of money, but many were also either overlapping or duplicative. Specifically, the report found that at least 68 of the initiatives overlapped with at least one other initiative due to lack of coordination among the agencies. Furthermore, GAO identified seven initiatives that were duplicative in the sense that they offered "financial support from multiple initiatives to the same recipient for deployment of a single project."[112] Additionally, GAO found that

> wind project developers have in many cases combined the support of **more than one Treasury initiative** and, in some cases, have received **additional support from smaller grant or loan guarantee programs** at DOE or USDA. [Emphasis added][113]

Wind subsidies are therefore currently duplicative across multiple agencies and through multiple programs.

[111] Government Accountability Office, *WIND ENERGY: Additional Actions Could Help Ensure Effective Use of Federal Financial Support*, March 2013, http://www.gao.gov/assets/660/652957.pdf.
[112] Id.
[113] Id.

## Federal Support for Renewables Increased through "Stimulus" Package

The Energy Information Administration conducted a renewable energy subsidy analysis for FY2007 to FY2011 and found that federal support for renewables increased by 108 percent. This increase was mainly because of the passage of the American Recovery and Reinvestment Act (ARRA) of 2009, which was meant to "stimulate" the economy during the worst part of the recession.[114] Specifically, the amount of federal subsidy money available to the wind industry skyrocketed to $4.99 billion.[115] Rather than replace other federal and state subsidies for wind power, this surge in the amount of federal financing available merely added to the total.

Much of the ARRA stimulus money for wind came from the Treasury through Section 1603 of the law.[116] The Section 1603 program provided grants equal to 30 percent of the cost of a renewable energy project to developers. The program expired on December 31, 2011. Today, no new projects can take advantage of this subsidy, but projects that were initiated before 2011 can still garner funding from this program, if the project is completed by December 31, 2016.[117]

In FY 2010, wind was subsidized more heavily per unit of energy production than coal, natural gas, nuclear power, geothermal, and hydropower. Only solar energy received more subsidies than wind.[118] In FY 2010, wind received $52.68 per MWh. Despite generating the majority of U.S. electricity for that year, coal only received $0.64 per MWh, and natural gas and petroleum liquids received only $0.63 per MWh.[119]

## Socializing Transmission Costs Favors Wind

***Rather than hold states accountable for their public policy choices, FERC lets states off the hook by allowing them to spread the cost of RPS-related transmission projects over multi-state regions.***

[114] Energy Information Administration, *Direct Federal and Financial Interventions and Subsidies in the Fiscal Year 2010,* Analysis and Projections, August 1, 2011, http://www.eia.gov/analysis/requests/subsidy/.
[115] Id.
[116] Michael Mendelsohn & John Harper, *1603 Treasury Grant Expiration: Industry Insight on Financing and Market Implications*, National Renewable Energy Laboratory, June 2012, http://www.nrel.gov/docs/fy12osti/53720.pdf.
[117] Solar Energy Industries Association, *1603 Treasury Program*, http://www.seia.org/policy/finance-tax/1603-treasury-program.
[118] Testimony of Mary J. Hutzler, *Hearing on Federal Financial Support for Energy Technologies: Assessing the Costs and Benefits,* Comte on Space, Science, and Technology, March 13, 2013, p. 6, http://docs.house.gov/meetings/SY/SY20/20130313/100476/HHRG-113-SY20-Wstate-HutzlerM-20130313.pdf.
[119] Id.

Federal support for wind power also comes from the Federal Energy Regulatory Commission (FERC), the agency that oversees electricity transmission.[120] In 2011, FERC finalized a landmark rulemaking, called Order No. 1000, which could eventually cost consumers $150 billion.[121] In effect, the rule socializes the cost of expensive new transmission grid upgrades driven by state-level RPSs.[122]

Rather than hold states accountable for their public policy choices, FERC lets states off the hook by allowing them to spread the cost of RPS-related transmission projects over multi-state regions. FERC's Order 1000 can be traced back to a piece of failed legislation introduced by Senator Harry Reid in 2009 that would have accomplished the same cost-socialization effect for renewable energy projects.[123]

Wind advocates are well aware of the boost this rule gives them in tipping the scale toward their industry through electricity transmission. AWEA claims:

