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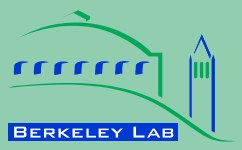

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Using the Federal Production Tax Credit to Build a Durable Market for Wind Power in the United States

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Disclaimer

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1. Introduction

The United States is endowed with a sizable renewable resource base, and yet only 2.7% of the nation's electricity supply came from non-hydro renewable energy sources in 2006. Other countries have already made significant strides towards using renewable energy. Denmark meets roughly 20% of its electricity needs with wind alone, for example, while Spain is at 9% and Germany and Portugal are at 7%. Despite having a much-more-robust wind resource than any of these countries, the U.S. currently meets less than 1% of its electricity needs with wind power.

Nonetheless, new investments in renewable generating capacity in the United States have been accelerating in recent years. Wind power has been at the forefront of this growth. The year 2006 was the largest on record in the U.S. for wind power capacity additions, with over 2,400 MW of wind added to the grid. And, for the second consecutive year, this made wind power the second-largest new resource added to the U.S. electrical grid in capacity terms, well behind new natural gas plants, but ahead of coal.

Among the most significant drivers of this recent growth has been the federal production tax credit (PTC) [Section 45 of the Internal Revenue Code], which offers a sizable incentive for investors in wind and other renewable power plants. Impetus has also been provided by a growing number of state renewable energy policies, the rising cost of fossil fuels, improved renewable energy technologies, and the prospect of future carbon regulations.

Despite the significance of the PTC for renewable energy, and the fact that Congress is currently considering a longer-term extension of the incentive, relatively little effort has been made to evaluate the impacts and effectiveness of the PTC, or to assess the benefits of a longer-term extension of the policy.[1] The purpose of this article is to make some modest strides in this direction by reviewing developments with the PTC over time, assessing its impact on the wind power market, highlighting the potentially positive implications of a longer-term extension of the PTC, and discussing some possible changes to the design of the PTC that might help overcome some of the limitations of the incentive as it is presently structured.[2]

2. History and Design of the Production Tax Credit

The U.S. Congress has a long history of providing tax incentives for energy development, including the development of renewable electricity. The PTC was established by the Energy

[1] Notable exceptions include: (1) Brandon Owens. 2004. "Does the PTC Work?" Platts. PR&C Renewable Power Service. (2) Energy Information Administration. 2007. "Response to Janice Mays, Chief Council of the U.S. House Committee on Ways & Means." Washington, D.C.: Energy Information Administration. (3) Michael Barntoff, Ian Black, Bodhi Burgess, Justin Felt, Matthew Garratt and Christian Guenther. 2007. "Renewable Power, Policy and the Cost of Capital." Prepared for the UNEP/BASE Sustainable Energy Finance Initiative. (4) Kahn, Ed. 1996. "The Production Tax Credit for Wind Turbine Powerplants is an Ineffective Incentive." Energy Policy, 24 (5): 427-435.

[2] This article does not defend the use of the PTC as an incentive instrument, relative to other forms of policy, or the use of tax incentives more generally. For arguments against the use of tax incentives of this type, see: (1) Kevin Hasset and Gilbert Metcalf. 2007. "An Energy Tax Policy for the Twenty-First Century." American Enterprise Institute for Public Policy Research. (2) Gilbert Metcalf. 2007. "Federal Tax Policy Towards Energy." Cambridge, Mass.: MIT Program on the Science and Policy of Global Change.

Policy Act of 1992 to stimulate use of renewable technologies for power production by providing a production-based credit for the first 10 years of project operations beginning at 1.5¢/kWh (adjusted upwards, in future years, for inflation). Initially, wind plants placed in service between 1994 and mid-1999 were eligible to receive this incentive (eligible biomass projects were eligible beginning in 1993). Only wind and "closed-loop" biomass[3] were originally eligible for the PTC; geothermal and solar energy instead received an investment-based tax credit.

