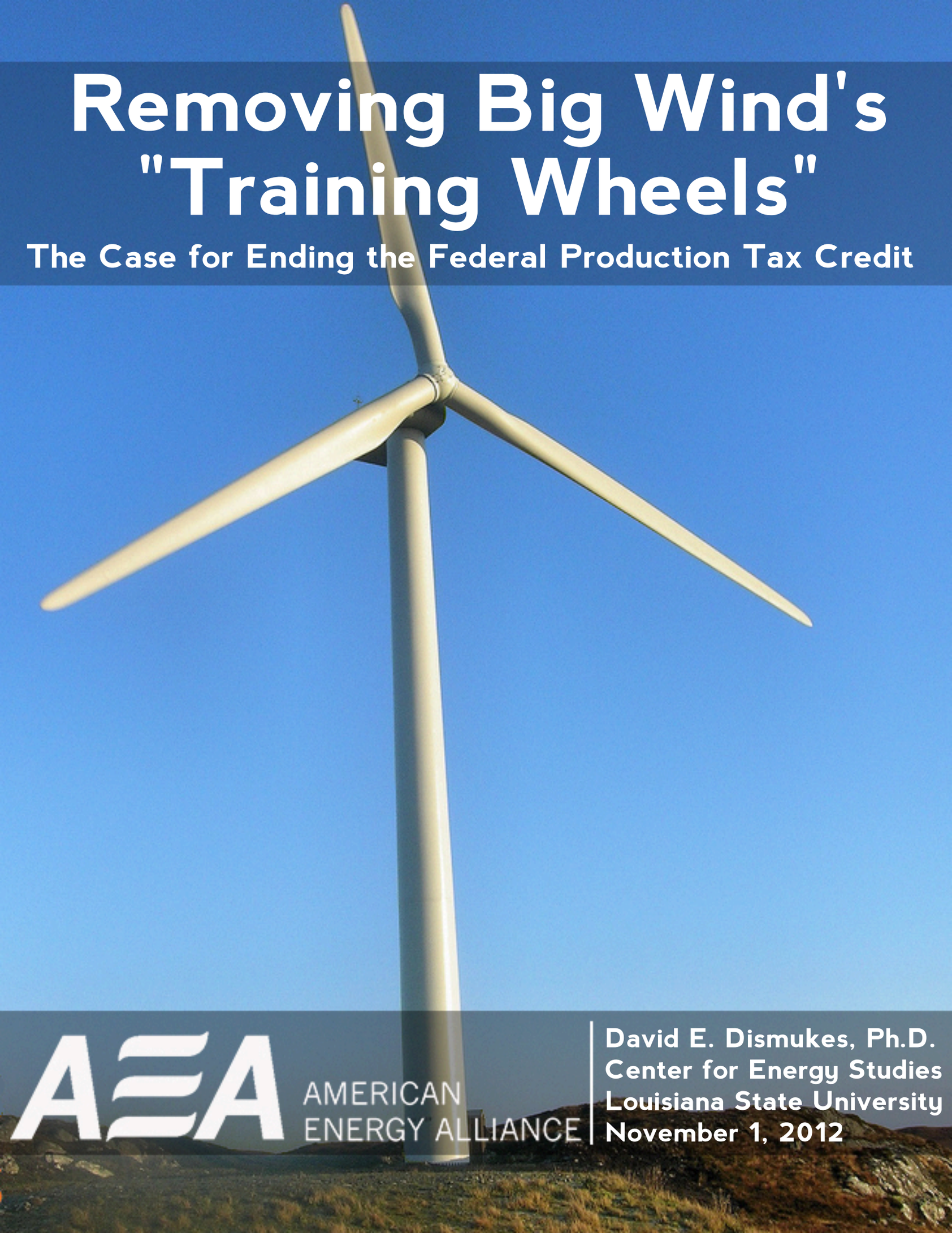

Removing Big Wind's "Training Wheels"

The Case for Ending the Federal Production Tax Credit

AMERICAN ENERGY ALLIANCE

David E. Dismukes, Ph.D.
Center for Energy Studies
Louisiana State University

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About the Author

David E. Dismukes is a professor, associate executive director, and director of Policy Analysis at the Center for Energy Studies, Louisiana State University. His research interests are related to the analysis of economic, statistical, and public policy issues in energy and regulated industries. Over the past 23 years, he has worked in consulting, academia, and government service.

Dr. Dismukes has been on the LSU faculty for more than 15 years and since that time has led a number of the Center's research efforts on topics associated with almost all aspects of the energy industry. He speaks regularly to professional, trade, and civic associations on important energy issues, trends, and topics. He has provided expert testimony to a wide range of state regulatory commissions, state legislatures, and before Congress. Dr. Dismukes received his M.S. and Ph.D. in economics from the Florida State University.

About AEA

Founded in May 2008, the American Energy Alliance ("AEA") is a not-for-profit organization that engages in grassroots public policy advocacy and debate concerning energy and environmental policies.

AEA believes that freely-functioning energy markets provide the most efficient and effective solutions to today's global energy and environmental challenges and, as such, are critical to the well-being of individuals and society. AEA believes that government policies should be predictable, simple and technology neutral.

I. Executive Summary

The federal wind Production Tax Credit ("PTC"), first enacted in 1992[1] to "jump start" a nascent, but promising industry,[2] provides wind producers with a subsidy of $22 per megawatt hour of electricity generated.[3] The PTC has been extended seven times,[4] but is scheduled to expire under current law on December 31, 2012. Extension of the federal wind PTC has become the "stalking horse" in the debate on government's role in picking energy "winners and losers." Although wind advocates proffer several internally inconsistent rationales[5] for continuing the federal wind PTC, a closer examination of compelling facts and data indicates these purported justifications are not about wind's continued viability without the PTC. Rather, the wind industry's arguments supporting a continuation of the federal wind PTC simply represent a classic case of "rent seeking" by an established industry seeking to maintain profits through a generous tax subsidy.

This research finds that the federal wind PTC is an inefficient, expensive, and unsustainable policy mechanism for promoting wind that should be allowed to expire in today's challenging fiscal environment for the following reasons:

- 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.

- Renewable portfolio standard ("RPS") mandates in 30 states and D.C., not the federal PTC, have primarily driven explosive wind development over the past five to eight years, and most significantly, have established a substantial guaranteed long-term market for renewables including wind that is expected to triple by 2030, even without the PTC. Standards & Poor's recently estimated as much as $150 billion in new renewable energy investment opportunities over the next 10 years, even if the PTC is not renewed, driven in large part by opportunities in wind energy development. Thus, offering billions of dollars in federal tax subsidies to wind generation, in addition to mandated state renewable subsidies, allows wind generators to "double dip," and reflects a gross waste of limited fiscal resources.

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[1] In 1978, wind subsidies were established under the Public Utility Regulatory Policy Act. The federal PTC increased those subsidies.

[2] Ryan Wiser, Mark Bolinger and Galen Barbose (2007). *Using the Federal Production Tax Credit to Build a Durable Market for Wind Power in the United States*. Lawrence Berkeley National Laboratory, LBNL-63583, p. 2.

[3] After adjusting for taxes, this equals $34 per MWh.

[4] The federal wind PTC has been extended in 1999, 2002, 2004 , 2005, 2006, 2008 and 2009.

[5] See, for instance, the September 18, 2012 Fox Business interview with American Wind Energy Association CEO Denise Bode at: http://video.foxbusiness.com/v/1847956031001/wind-energy-tax-credit-a-help-or-distorting-the-market/.

- The federal wind PTC is not needed to ensure an increase in future wind generation. The U.S. Energy Information Administration forecasts that even if the PTC and other incentives are eliminated, renewable generation will still be on track to rise from 500 billion kilowatt-hours in 2011 to approximately 750 billion kilowatt-hours by 2035.