> FERC has clear authority and responsibility to decide fair cost allocation. Plans must also account for public policy goals set by state or federal laws or regulations, placing renewable energy laws on par with the goals of increasing reliability and curbing power congestion.[124]

The quote above is revealing. To AWEA, pushing renewables onto the power grid is just as important as ensuring the reliability of the grid, even though the two goals are directly at odds. Also of note: Order 1000 was not included in the GAO report cited above (even though it was finalized two years before the GAO report), which indicates that the GAO's list of 82 federal programs supporting the wind industry is not exhaustive.[125]

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[120] Travis Fisher, *FERC Nominee Ronald Binz: Another Anti-Energy Czar,* Institute for Energy Research, July 15, 2013, http://instituteforenergyresearch.org/analysis/ferc-nominee-ronald-binz-another-anti-energy-czar/.

[121] Review and Outlook, *The Wind Power Tax: A regulator socializes transmission-line costs, and a utility fights back,* Wall Street Journal, February 10, 2013, http://online.wsj.com/articles/SB10001424127887324900204578284392827567184.

[122] Travis Fisher, *Would Ron Binz Tip the Scales at FERC?,* Institute for Energy Research, September 18, 2013, http://instituteforenergyresearch.org/analysis/would-ron-binz-tip-the-scales-at-ferc/.

[123] Travis Fisher, *FERC Nominee Ronald Binz: Another Anti-Energy Czar?,* Institute for Energy Research, July 15, 2013, http://instituteforenergyresearch.org/analysis/ferc-nominee-ronald-binz-another-anti-energy-czar/

[124] AWEA, *American Wind Energy Association applauds FERC's new transmission planning and cost allocation policy,* July 21, 2014, http://www.awea.org/MediaCenter/pressrelease.aspx?ItemNumber=4653.

[125] Government Accountability Office, *WIND ENERGY: Additional Actions Could Help Ensure Effective Use of Federal Financial Support*, March 2013, http://www.gao.gov/assets/660/652957.pdf.

### States Mandate Wind Power

While the PTC offers subsidies to wind producers, many states have passed laws mandating that a minimum amount of electricity come from renewable sources. According to the Environmental Protection Agency (EPA), 29 states and the District of Columbia have Renewable Portfolio Standards (RPSs), and 9 states have non-binding renewable portfolio goals.[126] Suppliers in RPS states can fulfill their renewable obligations by either: (1) making a direct financial investment in renewable generation, or (2) purchasing tradable "renewable energy certificates".[127]

***Like the PTC, RPS programs greatly benefit wind power at the expense of reliable sources of electricity such as natural gas, nuclear power, and coal.***

In 2012, the American Energy Alliance conducted a study that found,

> ...wind generation accounts for **90 percent** of all new renewable resources developed under state RPS programs. Therefore, the widespread adoption of RPS mandates has established a substantial and ever increasing market for wind that did not exist when the federal PTC was enacted in 1992.[128] [Emphasis added]

Like the PTC, RPS programs greatly benefit wind power at the expense of reliable sources of electricity such as natural gas, nuclear power, and coal.

States encourage wind through other policies as well. For example, some states require "performance-based incentives" which include feed-in tariffs to "temporarily elevate the price per kWh in order to encourage renewable energy innovation using high cost technologies."[129] States with feed-in tariffs and similar programs include California, Hawaii, and Maine.[130] Some states

[126] Environmental Protection Agency, *Survey of Existing State Policies and Programs that Reduce Power Sector CO2 Emissions*, June 2, 2014, http://www2.epa.gov/sites/production/files/2014-06/documents/existing-state-actions-that-reduce-power-sector-co2-emissions-june-2-2014_0.pdf.
[127] David E. Dismukes, *Removing Big Wind's "Training Wheels": The Case for Ending the Federal Production Tax Credit,* American Energy Alliance, November 1, 2012, http://americanenergyalliance.org/wp-content/uploads/2012/10/Dismukes-Removing-Big-Winds-Training-Wheels.pdf.
[128] Id.
[129] Environmental Protection Agency, *Survey of Existing State Policies and Programs that Reduce Power Sector CO2 Emissions*, June 2, 2014, http://www2.epa.gov/sites/production/files/2014-06/documents/existing-state-actions-that-reduce-power-sector-co2-emissions-june-2-2014_0.pdf.
[130] Energy Information Administration, *Feed in Tariffs and Similar Programs*, June 4, 2013, http://www.eia.gov/electricity/policies/provider_programs.cfm

use incentives in their tax codes to lower financial barriers to renewable energy production.[131] Others interpret a Carter-era federal law, PURPA (discussed in the history section), in ways that greatly benefit the wind industry.[132] Finally, 24 states require that their utilities conduct "portfolio management or integrated resource planning" in order to "incorporate a variety of energy resources" such as renewables.[133]