Presumably, the PTC is intended to support renewable generation due to the environmental, economic development, and energy security benefits that these sources provide, as well as their long-term cost-reduction potential. The PTC may also be a way of compensating for the Federal incentives that have historically been offered to conventional energy sources, as well as the greater tax burden that would otherwise fall on capital-intensive renewable technologies relative to fuel-intensive conventional generation options.[4]

Since first enacted, the PTC has been renewed or extended on five occasions, only two of which occurred prior to the expiration of the then-current policy (i.e., the PTC has lapsed on three occasions before later being renewed). Typically, the PTC has been reinstated for 1- to 2-year periods, with resource eligibility rules and other statutory details often also witnessing significant change. Table 1 shows the legislative history of the PTC.

Table 1. Legislative History of the PTC

Legislation	Date Enacted	PTC Eligibility Window (for wind)	PTC Lapse Duration	Effective Duration of PTC Window (considering lapses)
Section 1914, Energy Policy Act of 1992 (P.L. 102-486)	10/24/92	1994-June 1999	n/a	80 months
Section 507, Ticket to Work and Work Incentives Improvement Act of 1999 (P.L. 106-170)	12/19/99	July 1999-2001	6 months	24 months
Section 603, Job Creation and Worker Assistance Act (P.L. 107-147)	03/09/02	2002-2003	2 months	22 months
Section 313, The Working Families Tax Relief Act, (P.L. 108-311)	10/04/04	2004-2005	9 months	15 months
Section 1301, Energy Policy Act of 2005 (P.L. 109-58)	08/08/05	2006-2007	None	24 months
Section 201, Tax Relief and Health Care Act of 2006 (P.L. 109-432)	12/20/06	2008	None	12 months

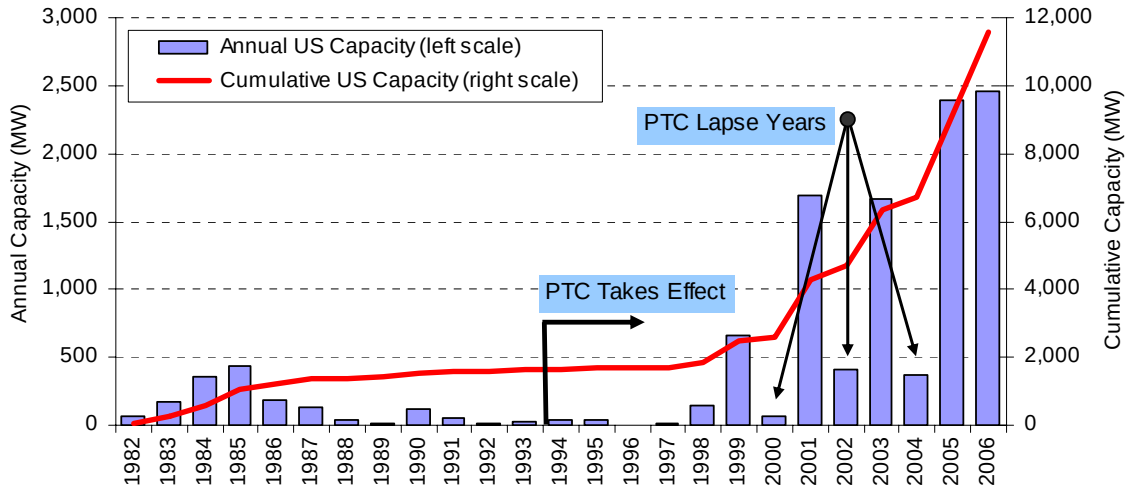
In 2007, the inflation-adjusted value of the PTC is 2.0¢/kWh for wind, "closed-loop" biomass, and geothermal power, and half that rate for traditional "open-loop" biomass, eligible hydropower, landfill gas, and municipal solid waste.[5] Projects must be in service by the end of

[3] "Closed-loop" biomass refers to plant material that is grown specifically for use in a biomass generator.
[4] See, e.g., Dallas Burtraw and Pallavi Shaw. 1995. "Fiscal Effects of Electricity Generation: A Full Fuel Cycle Analysis." Discussion Paper 95-16. Washington, D.C. Resources for the Future
[5] Solar, which has historically been eligible for a 10% investment tax credit, was also briefly eligible for the PTC starting with the 2004 renewal and lasting through 2005. Starting in 2006, the investment tax credit for solar increased to 30% of eligible system costs (with a $2000 cap for residential systems). In addition, other non-renewable technologies, such as refined coal, "Indian" coal, and nuclear power, are also eligible for federal production tax credits.