- The "one-size-fits-all" federal wind PTC is an exceptionally inefficient and expensive means of supporting wind generation that fails to recognize the industry's heterogeneity and operational differences, and grossly wastes limited fiscal resources by over-subsidizing many projects and driving over-development. The congressional Joint Committee on Taxation estimates that a one-year extension of the federal wind PTC will cost taxpayers an astronomical $12.1 billion. The fact that the wind industry may experience a market-driven downward correction in output and employment does not signify some type of policy failure justifying an expense of this nature.

- Over 50 percent of wind capacity is located in only five states; over 75 percent is located in just 11 states. The federal PTC, however, unfairly shifts wind energy development costs from taxpayers in the RPS states to those with little or no wind development, forcing taxpayers across the country to support an industry concentrated in only a few states. In fact, under the inequitable federal PTC, taxpayers in the states without RPS mandates pay approximately 24 percent of the PTC funding, even though they receive no direct benefit.

- The generous federal wind PTC has created distortionary "negative prices" in many regional power markets across the country by perversely incenting wind producers to pay the system to take their unneeded power just so they can collect the subsidy and still make a profit. These PTC-driven market distortions harm reliability by penalizing the conventional generators needed to backstop wind when it does not blow, forcing conventional generators to operate at a loss or not at all. As such, the federal wind PTC subsidy unfairly tilts the playing field in favor of intermittent wind, and disadvantages reliable and essential conventional resources such as natural gas.

- Wind generation has already led to billions in hidden costs for electricity consumers to cover the costs of interconnecting these intermittent, remotely-located resources, and providing backup generation when federally-subsidized wind resources fail to perform.

For all of these reasons it is clear the federal PTC should expire since it has morphed from an ill-designed temporary subsidy for a purportedly "infant industry," into an inequitable tax hand-out for what is clearly a well-established industry that distorts markets and allows wind to compete unfairly with both conventional generation resources and even other types of renewables.

II. Introduction

No one can reasonably claim that wind generation remains an "infant" industry: wind generation development has expanded tremendously from just eight MWs installed in 1980 to over 50,000 MW as of August 2012.[6] This significant expansion itself proves that wind generation is no longer an infant industry in need of training wheels, but instead is one ready to compete on its own with conventional energy resources and other types of renewable energy. For this reason alone, the federal wind PTC should be allowed to expire.

There are, however, several additional good reasons to allow the inefficient and uncompetitive federal wind PTC to expire. Two decades ago, when the federal PTC was created, no states had renewable portfolio standards ("RPS"). Yet over the last five to eight years, 30 states and the District of Columbia[7] have implemented renewable energy mandates or goals, affording wind generation and other renewables a guaranteed and subsidized market.

Over 75 percent of all active wind generating capacity came on-line in the past five years, a period concurrent with the expansion of state renewable energy mandates.[8] In fact, from 2006 to 2011, wind generation increased nearly fivefold.[9] Data confirms that these state renewable mandates not only drove the explosion of wind generation capacity development, but also established a guaranteed increasing future market for wind energy anticipated to triple in size by 2030[10] even if the federal PTC expires. The U.S. Energy Information Administration ("EIA") forecasts that even if the PTC and other incentives are eliminated, renewable generation will still be on track to rise from 500 billion kilowatt-hours ("kWhs") in 2011 to approximately 750 billion kWhs by 2035 (or a 50 percent increase in wind generation). This is a guaranteed increase in market share, even without the federal wind PTC, that is not offered to any other type of traditional power generation technology such as natural gas, coal, or nuclear.[11]

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[6] Earth Policy Institute with 1980-1999 data from Worldwatch Institute, Signposts 2001, CD-ROM (Washington, DC: 2001); 2000-2009 data from Global Wind Energy Council (GWEC), Global Wind Report: Annual Market Update 2010 (Brussels: 2011), p. 67; 2010 and 2011 data from GWEC, Global Wind Statistics 2011 (Brussels: 7 February 2012), Accessed September 20, 2012: www.earth-policy.org/datacenter/xls/update24_2.xls; and American Wind Energy Association (2012). American Wind Power Reaches 50-Gigawatt Milestone. Accessed September 20, 2012: http://www.awea.org/newsroom/pressreleases/50_GW_milestone.cfm/.

[7] In addition, seven states have established renewable energy goals.

[8] U.S. Department of Energy (2012). Installed Wind Capacity. Accessed September 20, 2012: http://www.windpoweringamerica.gov/wind_installed_capacity.asp.

[9] Ibid.

[10] See, Figure 4.

[11] U.S. Department of Energy, Energy Information Administration. (2012) *Annual Energy Outlook 2012: With Projections to 2035*. DOE/EIA-0383(2012). June 2012. p. 21. Also see Gabriel Nelson and Hannah Northey. (2012). "Subsidies or No, Renewables Should Grow: EIA Chief." *Greenwire*. October 17.

Notable as well, is that over 50 percent of all wind generation capacity is located in just five states, with over 75 percent located in 11 states.[12] This suggests that roughly 80 percent of U.S. taxpayers fund federal wind tax subsidies to promote wind generation concentrated in the remaining 20 percent of the country. The more equitable approach is to have states that choose to mandate increased wind development fund that public policy choice themselves through their RPS programs. The federal wind PTC, however, requires residents of all states, even those with no RPS programs and/or very little wind development, to subsidize wind generation although they receive little, if any, economic benefit. This significant public policy inequity could be easily remedied if the federal wind PTC were to expire.

Another reason to let the federal PTC expire is that this "one-size-fits-all" tax subsidy is incredibly inefficient. The wind generation industry is diverse, widely ranging in size, configuration, and output. The federal PTC, however, incorrectly assumes that all wind facilities have the exact same project economics, despite the fact that in some high wind regions, wind generation is already nearly cost competitive with conventional generation.[13]Further, recent estimates by the Congressional Joint Committee on Taxation suggest that a one year extension of the federal wind PTC will cost taxpayers some $12 billion.[14]Offering billions of dollars in federal tax subsidies to wind generation, in addition to mandated state renewable subsidies, allows wind generators to "double dip," and reflects a gross waste of limited fiscal resources. The "double dip" nature of these subsidies in high wind areas, in turn, increasingly leads to a host of "free rider"[15] problems as the scope of state renewable energy mandates, and the efficiency of the industry itself, increases.

Additionally, the development of uneconomic wind generation facilitated by the federal wind PTC distorts markets, not only increasing costs for taxpayers and electricity customers, but also harming reliability by undermining the economics of conventional generation such as natural gas-fired generation needed to back up wind generation when the wind does not blow. The fact that wind often fails to blow on hot summer days, when power is needed most, already challenges regional grid operators in their ability to maintain system adequacy and reliability. These integration challenges were manageable at smaller levels of wind development, but over time, increased state renewable mandates, filled primarily by wind generation, will force grid operators to build additional, costly

[12] U.S. Department of Energy (2012). *Installed Wind Capacity*. Accessed September 20, 2012: http://www.windpoweringamerica.gov/wind_installed_capacity.asp.

[13] Eric Lantz, Ryan Wiser and Maureen Hand (2012). IEA Wind Task 26: The Past And Future Cost Of Wind Energy. National Renewable Energy Laboratory, May 2012. p. 17; and Energy Information Administration, U.S. Department of Energy (2012). "Annual Energy Outlook 2012." Accessed September 9, 2012: http://www.eia.gov/forecasts/aeo/;

[14] Joint Committee on Taxation Estimate of Senate Finance Committee Tax Extenders Bill, August 2, 2012.

[15] Here, a "free rider" is defined as a market participant taking advantage of a particular subsidy or government program, designed to promote a particular activity, that would have performed the activity regardless of whether the subsidy or program were in place. "Free riders" reduce the effectiveness and efficiency of government subsidies and programs, diverting valuable resources away from other government activities.

supporting infrastructure, such as power transmission lines and backup generation, imposing another set of hidden costs on all electricity consumers, which itself is likely to lead to additional adverse, unintended consequences.