## EPA's Regulation of Carbon Dioxide from Existing Power Plants

EPA regulations have already made some existing coal plants uneconomical. Collectively, the Mercury and Air Toxics Standards, the Cross State Air Pollution rule, and the proposed regulation of carbon dioxide emissions from existing power plants have caused or will cause more than 72 gigawatts of electricity capacity to retire.[134] In the map below, the red dots show power plant retirements that occurred between the years 2000 and 2014, while the yellow dots indicate power plants that are projected to close in the future.


If finalized, EPA's proposed rule to limit carbon dioxide emissions from existing power plants will drastically alter the electrical system by making energy more expensive in order to spur further

[131] Environmental Protection Agency, *Survey of Existing State Policies and Programs that Reduce Power Sector CO2 Emissions*, June 2, 2014, http://www2.epa.gov/sites/production/files/2014-06/documents/existing-state-actions-that-reduce-power-sector-co2-emissions-june-2-2014_0.pdf.
[132] https://www.masterresource.org/energy-efficiency/purpa-renewable-energy-subsidies/
[133] Id.
[134] Power Plant Closures, Institute for Energy Research, http://instituteforenergyresearch.org/topics/policy/power-plant-closures/.

investment in renewable energy such as wind and energy efficiency measures.[135] The rule is based on four "building blocks" for compliance: (1) a 6 percent efficiency improvement to each existing power plant, (2) operating combined cycle natural gas plants at 70 percent capacity utilization, (3) a green energy production mandate calculated regionally, and (4) a 1.5 percent annual reduction in electricity demand.[136]

EPA recommends that states comply with the rule by choosing policy options that directly encourage wind power, such as new or enhanced RPSs, cap-and-trade initiatives, carbon taxes, and grid-operator carbon fees.[137] Other options would indirectly help wind by raising the cost of conventional sources of energy.

## 8. The PTC Does Not Consider Wind's Environmental Downsides

***Wind turbines have a track record of killing birds that accidentally fly into the structures. A recent study in the journal Biological Conservation estimates that between 140,000 and 328,000 birds are killed annually by wind turbines.***

Although many wind proponents, such as the League of Conservation Voters, have touted the energy source as environmentally friendly, wind power also has significant ecological drawbacks.[138] Wind turbines kill birds and bats, impact the health of nearby residents, and do not reduce carbon dioxide emissions to any meaningful extent.

### Birds

Wind turbines have a track record of killing birds that accidentally fly into the structures. A recent study in the journal *Biological Conservation* estimates that between 140,000 and 328,000 birds

[135] Kaavya Ramesh, *EPA's Misleading PR Campaign on Power Plant Rules,* Institute for Energy Research, July 30, 2014, http://instituteforenergyresearch.org/analysis/epas-misleading-pr-power-plant-rules/.
[136] John Glennon, *CEI's William Yeatman Summarizes 'EPA's Illegitimate Climate Rule',* Institute for Energy Research, August 7, 2014, http://instituteforenergyresearch.org/analysis/ceis-william-yeatman-summarizes-epas-illegitimate-climate-rule/.
[137] Environmental Protection Agency, *Q&A: EPA Regulation of Greenhouse Gas Emissions from Existing Power Plants,* Center for Climate and Energy Solutions, http://www.c2es.org/federal/executive/epa/q-a-regulation-greenhouse-gases-existing-power.
[138] League of Conservation Voters, *Clean Energy Tax Credits*, http://scorecard.lcv.org/roll-call-vote/2014-157-clean-energy-tax-credits.

are killed annually by wind turbines. Equally problematic is the fact that newer, taller turbines are more likely to result in additional bird fatalities.[139]

A study in *Renewable and Sustainable Energy Reviews* estimates that, on average, 3.1 birds are killed per MW of installed capacity per year in the U.S. and puts the maximum number at 11.7 birds dead per MW per year:[140] Since the U.S. had 61,292 MW of installed wind capacity in 2013,[141] these bird death figures would put the range of dead birds that year between 190,000 and 717,116.