2008 to be eligible for the current PTC. The PTC is provided to the owner(s) of the eligible renewable generating project, and is reduced if eligible projects also receive certain types of government grants, tax-exempt bonds, subsidized energy financing, or other Federal tax credits. Only projects located in the United States that sell their output to an "unrelated person" may qualify for the PTC.

3. Impact of the PTC on Wind Power Development

The PTC reduces the price of wind-generated electricity by roughly 2¢/kWh on a 20-year levelized basis, thereby making wind more attractive to electric utilities and other investors.[6] In fact, with the PTC, wind power is now economically attractive in some regions of the country relative to more-conventional electricity sources.[7] The PTC, coupled with the rising cost of conventional fuels, R&D advances, and a variety of state policies, has stimulated significant – though erratic – growth in the use of wind power over the past 10 years, as shown in Figure 1. (In contrast, though not shown here, the PTC has not yet had a major impact on the development of other eligible renewable technologies, in part because many of these technologies have only recently been made eligible for the incentive).



* The first PTC lapse actually lasted only until mid-December 1999 (not 2000), but the late-1999 renewal impacted development activity in 2000.

Figure 1. U.S. Wind Power Capacity (annual and cumulative)

Partly as a result of the PTC, the U.S. has led the world in newly installed wind power capacity for the last two years. Nearly $4 billion was invested in new U.S. wind projects in 2006 alone and, since the PTC began in 1994, U.S. wind plant additions represent an aggregate investment

[6] Because the PTC *directly* reduces the amount of Federal income taxes paid, it should be thought of as providing $20/MWh of *after-tax* income (in 2007 dollars). The amount of *pre-tax* income required to yield $20/MWh of *after-tax* income is $20/(1-marginal tax rate), or $30.8/MWh assuming a 35% marginal income tax rate. At a 7% real discount rate, $30.8/MWh for 10 years provides an equivalent PTC value of $20.4/MWh (in 2007 dollars) levelized over 20 years.

[7] See, e.g., Ryan Wiser and Mark Bolinger. 2007. "Annual Report on U.S. Wind Power Installation, Cost, and Performance Trends: 2006." LBNL-62702. Washington, D.C.: U.S. Department of Energy.

of roughly $13 billion. Major state beneficiaries of the PTC, in terms of installed wind capacity, include Texas, California, Iowa, Minnesota, Washington, and Oklahoma. A total of 20 states had more than 50 MW of wind capacity at the end of 2006.

As limited evidence of the importance of the PTC to the U.S. wind sector, wind capacity additions have, since 1999, seen pronounced lulls in three years: 2000, 2002, and 2004 (see Figure 1). In each of these cases, the PTC lapsed for some period of time before being subsequently extended, substantially dampening development activity. Though some wind development will surely occur even without the federal PTC (e.g., due to state policy efforts and other factors), this historical experience suggests that the PTC, or some alternative policy, may be crucial if significant near-term growth of the wind market is desired.[8]

Analyses funded by the federal government, by non-profit organizations, and by the private sector confirm this finding, and show that if renewable resources are to be harnessed at a significant scale in the United States, continued supportive policy will likely be needed. The Energy Information Administration's 2007 Annual Energy Outlook (AEO), for example, predicts only 18 GW of wind by 2030 absent new policies and not considering the impacts of state renewables portfolio standards, with non-hydro renewable electricity increasing from 2.8% of total U.S. electric supply in 2006 to 3.6% by 2030.[9]