Electricity production and real time pricing information from the country's electric grid operators confirms that federal wind PTCs facilitate market distortions in wholesale electricity markets, harming reliability by causing essential conventional generation, such as natural gas, to operate at times at a loss, or simply not operate at all. Several studies have found numerous examples of wind generators selling their electricity at "negative prices," effectively paying the system to take their unneeded power just so they could continue to receive the federal wind PTC.[16] The demonstrated adverse impact of such PTC-driven distortionary negative pricing offers yet another compelling reason to allow the federal wind PTC to expire.

III. Wind is a Well-Established Industry

U.S. wind generation has grown dramatically since 1980 from eight MWs to about 50,000 MW in 2012.[17] This massive growth alone demonstrates wind is no longer an infant industry requiring a "jumpstart" through continuation of the federal PTC.[18] The U.S. Department of Energy's 2011 Wind Technologies Report[19] offers additional proof that wind is no longer an infant industry requiring continued federal tax subsidies. In particular, the report highlights that by the end of 2011, some 219,000 MWs of announced wind projects had requested transmission interconnection, comprising approximately 45 percent of all generation then in the queue, and about 1.5 times the amount of natural gas generation requesting similar transmission interconnection.[20] Although not all this wind capacity will be developed,[21]such a substantial level of potential wind generation development significantly disproves the purported "infant" industry argument and provides additional support for allowing the federal wind PTC to expire.

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[16]U.S. Department of Energy, Energy Information Administration (2012). Negative prices in wholesale electricity markets indicate supply inflexibilities. *Today in Energy*, February 23, 2012; Michael Giberson (2012). "Negative Power Prices in RTO and Bilateral Power Markets." Accessed September 6, 2012: http://knowledgeproblem.com/2012/07/03/negative-power-prices-in-rto-and-bilateral-power-markets/.; and Michael Giberson (2008). "Frequent negative power prices in the West region of ERCOT result from wasteful renewable power subsidies." Accessed September 6, 2012: http://knowledgeproblem.com/2008/11/20/frequent_negati/. Frank Huntowski, Aaron Patterson, Michael Schnitzer (2012). *Negative Electricity Prices and the Production Tax Credit – Why Wind Producers Can Pay Us to Take Their Power and Why That's a Bad Thing*. The Northbridge Group, September 14.

[17] Numbers effective as of August, 2012.

[18]Ryan Wiser, Mark Bolinger and Galen Barbose (2007). *Using the Federal Production Tax Credit to Build a Durable Market for Wind Power in the United States*. Lawrence Berkeley National Laboratory, LBNL-63583, p. 2.

[19] Ryan Wiser and Mark Bollinger (2012). "2011 Wind Technologies Market Report." Oak Ridge: Energy Efficiency and Renewable Energy, U.S. Department of Energy.

[20] Ibid.

[21] Historically about half of the resources in the queue are developed.

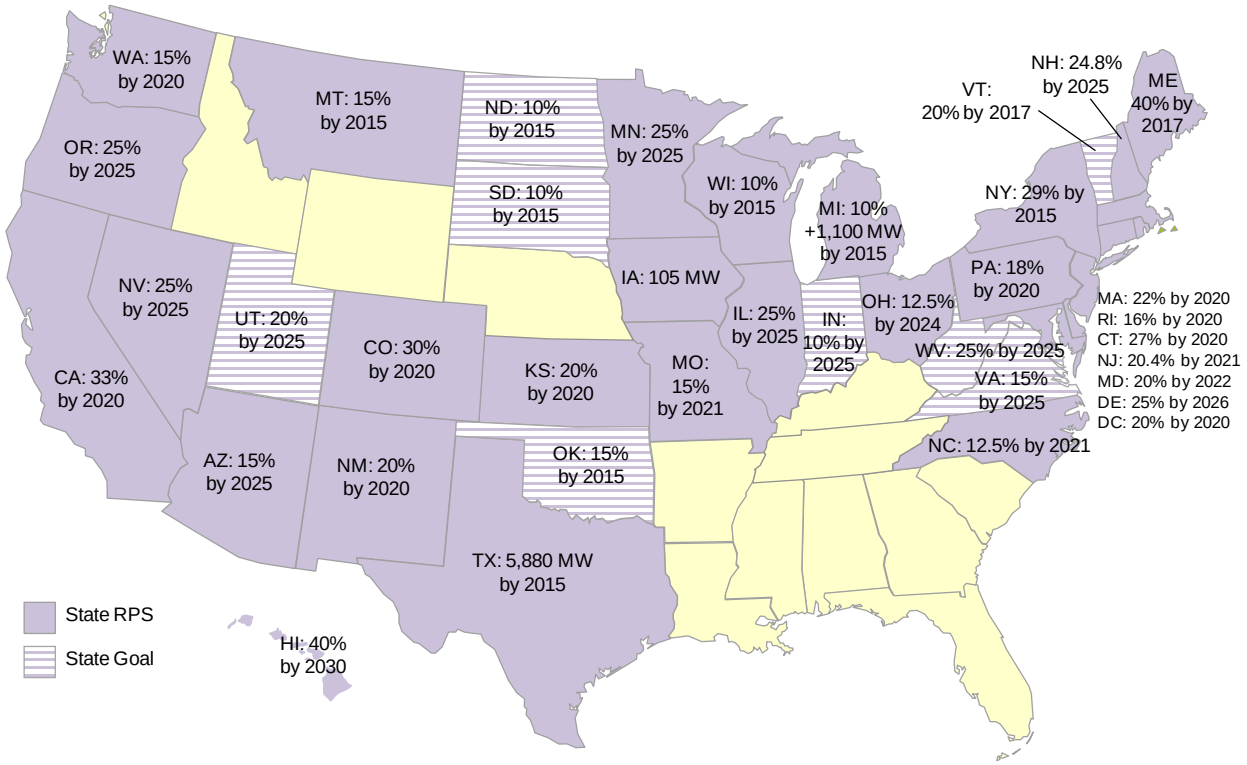
A closer look at these recent wind capacity addition numbers also shows that merchant or non-contracted capacity comprises a large share of this new wind generation, suggesting an industry that is mature enough to embrace riskier, more speculative development. In fact, in the last ten years, merchant/non-contracted wind generation has increased by about 1,300 percent from only one percent of total wind energy capacity in 2001, to 30 percent in 2011. The tremendous expansion of merchant wind offers a clear sign that wind generation is not a nascent industry, but instead a well-established one willing to assume increasing degrees of risk, and ready to be weaned from this inefficient, distortive federal PTC subsidy.

IV. The Primary Role of State RPS Mandates in Wind Generation Development

The passage of the federal wind PTC in 1992 did not result in an explosion of new wind generation capacity. Rather, wind generation development languished until 1998 when about 226 MW of new wind generation capacity was brought on-line in that year alone.[22]This was about the same time that many states began adopting "renewable portfolio standards" or what is commonly referred to as an "RPS." Today, 30 states and the District of Columbia have RPS mandates and an additional seven states have voluntary goals, all of which cover wind and other renewable resources. Suppliers in these RPS states can fulfill their renewable obligations by either: (1) making a direct financial investment in renewable generation; or (2) the purchase of a tradable "renewable energy certificate" (or "REC").

[22] Earth Policy Institute with 1980-1999 data from Worldwatch Institute, Signposts 2001, CD-ROM (Washington, DC: 2001); 2000-2009 data from Global Wind Energy Council (GWEC), Global Wind Report: Annual Market Update 2010 (Brussels: 2011), p. 67; 2010 and 2011 data from GWEC, Global Wind Statistics 2011 (Brussels: 7 February 2012), Accessed September 20, 2012: www.earth-policy.org/datacenter/xls/update24_2.xls.