Federal law prohibits killing most bird species. Wind facilities, however, are *allowed* to kill protected bird species. The Obama administration has never fined or prosecuted a wind facility for killing eagles or other protected birds. As IER has previously explained,

> [T]he Fish and Wildlife Service has given a specific wind farm permission to kill condors, huge birds with a 9-foot wingspan, which were brought back from the brink of extinction a quarter-century ago. The U.S. Fish and Wildlife Service told operators of Terra-Gen Power's wind farm in the Tehachapi Mountains of California that they will not be prosecuted if their turbines accidentally kill a condor during the expected 30-year life span of its wind farm.[142]

Thus, while reliable energy sources are frequently castigated for their environmental impacts, wind power is explicitly allowed to negatively impact the environment. In fact, in 2013 the US Department of the Interior issued a rule that allows wind energy companies to obtain permits to kill or injure eagles for a thirty-year time period.[143]

### Bats

Turbines also frequently kill bats. The U.S. Geological Survey (USGS) estimates that "tens to hundreds of thousands [of bats] die at wind turbines in North America each year."[144] These bat species, according to USGS, tend to be those that are flying long distances, also known as "tree

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[139] Scott R. Loss, Tom Will, and Peter P. Marra, *Estimates of Bird Collision Mortality at Wind Facilities in the Contiguous United States,* Biological Conservation, December 2013, http://www.sciencedirect.com/science/article/pii/S0006320713003522

[140] R. Saidur et al, "Environmental impact of wind energy," *Renewable and Sustainable Energy Reviews* 15 (2011) 2423–2430.

[141] BP Statistical Review of World Energy 2014, June 2014, http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy.html.

[142] Institute for Energy Research, *Feds Give Wind Farms License to Kill*, May 20, 2013, http://instituteforenergyresearch.org/analysis/feds-give-wind-farms-license-to-kill/

[143] Audubon Society, Audubon Opposes the Interior Department's 30-Year Eagle Permit Rule for Wind Farms, http://policy.audubon.org/audubon-opposes-interior-department-s-30-year-eagle-permit-rule-wind-farms-0

[144] Paul Cryan, *Bat Fatalities at Wind Turbines: Investigating the Causes and the Consequences*, Fort Collins Science Center, https://www.fort.usgs.gov/science-feature/96

bats." A separate estimate from Mark Hayes, a researcher at the University of Colorado, suggests a conservative figure of 600,000 bats dead because of wind turbines in 2012, noting that the actual figure could be 50 percent higher.[145]

***As U.S. Geological Survey research biologist Paul Cryan notes, turbines kill more bats than have ever been collected for scientific purposes in American history…***

A study published in the journal *Frontiers in Ecology and the Environment* estimates that, at wind facilities in the eastern U.S., the number of bat fatalities has ranged from 15.3 to 41.1 bats per MW of installed capacity per year. The following table illustrates the number of bats the study estimates are killed at various wind facilities across the country per MW of installed capacity per year:[146]

**Regional comparison of monitoring studies and factors influencing estimates of bat fatalities, modified from TH Kunz *et al.***