The impact of a PTC extension on wind power deployment, however, is uncertain, and depends significantly on model assumptions. The Energy Information Administration, for example, has recently estimated that, relative to the AEO 2007 reference case, a 5-year PTC extension would increase wind generation by 40% in 2030, while a permanent extension of the PTC would more than triple wind generation by the same date and allow wind power to grow to serve roughly 3% of U.S. electricity supply.[10] In contrast, using a model that is specifically designed to forecast wind deployment, the National Renewable Energy Lab has estimated that an extension of the PTC through 2020 could stimulate enough wind power to serve as much as 17% of the nation's electricity supply by 2030.[11]

[8] This observation ignores the potential impact of market expectations on wind development. For example, in each of the three PTC lapse years, it is likely that wind developers expected the PTC to eventually be renewed, and therefore simply waited for its renewal prior to completing their projects. In other words, the lulls in wind development *may* not have been as pronounced (though at the same time, the spikes in development would almost certainly not be as large) if the market had truly believed upon each PTC expiration that the credit was truly gone for good.

[9] Energy Information Administration, 2007. "Annual Energy Outlook 2007." DOE/EIA-0383(2007). Washington, D.C.: Energy Information Administration. Note, however, that the Energy Information Administration's estimate of 18 GW of wind by 2030 may well be achieved by the end of 2008, 22 years ahead of schedule, leading to some reasonable skepticism about the accuracy of this forecast.

[10] Energy Information Administration. 2007. "Response to Janice Mays, Chief Council of the U.S. House Committee on Ways & Means." Washington, D.C.: Energy Information Administration.

[11] Walter Short, Nate Blair, Paul Denholm and Donna Heimiller. 2006. **"**Modeling the Penetration of Wind Energy Into the U.S. Electric Market.**"** Presented at the CNLS 26th Annual Conference. August 16, 2006.

4. Consequences of the Boom-and-Bust Cycle of Development

Though the historical impacts of the PTC are well known, somewhat less-recognized is the fact that the frequent expiration/extension cycle that we have seen since 1999 has had several negative consequences for the growth of the wind sector. Due to the series of 1- to 2-year PTC extensions, growing demand for wind power has been compressed into tight and frenzied windows of development. This has led to boom-and-bust cycles in renewable energy development, under-investment in wind turbine manufacturing capacity in the U.S., and variability in equipment and supply costs, making the PTC less effective in stimulating low-cost wind development than might be the case if a longer-term and more-stable policy were established.

More specifically, some of the potentially negative impacts of the PTC expirations and shorter-term extensions on the wind industry are as follows:

1. **Slowed Wind Development:** Data in Figure 1 demonstrate that the risk of non-renewal of the PTC can slow wind development in certain years. Even in years in which the PTC is secure, uncertainty in the near-term future availability of the PTC may undermine rational industry planning, project development, and manufacturing investments, thereby leading to lower levels of new wind project capacity additions.

2. **Higher Wind Supply Costs:** Wind project costs in the U.S. decreased substantially from the early 1980s to the early 2000s, demonstrating the success of public and private R&D investments and the commercial success of the technology. Since 2001, however, installed wind costs have risen by roughly $500/kW, with power sales prices rising in turn.[12] Although capital costs for all generation technologies have risen in recent years, there is reason to believe that this increase in the cost of wind power has been exacerbated by the erratic boom-and-bust cycle created by the 1- to 2-year PTC extensions in recent years.

3. **Greater Reliance on Foreign Manufacturing:** Uncertainty in the future scale of the U.S. wind power market has limited the interest of both U.S. and foreign firms in investing in wind turbine and component manufacturing infrastructure in the U.S. Consequently, the U.S. remains heavily reliant on wind turbines and components manufactured elsewhere.