Figure 1. State RPS Policies



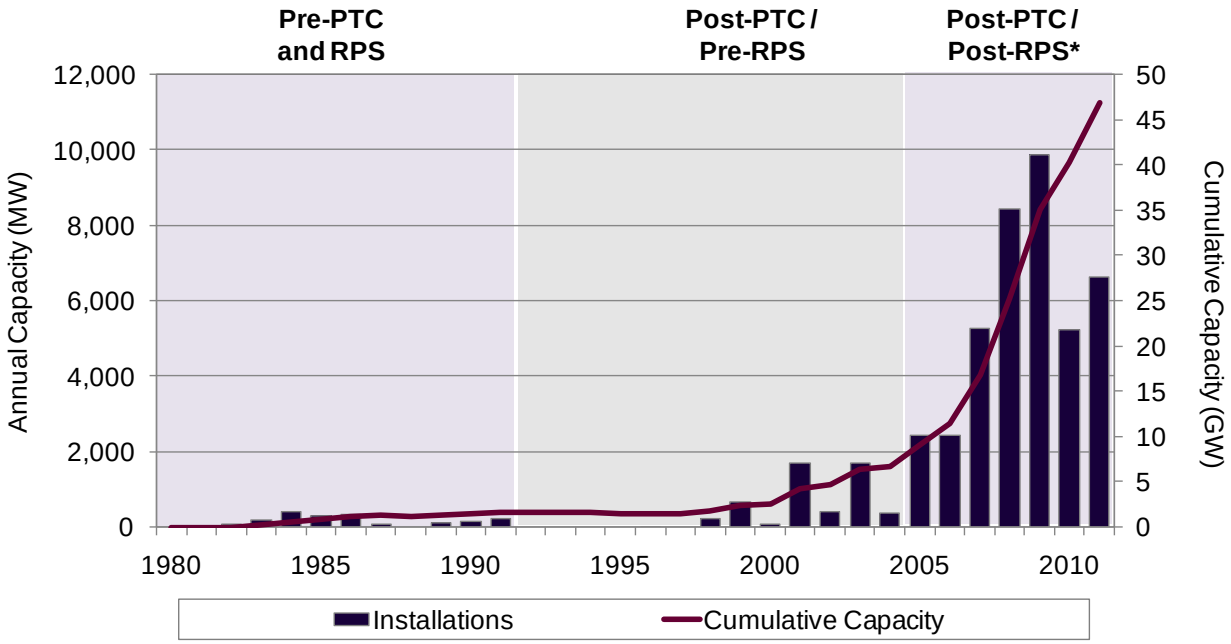
Source: Database of State Incentives for Renewables and Efficiency.
Note: As of September 2012; *Indiana, Pennsylvania and West Virginia include separate tier of non-renewable 'alternative' energy resources.

Although a few states adopted RPS policies as early as the mid to late 1990s, most states enacted their RPS mandates between 2004 and 2007, long after Congress adopted the federal wind PTC.[23] States typically classify a wide range of renewables as eligible to meet supplier RPS obligations. To date, however, wind generation accounts for 90 percent of all new renewable resources developed understate 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.[24] (See Figure 2.)

[23]Exeter Associates, Inc. (2008). *Progress Report: Review of State Renewable Portfolio Standard Programs in the Northeast & Mid-Atlantic Regions*. Prepared by Exeter Associates, Inc., for the Northeast and Mid-Atlantic States Collaborative on RPS Implementation, December, 2008.

[24]The Congressional Research Service notes the importance of RPS policies as being the "primary renewable energy demand driver" over the past several years. See Phillip Brown (2012). *U.S. Renewable Electricity: How Does the Production Tax Credit (PTC) Impact Wind Markets?* Washington: Congressional Research Service, p.8.

Figure 2.Wind Energy Capacity Development (MW, 1980-2011)

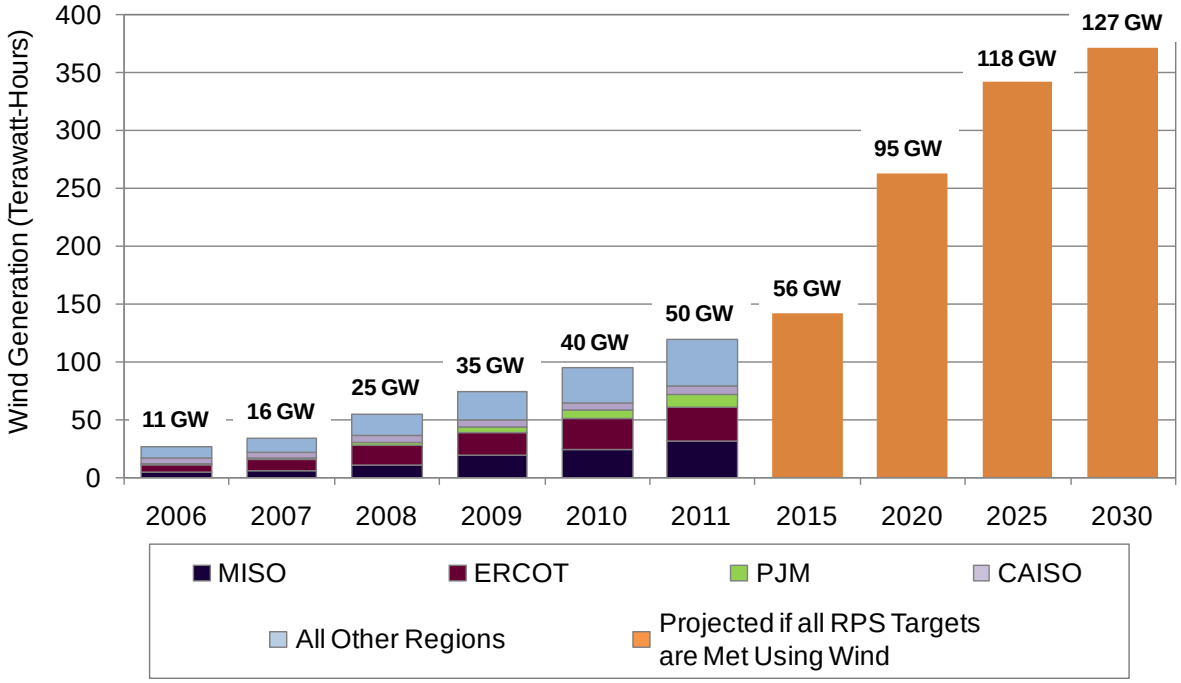


Source: Earth Policy Institute.
Note: Numerous states adopted RPS policies prior to 2004; however, it was not until 2006-2007 that these policies accounted for 50 percent of U.S. retail electricity sales.

If future RPS requirements were to be fulfilled by wind, the wind market would grow to almost 130 GW of capacity through 2030, about triple the current 50 GW already installed (see Figure 3). As such, even post federal PTC expiration, the outlook for future wind generation development continues to be exceptionally favorable, underscoring the reality that wind no longer needs a federal wind PTC "crutch." Further, and in a clear sign that wind development will continue without the PTC, NextEra Energy Resources, a major wind developer, stated in its most recent Third Quarter earnings call, "we signed our first PPA for 2013 U.S. wind project, a project that is not dependent upon extension of the PTC program…we see it as supportive of the view we have publicly expressed that there will continue to be a wind development business in the U.S. post-2012 even if the PTC program is not extended."[25]

[25] Statements made by Moray P. Dewhurst - Chief Financial Officer, Executive Vice President, NextEra during 3rd quarter earnings call on October, 24, 2012.

Figure 3. U.S. Wind Generation Capacity to 2030 if all RPS Targets are met Using Wind



Source: U.S. Energy Information Administration; NorthBridge Group analysis.

It is easy to see why RPS mandates have driven wind generation development more than the federal wind PTC. Unlike the federal wind PTC, state RPS requirements: (a) set a fixed and relatively large annual renewable generation requirement that every electricity supplier must meet to provide service; and (b) are not subject to periodic renewal since these annual RPS mandates extend well out into the future.