| Region | Facility | Landscape[1] | Estimated fatalities ($MW^{-1}yr^{-1}$)[2] | Search Interval (d) | Percent search efficiency[3] | Carcass removal (bats $d^{-1}$)[4] | Reference |
|---|---|---|---|---|---|---|---|
| Pacific Northwest | Klondike, OR | CROP, GR | 0.8 | 28 | 75* | 32*/14.2 | Johnson *et al.* 2003a |
| | Stateline, OR/WA | SH, CROP | 1.7 | 14 | 42* | 171*+716.5 | Erickson *et al.* 2003a |
| | Vansycle, OR | CROP, GR | 1.1 | 28 | 50* | 40*/23.3 | Erickson et al. 2000 |
| | Nine Canyon, WA | GR, SH, CROP | 2.5 | 14 | 44* | 32*/11 | Erickson *et al.* 2003b |
| | High Winds, CA | GR, CROP | 2 | 14 | 50* | 8/[5] | Kerlinger *et al.* 2006 |
| Rocky Mountains | Foote Creek Rim, WY | SGP | 2 | 14 | 63 | 10/(20) | Young *et al.* 2003, Gruver 2002 |
| South - Central | Oklahoma Wind Energy Center, OK | CROP, SH, GR | 0.8 | 8 surveys[6] | 67 | [7] | Piorkowski 2006 |
| Upper Midwest | Buffalo Ride, MN 1 | CROP, CRP, GR | 0.8 | 14 | 29* | 40/10.4 | Osborn *et al.* 1996 |
| | Buffalo Ridge, MN 2 (1996-1999) | CROP, CRP, GR | 2.5 | 14 | 29* | 40/10.4 | Johnson *et al.* 2003b |
| | Buffalo Ridge, MN 2 (2001-2002) | CROP, CRP, GR | 2.9 | 14 | 53.4 | 48/10.4 | Johnson *et al.* 2004 |
| | Lincoln, WI | CROP | | 1 -- 4 | 70* | 50*/~10 | Howe *et al.* 2002 |
| | Top of Iowa, IA | CROP | 8.6 | 2 | 72* | 156*8 | Jain 2005 |
| East | Meyersdale, PA[9] | DFR | 15.3 | 1 | 25 | 153/18 | Kerns *et al.* 2005 |
| | Mountaineer, WV (2003) | DFR | 32 | 7 -- 27 | 28* | 30*/6.7 | Kerns & Kerlinger 2004 |
| | Mountaineer, WV (2004)[9] | DFR | 25.3 | 1 | 42 | 228/2.8 | Kerns *et al.* 2005 |
| | Buffalo Mountain, TN 1 | DFR | 31.5 | 3 | 37 | 42/6.3 | Fiedler 2004 |
| | Buffalo Mountain, TN 2 | DFR | 41.1[10] | 7 | 41 | 48/5.3 | Fiedler *et al.* 2007 |

[1]CROP = agricultural cropland; CRP = conservation reserve program grassland; DFR = deciduous forested ridge; GR = grazed pasture or grassland; SGP = short grass prairie' SH = shrubland. [2]Estimated number of fatalities, corrected for searcher efficiency and carcass removal, per turbine, divided by the number of megawatts (MW) of installed capacity. [3]Overall estimated percent searcher efficiency using bat or bird carcasses in bias correction trials. Bird carcasses were sometimes used as surrogates of bats in search efficiency trials, and instances in which this is the case are denoted with *. [4]Number of birds + number of bats used in bias correction trials/ mean number of days that carcasses lasted during trials. Bird carcasses were sometimes used as surrogates of bats in search efficiency trials, and instances in which this is the case are denoted with *. [5]For this facility, the proportion of the 8 trial bats not scavenged after seven days was used to adjust fatality estimates. [6]Two searches (one in late May and one in late June) conducted at each turbine in 2004, and four searches every 14 days conducted at each turbine between 15 May and 15 July in 2005. [7]Authors used a hypothetical range of carcass removal rates derived from other studies (0-79%) to adjust fatality estimates. [8]Number of birds used during six trials; the mean number of days that carcasses lasted was not available; on average 88% of bird carcasses remained two days after placement. [9]Six-week study period from 1 August to 13 September 2004. [10]Weighted mean number of bat fatalities per MW with weights equal to the proportion of 0.66 MW (n=3 of 18) and 1.8 MW (n= 15 of 18) turbines.

Given that installed wind capacity in the U.S. was at 61,292 MW in 2013, this journal's estimate would mean that the number of bats killed that year ranged between 937,768 and 2,519,101.

[145] Mark Hayes, *Bats Killed in Large Numbers at United States Wind Energy Facilities*, Bioscience, December 2013, http://www.aibs.org/bioscience-press-releases/resources/Hayes.pdf

[146] Thomas H. Kunz et al., "Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses," *Frontiers in Ecology and the Environment* 5.6 (2007): 315-324, http://www.bu.edu/cecb/files/2009/12/kunzbats-wind07.pdf.

Wind turbines have been especially detrimental to hoary bats, which are potentially ecologically at risk, according to the Montana state government.[147] As U.S. Geological Survey research biologist Paul Cryan notes, turbines kill more bats than have ever been collected for scientific purposes in American history:[148]

> For perspective, more hoary bats are estimated to die at certain individual wind energy facilities in the United States in two to three years than have ever been collected and preserved as scientific study specimens in the museums of the Americas. In some parts of the country, bat researchers who only rarely catch hoary bats in the wild can now walk beneath turbines at certain wind energy facilities during autumn and find more dead hoary bats on the ground in a few weeks than they have caught during their entire careers.