That post-RPS wind generation increased fivefold between 2006 and 2011, also underscores that state RPS mandates, not the pre-existing federal wind PTC, were the major drivers of wind's tremendous expansion. Although the American Recovery and Reinvestment Act ("ARRA" or "Stimulus Plan"), allowing wind producers to substitute the federal wind PTC with a 30 percent up-front cash payment[26] facilitated some of this recent development, it is highly unlikely that much, if any of this wind generation would have been developed without a large, state mandated renewable generation market. Recently, an executive of New Jersey Clean Energy Ventures highlighted this fact noting that, regardless of whether the federal PTC was renewed, its multi-million dollar wind project investment was "sound" because RPS requirements, not the federal wind PTC, were the real drivers for

[26] The now expired Section 1603 grants allowed for this subsidy substitution. A recent Congressional Review Service (CRS) report noted the U.S. Treasury estimates that Section 1603 cash grants will cost over $20 billion through 2016.

future wind industry growth.[27] Participants at a recent Platts Financing US Power Conference corroborate this conclusion with a Standard & Poor's speaker noting that "if the PTC is not renewed … state renewable portfolio standards can play a large role in making the renewable energy industry viable" and that "renewables with RPS will still have contracts…we came up with $150 billion over the next 10 years still to be built with renewables."[28]

As noted earlier, RECs are the tradable instruments used in RPS states to provide above-market financial support for wind and other renewable energy resources: the higher the REC, the greater the above-market financial subsidy needed to bring the marginal renewable resource on-line. REC prices are higher when state mandates require more renewable generation capacity, and lower when supply exceeds the requirements. Importantly, electricity consumers in states that have adopted an RPS program assume the cost of RECs: those states with higher renewable generation requirements will likely pay more for their renewable generation than those states adopting smaller annual requirements, holding other factors constant. The simple mechanics of REC prices suggests two possible outcomes in a post-federal wind PTC world: (1) any additional financial support needed to bring new wind resources to the market will be passed along through REC price increases; and (2) consumers in those states choosing aggressive renewable generation standards will appropriately cover the costs of any resulting REC price increase.

Notably, over 50 percent of currently-active wind capacity is located in only five states;[29] over 75 percent is located in just 11 states.[30] Under the federal wind PTC, however, taxpayers in the states without RPS mandates pay approximately 24 percent of the PTC funding, even though they receive no direct economic benefit.[31] As such, the current federal PTC structure unfairly shifts the cost of wind energy development from taxpayers in the RPS states to those with little or no wind development, forcing taxpayers across the country to support an industry concentrated in a few states.

Moreover, any additional support that may be required post-PTC expiration will likely be small. Figure 4, for instance, provides estimates of the various net present value ("NPV")sources of financial support needed to generate a return on, and of, hypothetical onshore and offshore wind energy investments. This financial support primarily comprises wholesale power market sales, REC sales, federal depreciation allowances, and until the end of this year, the federal wind PTC.

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[27] "NJ Company Places $8.8 Million Bet on Fledgling Onshore Wind Market", New Jersey Spotlight, September 11, 2012.

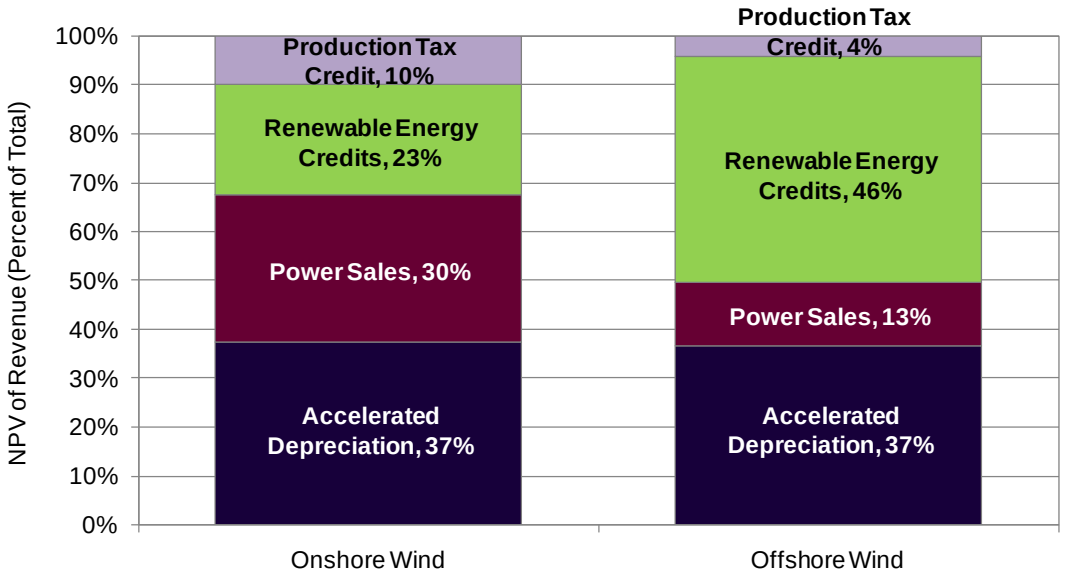
[28] Statements made by Trevor D'Olier-Lees, Analyst with Standards and Poor's Ratings Services at Platts Financing US Power Conference, October 19, 2012.

[29] U.S. Department of Energy (2012). Installed Wind Capacity. Accessed September 20, 2012: http://www.windpoweringamerica.gov/wind_installed_capacity.asp.

[30] Ibid.

[31] Based on individual federal income tax paid by residents of each state, according to 2010 data from IRS Statistics of Income Division.

Figure 4. Renewable NPV of Revenue Streams



Source: Author's construct. Major assumptions include installed costs of $2,438/kW (onshore) and $5,975/kW (offshore), an internal rate of return on investment of 12 percent, and wholesale power prices based on the Energy Information Administration, Annual Energy Outlook 2012.

Notably, energy sales revenues, REC revenues, and accelerated depreciation, not the federal wind PTC, provide the greatest financial support for wind generation investments. In fact, the federal wind PTC provides only 10 percent of the overall financial support needed for a typical onshore wind project and four percent for a hypothetical offshore wind project. Thus, contrary to claims of wind industry advocates, such as the American Wind Energy Association ("AWEA"), allowing the federal wind PTC to expire, by itself, should have minimal impacts on cost-effective wind projects, a conclusion corroborated by a number of current studies and forecasts.[32]

Trade press reports also note that realistic wind developers in the industry are preparing for a post-PTC world. Paul Gaynor, CEO of First Wind, was recently reported as noting that he could see the elimination of PTC as being a "good thing" for the industry.[33] Using the PTC to finance projects, through tax equity, is expensive, and the elimination of the PTC could lower the average cost of capital needed to finance projects by as much as $7

[32]Statement of Molly Sherlock, Specialist in Public Finance, Congressional Research Service (2012). *Impact of Tax Policies on the Commercial Application of Renewable Energy Technology*. Before House Committee on Science, Space, and Technology Subcommittee on Investigations and Oversight & Subcommittee on Energy and Environment, April 19, 2012; Eric Lantz, Ryan Wiser and Maureen Hand (2012). *IEA Wind Task 26: The Past And Future Cost Of Wind Energy*. National Renewable Energy Laboratory, May 2012. p. 28.

[33] Peter Maloney (2012). "Renewable Developers Begin to Look Beyond Tax Credits." *Platts,* June 29.

per MWh.[34] Gaynor also noted that he sees a path that easily leads to making renewables subsidy-free and competitive with conventional forms of power.[35] To get there, the wind industry needs to reduce turbine prices, which in 2012 are already reported to be 15 percent lower than 2011 levels, increase operating capacity factors (each 10 percent improvement in a project's capacity factor is worth $7/MWh), and extend the rated lives of currently-operating projects from 25 to 30 years.[36]Even if the federal wind PTC were allowed to expire, wind producers therefore have the opportunity to offset these losses not only through REC price increases and the previously detailed continued growth in a state renewable energy mandates, but also through continued efficiency gains. Such opportunities are supported by the recent comments of First Wind's Senior Vice president Pete Keel, who concluded that in "our view is that the PTC is the wrong long-term solution."[37]

Furthermore, unlike wind, which has been allowed to "double dip," receiving both state subsidies and the federal PTC, conventional generation resources receive no direct production subsidies. Continuing the federal wind PTC in the face of ever increasing RPS mandates is not only unfair to taxpayers in non-RPS states and to essential conventional generation, but is also a gross waste of limited financial resources, all of which provides additional justification for allowing the PTC to expire.