## Turbine Production

It is not just that wind turbines themselves kill animals, though—even the process of producing turbines carries significant environmental costs. As IER has pointed out before, modern wind turbines rely on rare earth metals primarily mined and processed in China.[149] While the U.S. has a relatively safe track record of environmental stewardship, the same safeguards do not exist in China. Simon Parry from the *Daily Mail* visited China to see the rare earth metals industry at work and found a truly eerie scene. He discovered what he described as a lake that "instantly assaults your senses," where "your eyes water and a powerful, acrid stench fills your lungs."[150]

The reasons why rare earth material extraction harms the environment are diverse. According to a study published in the journal *ISRN Metallurgy*, radioactivity and contamination of the local environment are two of the largest reasons. The study explains,

> "One of the most important environmental issues for producers of rare earths is the problem posed by the radioactivity of thorium-containing monazite and xenotime ores...Other concerns of RE pollution relate contamination of the local environment. These include potential bioaccumulation in the food chain from waste or dust

[147] Montana Field Guides, "Hoary Bat - Lasiurus cinereus," Montana Official State website, http://fieldguide.mt.gov/speciesDetail.aspx?elcode=AMACC05030.
[148] Paul M. Cryan, "WIND TURBINES AS LANDSCAPE IMPEDIMENTS TO THE MIGRATORY CONNECTIVITY OF BATS," *Envtl. L.* 41 (2011): 355, http://docs.wind-watch.org/cryan-wind-turbines-migratory-bats.pdf.

[149] Travis Fisher and Alex Fitzsimmons, Big Wind's Dirty Little Secret: Toxic Lakes and Radioactive Waste, instituteforenergyresearch.org, October 23, 2013, http://instituteforenergyresearch.org/analysis/big-winds-dirty-little-secret-rare-earth-minerals/
[150] Simon Parry and Ed Douglas, In China, the True Cost of Britain's Clean, Green Wind Power Experiment: Pollution on a Disastrous Scale, dailymail.co.uk, January 26, 2011, http://www.dailymail.co.uk/home/moslive/article-1350811/In-China-true-cost-Britains-clean-green-wind-power-experiment-Pollution-disastrous-scale.html

> contamination of water ways and soil from mines when used in downstream industrial processes and in agricultural fertilisers."[151]

Accordingly, wind turbine production is far from environmentally-friendly and involves an extraction process that intensifies radioactivity and contaminates food chains and waterways.

### Human Health Effects

Although much of the administration's push against coal has been based on the health effects of living near coal plants,[152] wind turbines have adverse health impacts on nearby residents as well.

***Canadian family physicians can expect to see increasing numbers of rural patients reporting adverse effects from exposure to industrial wind turbines (IWTs). People who live or work in close proximity to IWTs have experienced symptoms that include decreased quality of life, annoyance, stress, sleep disturbance, headache, anxiety, depression, and cognitive dysfunction.***

According to a peer-reviewed article by Roy D. Jeffrey in the journal *Canadian Family Physician*, for example, Canadians living near wind turbines have been negatively impacted:

> Canadian family physicians can expect to see increasing numbers of rural patients reporting adverse effects from exposure to industrial wind turbines (IWTs). People who live or work in close proximity to IWTs have experienced symptoms that include decreased quality of life, annoyance, stress, sleep disturbance, headache, anxiety, depression, and cognitive dysfunction. Some have also felt anger, grief, or a sense of injustice. Suggested causes of symptoms include a combination of wind turbine noise, infrasound, dirty electricity, ground current, and shadow flicker. Family physicians should be aware that patients reporting adverse effects from IWTs might experience symptoms that are intense and pervasive…

A separate study in *Noise & Health* concluded that the noise from wind turbines significantly contribute to sleep disruption in nearby residents. As the chart below reveals, living closer to a wind facility can negatively impact people's sleep quality and duration.[153]

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[151] Paul Koltun and Ambavalar Tharumarajah, "Life Cycle Impact of Rare Earth Elements," *ISRN Metallurgy* (2014), http://www.hindawi.com/journals/isrn/2014/907536/.

[152] EPA, "OVERVIEW OF THE CLEAN POWER PLAN: CUTTING CARBON POLLUTION FROM POWER PLANTS," http://www2.epa.gov/sites/production/files/2014-05/documents/20140602fs-overview.pdf.

**Sleep and mental health outcomes of residents living near IWTs**

*(Average distance (meters) from residence to nearest IWT)*

| Parameter | 375 - 750 (601) | 751 - 1400 (964) | 375 - 1400 (792) | 3300 - 5000 (4181) | 5300 - 6600 (5800) | 3000 - 6600 (5428) | P-Value[1] |
|---|---|---|---|---|---|---|---|
| Mean PSQI[2] | 8.7 | 7 | 7.8 | 6.6 | 5.6 | 6 | 0.0461 |
| % PSQI score > 5[3] | 77.8 | 55 | 65.8 | 57.1 | 37 | 43.9 | 0.0745 |
| Mean ESS[4] | 7.2 | 8.4 | 7.8 | 6.4 | 5.3 | 5.7 | 0.0322 |
| % with ESS score > 10[5] | 16.7 | 30 | 23.7 | 14.3 | 7.4 | 9.8 | 0.1313 |
| Mean worsening sleep score post IWTs[6] | 3.2 | 3.1 | 3.1 | 1.2 | 1.4 | 1.3 | <.0001 |
| Improved sleep when away from IWTs | 9/(14) | 5/(14) | 14/(28) | 1/(11) | 1/(23) | 2/(34) | <.0001 |
| % New sleep medications post IWTs | 11.1 | 15 | 13.2 | 7.1 | 7.4 | 7.3 | 0.4711 |
| New diagnoses of insomnia | | | 2 | | | 0 | |
| Mean SF36 MCS | 40.7 | 43.1 | 42 | 50.7 | 54.1 | 52.9 | 0.0021 |
| % Wishing to move away post IWTs | 77.8 | 70 | 73.7 | 0 | 0 | 0 | <.0001 |

*[1]Testing difference of 375 – 1400 m group with 3000 – 6600 m group [2]Pittsburgh Sleep Quality Index [3] PSQI > 5 is considered a 'poor sleeper' [4] Epworth Sleepiness Scale*
*[5]About 10 – 20 percent of the general population has ESS scores > 10 [6] (New sleep problems + Worsening sleep problem)/2; Strongly agree (5) – Strongly disagree (1)*

## Carbon Dioxide Emissions

Wind is frequently promoted as a way to reduce carbon dioxide emissions from power plants. But wind does not generate much in the way of carbon dioxide emission reductions. Energy expert Robert Bryce explained:

> The American Wind Energy Association claims that wind energy reduced U.S. carbon dioxide emissions by 80 million tons in 2012. That sounds significant. But consider this: global emissions of that gas totaled 34.5 billion tons in 2012. Thus, **the 60,000 megawatts of installed wind-generation capacity** in the United States reduced global carbon dioxide emissions by about **two-tenths of 1 percent**. That's a fart in a hurricane.[154] [Emphasis added]

Thus, even if AWEA is correct in its CO2 reduction estimates, wind power has no appreciable impact on global CO2 emissions. In fact, contrary to AWEA's claims, wind can also actually *increase* emissions. A study[155] by the United Kingdom-based research group Civitas[156], for example, explains:

> Wind-power...requires conventional back-up plants to provide electricity when the wind is either blowing at very low speeds (or not at all) or with uncontrolled variability (intermittency)...This is all the more relevant given the relatively **high CO2 emissions** from conventional plants **when they are used in a back-up capacity**. In a comprehensive quantitative analysis of CO2 emissions and wind-power, Dutch physicist

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[153] Michael A. Nissenbaum, et. al., "Effects of industrial wind turbine noise on sleep and health," *Noise & Health* 14.6 (2012): 237-243, http://www.noiseandhealth.org/article.asp?issn=1463-1741;year=2012;volume=14;issue=60;spage=237;epage=243;aulast=Nissenbaum.
[154] Robert Bryce, *Smaller Faster Lighter Denser Cheaper*, 2014, page 222.
[155] http://www.civitas.org.uk/economy/electricitycosts2012.pdf
[156] http://www.civitas.org.uk/index.php