V. The "One-Size-Fits-All" Federal PTC Is a Grossly Inefficient Mechanism to Promote Wind Generation

Policy makers must have complete information about a wide range of factors influencing wind development decisions to ensure any modicum of socially-optimal levels of development. In theory, calculation of a purported "optimal" wind generation incentive should be based upon numerous considerations including a relatively detailed understanding of the installed cost for various wind energy projects across a wide range of capacity sizes and technologies; developer risk preferences; and wind speeds and output levels across a wide range of geographic locations. The variation and heterogeneity of the wind industry alone suggests that the single "one-size-fits-all" federal wind PTC subsidy is an extremely inefficient incentive mechanism that likely over-subsidizes a wide range of projects.

The numerous inefficiencies associated with "one-size-fits-all" renewable subsidies have become painfully obvious over the last several years throughout Europe. For the past decade, Spain, Denmark, and Germany have provided per unit (kWh) renewable energy subsidies through "Feed-In Tariffs" (or "FITs"). These "FITs," however, have proven to be

[34] *Ibid.*
[35] *Ibid.*
[36] *Ibid.*
[37] Statements made at Platts Financing US Power Conference, October 19, 2012.

exceptionally costly and inefficient mechanisms, leading to too much wind, at too great an expense, resulting in large rate increases for electricity consumers.[38]

A recent statement from Siemens Wind Energy, a major wind turbine manufacturer, highlighted the over-subsidization created by the "one-size-fits-all" federal PTC. Siemens characterized 2012wind generation installation levels of 6,000 wind turbines as "artificially high," conceding not only that "[t]he PTC…brought this artificial peak," but also identifying as major drivers for a needed industry correction"[natural] gas prices, which are traditionally projected at $4 to $5 per million BTUs have stabilized at about $2 per million BTU and, of course the economy is still lagging ... a perfect storm of events."[39]

Siemens, in fact, offered an optimistic outlook for future post-PTC wind development, indicating new construction likely would "rebound" later in the decade even without the federal wind PTC, and even with continued moderate natural gas pricing. This highlights that any near-term, post-PTC wind capacity contraction likely reflects an efficient market correction to address considerable wind generation over-development, rather than any energy policy failure.

Similarly, growing evidence indicates that the significant inefficiencies of the flawed federal wind PTC have caused other over-incentive problems. During the past twenty years, the federal wind PTC has increased by over 40 percent, even though the levelized cost of wind generation has fallen by some 67 percent during the same period of time.[40] The average levelized cost of U.S. wind generation is a function of a number of site-specific variables, particularly locational wind speeds that influence total generation output, that, in turn, can lower per unit costs as a fixed level of costs are divided by more output (generation).[41]Industry improvements in efficiency and costs in several high speed wind location in the U.S. makes wind generation economic and cost competitive with conventional generation in many locations.[42]Yet, a grossly inefficient "one-size-fits-all" federal wind PTC continues to support these active projects for a ten-year period. This is simply a waste of valuable taxpayer resources that will continue to the tune of about $12.1 billion even if the federal wind PTC is extended just one year alone.[43]

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[38]Spain's FITs reportedly led to a doubling of its wind capacity from 15 percent to 33 percent, increasing utility bills by 44 percent. Germany saw up to a 40 percent increase in utility bills during a comparable period due in large part to wind FITs. See Richard Green and Adonis Yatchew (2012). "Support Schemes for Renewable Energy: An Economic Analysis." *Economics of Energy & Environmental Policy*. Vol. 1(2) 91.

[39]*"Siemens to lay off 146 at Hutchinson plant, citing tax credit, natural gas prices and economic slowdown"*. Accessed September 19, 2012: http://www2.ljworld.com/news/2012/sep/19/siemens-lay-146-hutchinson-plant-citing-tax-credit/.

[40] Eric Lantz, Ryan Wiser and Maureen Hand (2012). *IEA Wind Task 26: The Past And Future Cost Of Wind Energy*. National Renewable Energy Laboratory, May, p. 14.

[41] Eric Lantz, Ryan Wiser and Maureen Hand (2012). IEA Wind Task 26: The Past And Future Cost Of Wind Energy. National Renewable Energy Laboratory, May 2012. pp. 15-16.

[42]Ibid.

[43]Ibid.

Cost comparisons offer some insights into the prevalent over-incentive problem created by the federal wind PTC. A recent study by the *Breakthrough Institute,* for instance, estimates the unsubsidized cost of wind at between $60 to $90/MWh.[44] This same study notes that the unsubsidized cost of wind generation already compares favorably with new combined cycle natural gas generation, at around $52 to $72/MWh, and further notes that wind generation is likely already competitive with natural gas in areas that have high wind speeds.[45]

More importantly, the *Breakthrough Institute* study notes that the combination of the federal wind PTC, and the modified cost recovery system for depreciation, lowers the cost of wind energy to $33 to $65/MWh—a range well below new, highly efficient natural gas capacity.[46]In developing its most recent *Annual Energy Outlook,* the EIA, for example, uses a levelized cost of $61.50/MWh for new natural gas generation, an amount far above the PTC-subsidized cost of wind development, providing additional evidence that the inefficient "one-size-fits-all" federal PTC substantially over-subsidizes numerous facilities. This evidence of over-subsidization supports allowing the federal wind PTC to expire.

VI. Wind's Intermittency Increases Costs, Distorts Markets, and Imperils Reliability by Harming Conventional Generation

Wind is an intermittent, unreliable generation resource, exhibiting relatively wide output swings and producing most of its electricity during off-peak evening hours when power is least needed as opposed to during day-time peaking hours when electricity demand is high, and when power is needed the most.[47]Electricity grid operators must address numerous important operational issues when integrating wind generation, including maintaining power quality, meeting power availability requirements and expectations, and supporting system reliability.[48] While all generation must address these important integration criteria, wind generation's scale, intermittency, and variability creates a number of unique challenges[49] that impose substantial additional costs on electricity consumers.[50]

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[44]Alex Trembath and Jesse Jenkins (2012). *Gas Boom Poses Challenges for Renewables and Nuclear*. Oakland, CA: Breakthrough Institute Energy & Climate Program. 5.

[45]Ibid.

[46]Ibid.

[47]For instance, Texas has the largest amount of wind generation capacity of any state with approximately 10,000 MWs of wind resources. Wind accounts for 13 percent of Texas' total generation capacity, but only 8.5 percent of its annual average generation. Wind contributes about 8.7 percent to capacity available on peak. See ERCOT (2012). *ERCOT Quick Facts*. Accessed on September 6, 2012: http://www.ercot.com/news/press_releases/.

[48]See Lennart Soder and Thomas Ackermann (2005) "Wind Power in Power Systems: An Introduction." In *Wind Power in Power Systems*. Edited by Thomas Ackerman. New York: Wiley & Sons, p. 28.

[49]*Ibid*.

[50]While wind generation shares are small on an annual average basis, they can be considerably higher during certain hours of the day, particularly during off-peak evening hours when the wind may blow at

One of the most immediate challenges associated with integrating increased wind resources into regional power grids is the development of costly transmission infrastructure to move electricity from very remote rural areas, where wind speeds are usually at their highest, to locations where loads are concentrated. Over the past five years alone, the Federal Energy Regulatory Commission ("FERC") has approved over $15 billion in new transmission investments simply to facilitate the movement of wind generation.[51] These investments translate into higher costs and higher rates for retail customers.