> C. le Pair has recently shown that deploying wind turbines on "normal windy days" in the Netherlands actually increased fuel (gas) consumption, rather than saving it, when compared to electricity generation with modern high-efficiency gas turbines. Ironically and paradoxically **the use of wind farms therefore actually increased CO2 emissions**, compared with using efficient gas-fired combined cycle gas turbines (CCGTs) at full power. [Emphasis added]

That is, because wind power relies on backup electricity from coal-fired or natural gas-fired plants when the wind isn't blowing, we have to take into account CO2 emissions from the backup generation. The Civitas study reveals that CO2 emissions from these plants are *especially* high when used in a backup capacity—combined cycle natural gas plants operating without wind on the grid would emit less CO2.

## Conclusion

***We can do better. We shouldn't pursue an energy strategy that subsidizes unreliable sources of power while simultaneously cracking down on reliable sources with new regulations from the EPA.***

It is well past time for Washington to take the training wheels off of the wind industry and let it chart its own course. The federal wind production tax credit has propped up the wind industry for 22 years—on top of dozens of other federal and state policies designed to support wind—yet industry lobbyists claim it still needs help.

Two decades after the PTC was first enacted, wind-generated electricity comprises less than 5 percent of our total supply. At the same time, wind power has contributed little to the environmental and energy security goals it was meant to address. Unfortunately, the PTC is a very effective way to accomplish at least one thing: wasting American taxpayers' money.

We can do better. We shouldn't pursue an energy strategy that subsidizes unreliable sources of power while simultaneously cracking down on reliable sources with new regulations from the EPA. Wind energy can't deliver reliable power because, even after two decades of a tax credit, it still relies on random weather patterns to generate electricity. Subsidizing today's wind industry does nothing to solve wind power's fundamental reliability problem.

Furthermore, far from being a "job creator," the PTC is a net jobs loser. Even if the industry does add some jobs to the economy, those jobs come at the expense of other jobs in industries that would create new value for customers. We should not follow the example of Spain, where 2.2 jobs were lost for every "green job" created.

The PTC cannot be justified on environmental grounds, either. The U.S. is already outpacing the rest of the world in terms of CO2 reductions, largely because of innovations in natural gas rather than because of wind power. Wind turbines also kill a staggering amount of protected birds and bats and have negative health effects on nearby residents.

The costs of the PTC overwhelmingly outweigh the benefits. Lawmakers should prioritize American households over wind industry lobbyists.

# Appendix

The cost of the PTC amounts to the total tax bill of 4.8 million families with median incomes. Here's how our math breaks down:

Assumptions:

- Total wages are the 2013 median household income: $52,250[155]
- Family of four (2 parents, 2 children)
- No other business or income
- Standard deduction (no itemized deductions): $12,200[156]
- One personal exemption per family member: $3,900 per person
- Married couple filing jointly

Using a 2013 Form 1040[157]

- Total Exemptions: 4
- Wages, salaries, etc. (Line 6d): $52,250
- Total Income (Line 22): $52,250
- Adjusted Gross Income (Line 37): $52,250
- Standard Deduction (line 40): $12,200
- Subtract standard deduction from wages (line 41): $40,050
- Total exemptions (4 x $3,900) (line 42): $15,600
- Taxable income (line 41 minus line 42) (line 43): $24,450
- Total tax (using the "2013 Tax Table" on page 77): $2,779

Number of Median Income Families Who's Entire Check Would Foot the PTC Bill

- **E**stimate from the chairman's mark to the EXPIRE Act: $13.347 billion
- Total Tax for the Family: $2,779
- Number of families whose entire tax check would have to fund the PTC (chairman's estimate divided by the family's tax): **4.8 million**

[155] Amanda Noss, "Household Income: 2013," U.S. Census Bureau, September 2014, http://www.census.gov/content/dam/Census/library/publications/2014/acs/acsbr13-02.pdf
[156] Kelly Phillips Erb, "IRS Announces 2014 Tax Brackets, Standard Deduction Amounts And More," Forbes, October 31, 2013, http://www.forbes.com/sites/kellyphillipserb/2013/10/31/irs-announces-2014-tax-brackets-standard-deduction-amounts-and-more/
[157] Internal Revenue Service, "1040," 2013, http://www.irs.gov/pub/irs-pdf/i1040.pdf