Table 1: FERC Approved Transmission Projects Facilitating Wind

Project	Region	Year of FERC Order	Size	Estimated Cost	ROE Adders[1]	CWIP in Rate Base	Abandoned Plant Cost Recovery	Pre-Commercial Cost Recovery	Hypothetical Capital Structure (Equity/Debt)
MidAmerican Energy Co	Iowa-Illinois-Missouri	2011	546 miles, 161 and 345 kV	$573 million	n.a.	100%	100%	n.a.	n.a.
Dessert Southwest Power	Southern CA	2011	118 miles, 500-kV	$350 million	150 b.p.	100%	Yes	n.a.	50% / 50%
Ameren Services - Illinois Rivers Project	Missouri-Illinois-Indiana	2011	331 mile 345-kV	$739 million	12.38% [2]	100%	Yes	n.a.	56% / 44%
Ameren Services - Big Muddy River Project	Missouri-Illinois	2011	185 mile 345-kV	$383 million	12.38% [2]	100%	Yes	n.a.	56% / 44%
Atlantic Wind Connection	Atlantic Coast / PJM	2011	250 miles of four 320 kV	$5 billion	13.58% (incl. 250 b.p.)	100%	100%	n.a.	60% / 40%
Great River Energy	Minnesota	2010	miles, 345 kV; and 68-miles, 230 kV.	$310 million	n.a.	100%	100%	n.a.	20% / 80%
Otter Tail CapX2020	Dakota, South Dakota	2009	568 miles, 230 and 345 kV	~ $1.5 billion	n.a.	100%	100%	n.a.	n.a.
Green Power Express	Midwest	2009	3,000 miles, 765 kV	$10-$12 billion	110 b.p.	100%	100%	100%	n.a.
Pioneer Transmission	PJM-MISO	2009	240 miles, 765 kV	$1 billion	200 b.p.	100%	100%	100%	n.a.
ITC Great Plains	Kansas-Nebraska	2009	210 miles, 345 kV/765 kV; and 180 miles, 765 kV	$787 million	150 b.p.	100%	100%	100%	n.a.
Tallgrass Transmission	Oklahoma	2008	765 kV	$500 million	200 b.p.	100%	100%	100%	n.a.
Prairie Wind Transmission	Kansas	2008	230 miles, 765 kV	$600 million	200 b.p.	100%	100%	100%	n.a.
Central Maine Power and Maine Public Service Co.	Maine	2008	200 miles, 345 kV	$625 million	150 b.p.	n.a.	100%	n.a.	n.a.
Pacificorp - Energy Gateway Transmission Expansion Project [3]	Wyoming-Idaho	2008	300+ miles, 230 and 500 kV	$1.9 billion	200 b.p.	n.a.	100%	n.a.	n.a.

Source: Federal Energy Regulatory Commission.

considerable speeds. See Steve Hargreaves. "Wind Power Hits 57% Mark in Colorado." CNNMoney, August 6, 2012. Accessed on August 8, 2012: http://money.cnn.com/2012/08/06/news/economy/wind-power-Colorado/index.htm?i Also see Rocky Barker (2012). "Wind Production Exceeds Hydro in Pacific Northwest for First Time Tuesday." *Idaho Statesman*. October 16.

[51] The $15 billion estimate does not include the $7 billion in ERCOT-related transmission investment approved by the Texas Public Utilities Commission. Texas, for instance, passed Senate Bill 20 in 2005 designed to create what is referred to as "Competitive Renewable Energy Zones," or "CREZs," that delineate areas of future power transmission development to integrate new wind energy into the Texas power grid. The PUCT approved these new transmission investments with an estimated price tag of close to $5 billion. The final price tag for this wind transmission investment, however, was some 40 percent higher at close to $7 billion: a cost that will be effectively socialized across the entire Texas power grid and recovered through the monthly electricity bills of each Texas household, business, and industry.

A number of recent academic studies corroborate the presence of additional, and often hidden, costs associated with intermittent wind generation. For example, in a recent *Energy Journal* article,[52] the authors conclude, "the variability of wind resources" and "the need for higher levels of reserve generating capacity to maintain reliability standards impose additional costs on the system that should not be ignored."[53] Applying a well-established simulation model utilized in prior-published research, the authors demonstrate that the capacity payments needed to back up intermittent wind generation increases substantially as load and/or the share of wind generation increases.

A similar article in the same 2012 edition of the *Energy Journal,*[54] raise issues regarding resource adequacy in the face of increasing Texas wind generation. The authors conclude that:

> …rising wind generation…can discourage natural gas-fired generation investment…. Even though CCGT and CT [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 [generation] to maintain system reliability.[55]

Most significantly, these two recent reports demonstrate convincingly that federal PTC-driven wind expansion negatively impacts essential natural gas-fired power generation. Wind's negative impact on natural gas is especially important since it is essential to maintain electric system adequacy and reliability given its quick development and ramp-up capabilities. These ramp-up capabilities are especially important in filling regional power requirements when the wind stops blowing. Yet the large federal wind PTC subsidy unfairly tilts the playing field in favor of intermittent and less-reliable wind generation that generally fails to perform when power is most needed.

Another emerging PTC-related problem is its interaction with wholesale electricity markets to create distortionary "negative prices." Unless dispatched, wind producers are not paid the generous PTC subsidy that, on a pre-tax basis, amounts to as much as $34/MWh.[56] Increasingly, the PTC perversely incentivizes wind producers to pay the system an amount equal too, or less than, a negative $34/MWh, to take their unneeded

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[52]Timothy D. Mount, Surin Maneevitjit, Alberto J. Lamadrid, Ray D. Zimmerman, and Robert J. Thomas (2012). "The Hidden System Costs of Wind Generation in a Deregulated Electricity Market." *Energy Journal*, 33 (1): 161-186.

[53]*Ibid*. at p. 223.

[54] Chi-Keung Woo, Ira Horowitz, Brian Horii, Ren Orans, and Jay Zarnikau (2012). "Blowing in the Wind: Vanishing Payoffs of a Tolling Agreement for Natural-Gas Fired Generation of Electricity in Texas." *Energy Journal,* 33 (1): 207-229.

[55] Ibid.

[56] Because it is a tax credit the PTC is denominated in after-tax dollars and thus the $22/MWh after-tax PTC is equivalent to a pre-tax value of $22 divided by one minus the tax rate, or roughly $34/MWh.

generation.[57]Most significantly, wind generation, unlike other generation resources such as natural gas, can submit bids up to a negative $34/MWh and still earn a profit. The increasing incidence of wind generators using the federal wind PTC to distort market outcomes has garnered increasing attention.

On two occasions in 2012, the EIA investigated this negative pricing issue. EIA's first negative pricing study, published in February 2012, focused on bilateral transactions in various markets of the Pacific Northwest for the first part of 2011. The EIA study found over 80 instances of negative transaction prices between January and June of 2011acknowledging that:

> Eligible renewable generators can take a 2.2 cents/kWh or $22/MWh production tax credit (PTC) on electricity sold. This means that some generators, primarily those operating wind turbines, may be willing to sell their output at negative prices to continue producing power. Typically, wind generators are the largest such group in any region.[58]

EIA also noted, in this same report, that wind capacity had grown significantly in recent years, increasing the "likelihood of the conditions leading to negative prices." In its June 2012 study, EIA corroborated its finding that under certain circumstances, the federal wind PTC incents wind generators to "sell their output at negative prices to continue producing power."[59]

Such negative price incidents, however, are not restricted to a few isolated areas. Rather, their frequency has been increasing recently across a number of regions. Figure 5 graphs the share of negative market clearing prices over the past two years against the share of wind generation in the ERCOT, SPP, MISO, and PJM markets, showing an exceptional degree of correlation between negative market-clearing power prices and the increase in wind generation in each respective market.

Moreover, as highlighted in another recent report by the Northbridge Group,[60] subsidy-driven negative prices from wind producers are neither related to real-time operational constraints on transmission systems, nor the outcome of some anomalous

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[57] Analyses examining hours in which negative price bids set the clearing price for all dispatched generators include Michael Giberson (2012). "Negative Power Prices in RTO and Bilateral Power Markets." Accessed September 6, 2012: http://knowledgeproblem.com/2012/07/03/negative-power-prices-in-rto-and-bilateral-power-markets/.; and Michael Giberson (2008). "Frequent negative power prices in the West region of ERCOT result from wasteful renewable power subsidies." Accessed September 6, 2012: http://knowledgeproblem.com/2008/11/20/frequent_negati/.

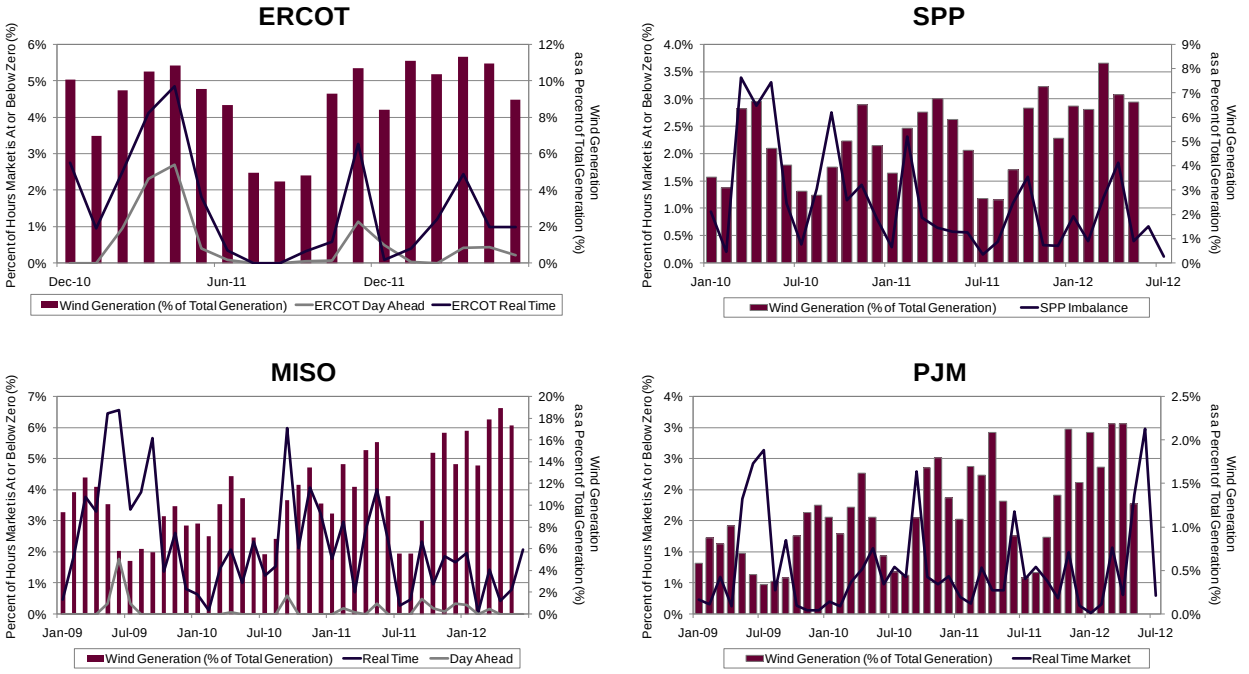
[58] U.S. Department of Energy, Energy Information Administration (2012). "Negative Wholesale Electricity Markets Indicate Supply Inflexibilities." *Today in Energy*, February 23.

[59] U.S. Department of Energy, Energy Information Administration (2012). "Negative Wholesale Electricity Prices Occur in RTOs. *Today in Energy*, June 18.

[60] Frank Huntowski, Aaron Patterson, Michael Schitzer (2012).*Negative Electricity Prices and the Production Tax Credit – Why Wind Producers Can Pay Us to Take Their Power – and Why That is a Bad Thing*. The Northbridge Group, September 12.

economic conditions. On the contrary, the report notes these negative pricing outcomes are simply a function of opportunistic pricing strategies pursued by wind generators willing to impose costs on other generators so they can continue to receive the guaranteed federal tax subsidy. These negative pricing outcomes distort the market by sending incorrect price signals, which harm the reliable and cost-effective operation of the electric system.[61] In particular, after analyzing energy production and real time pricing information from various regional grid operators, the report concluded: "negative prices created by the PTC harm reliability by [penalizing] other resources….critical to backstopping wind's fluctuating output,[62]…[thus] increasing the likelihood existing units will choose to retire, and deterring build of new capacity."[63]

Figure 5: Negative Prices and Wind Generation in ERCOT, SPP MISO, and PJM



Source: RTO Websites; andFormEIA-923, Energy Information Administration, U.S. Department of Energy.

The resulting market distortions and harm to reliability provide perhaps the strongest reasons for allowing the federal wind PTC to expire. Recent comments of Chairperson Donna Nelson, of the Public Utilities Commission of Texas ("PUCT"), in testimony before the Texas Senate Natural Resources Subcommittee, underscore this reality:

[61] Ibid at p. 9.
[62] Ibid at p. 14.
[63] Ibid at p. 16.

> Federal incentives for renewable energy …have distorted the competitive wholesale market in ERCOT. Wind has been supported by a federal production tax credit that provides $22 per MWH of energy generated by a wind resource. With this substantial incentive wind resources can actually bid negative prices into the market and still make a profit. We've seen a number of days with a negative clearing price in the west zone of ERCOT where most of the wind resources are installed. When a wind resource bids a negative price that of course means that the resources is [sic] willing to pay someone else to take electricity generated by the wind farm because they are receiving the $22 federal tax credit. The market distortions caused by renewable energy incentives are one of the primary causes … of our current resource adequacy issue. Federal renewable incentives allow wind resources to bid artificially low…and this distortion makes it difficult for other generation types to recover their cost and discourages investment in new generation. Given the significant renewable generation capacity already installed in Texas and the distortionary effects of incentives on the markets,…we all need to move with extreme caution before adopting any additional incentives or mandates.[64]

As such, the inefficient federal PTC should be allowed to expire because it has morphed from an ill-designed temporary subsidy designed to jump start what was purportedly thought of as an "infant industry," to an inequitable tax hand-out that now allows the well-established wind industry to compete unfairly with essential and more reliable conventional resources such as domestic natural gas.

[64] Chairman Donna Nelson testimony before the Texas Senate Natural Resources Subcommittee (September 6, 2012), transcribed from http://www.senate.state.tx.us/avarchive/.

VII. Conclusions

Now is the time to allow the federal wind PTC to expire since it is clearly no longer needed to encourage rational wind generation development and, in fact, disproportionately favors wind over other domestic resources like natural gas and even other renewables. The wind generation industry has a cumulative development of 50,000 MWs of capacity, 80 percent of which became operational in the last five years alone. This exceptional development is the result of a number of factors that include favorable economic conditions, high energy prices, development efficiencies, but, most importantly, state renewable energy mandates that provide considerable financial support for wind generation. Only at the margin, can one make any meaningful argument that the federal wind PTC has been effective at stimulating wind capacity development over the past several years, and even then, it is not clear that these incentives have facilitated a healthy or sustainable degree of development.

If anything, the federal wind PTC is contributing to an increasing degree of overdevelopment that is of questionable economics, and at least in part, may be creating a number of negative externalities for other generation suppliers and consumers. While the wind generation industry and its advocates argue that the federal PTC should be continued in order to maintain current wind generation development and jobs, these arguments overlook the fact the wind industry is already over-built with considerable excess capacity in many parts of the U.S. The federal wind PTC contributes to this excess development by over-subsidizing an industry that has become increasingly more competitive. Continuing the federal wind PTC is not needed to maintain profitability or grow an "infant industry," and would serve no other purpose but continue recent trends that distort otherwise competitive wholesale power markets and lead to a host of hidden costs that will be paid by taxpayers and electricity customers today, and for many years to come.