4. **Difficulty in Rationally Planning Transmission Expansion:** Accessing substantial amounts of wind energy will require investments in the transmission grid. Uncertainty in the future of the PTC makes transmission planning for wind particularly challenging because the economic attractiveness of wind projects – and therefore of expanding the transmission system for those projects – hinges in many cases on the PTC.

5. **Reduced Private R&D Expenditure:** Shorter-term PTC extensions may lower the willingness of private industry to engage and invest in long-term wind technology R&D that is unlikely to pay off within a 1- to 2-year PTC cycle, given uncertainty in the future domestic market demand for those advanced technologies.

[12] See, e.g., Ryan Wiser and Mark Bolinger. 2007. "Annual Report on U.S. Wind Power Installation, Cost, and Performance Trends: 2006." LBNL-62702. Washington, D.C.: U.S. Department of Energy.

5. Breaking the Cycle: Potential Benefits of a Longer-Term PTC Extension

In part due to the potential shortcomings of short-term PTC extensions discussed above, Congress is currently considering several longer-term PTC extensions. A 4-year extension is included in the House energy bill passed in 2007 (H.R. 3221), while a 5-year extension has recently been under consideration in the Senate (H.R. 6, S. Amdt. 1704). Because consideration of a long-term PTC extension has, until recently, occurred with little systematic analysis of the potential advantages of such an extension, recent research at Berkeley Lab has sought to investigate, with more specificity, some of the possible benefits of a 5- to 10-year PTC extension, or some other stable and long-term promotional policy.

Preliminary analysis by Berkeley Lab in late 2006 suggested that a longer-term PTC extension may be able to drive the installed cost of wind down by 5% to 15%, relative to a continuation of the present cycle of 1- to 2-year extensions. Savings were estimated to come, in part, from de-linking U.S. wind turbine prices from the Euro-Dollar exchange rate and reducing transportation costs as local manufacturing becomes more prevalent.[13] More recent statistical analysis of historical wind capital cost trends in the U.S. also suggests the possibility of a capital cost premium of up to 12% as a result of the present boom-and-bust cycle.[14]

To augment and validate this analysis, we conducted a brief survey of wind industry members. Through the survey, we hoped to develop a better understanding of some of the specific benefits of a longer-term PTC extension. Survey participants included two wind turbine manufacturers, four components suppliers, five wind project developers/O&M providers, and one construction contractor. Though this sample represents a diverse and key subset of industry stakeholders, the very limited sample size should be noted. In addition, it should be understood that wind industry participants have a natural self-interest in a PTC extension, and that the survey did not seek to address other relevant perspectives on the benefits and drawbacks of a longer-term PTC extension. We therefore encourage readers to think of the survey results as useful inputs to policy decisions, but by no means a comprehensive analysis of the advantages and disadvantages of such an extension.

The four key findings of the survey are as follows.

Finding #1: The Benefits to the Wind Industry of a 5- to 10-Year PTC Extension Are Expected to be Diverse

Survey respondents ranked a number of potential benefits from a 5- to 10-year PTC extension, relative to a continuation of the current 1- to 2-year extension cycle. Respondents were asked to answer the question from an aggregate industry perspective.

Survey respondents view the most important benefit of a 5- to 10-year PTC extension to be the greater number of wind project installations expected to result from that policy stability (Figure

[13] Ryan Wiser, Mark Bolinger and Galen Barbose. 2006. "The Value of Long-Term Policy Stability; Reasons for Recent Wind Price Increases." Unpublished Berkeley Lab memorandum. November 13.
[14] These findings are from a forthcoming Berkeley Lab report titled "Understanding Trends in the Installed Costs of Wind Projects," likely due out in early 2008.

2). Other major benefits include more rational transmission planning, reductions in installed project costs, and enhanced private R&D. Though expectations for reductions in project costs are not surprising, it is interesting to note the perceived importance of a 5- to 10-year PTC extension on transmission planning and private R&D investments. Neither of these potential benefits has typically been emphasized in discussions over PTC extension. A longer-term PTC extension is expected to have lesser impacts on O&M costs and siting and permitting conflicts.

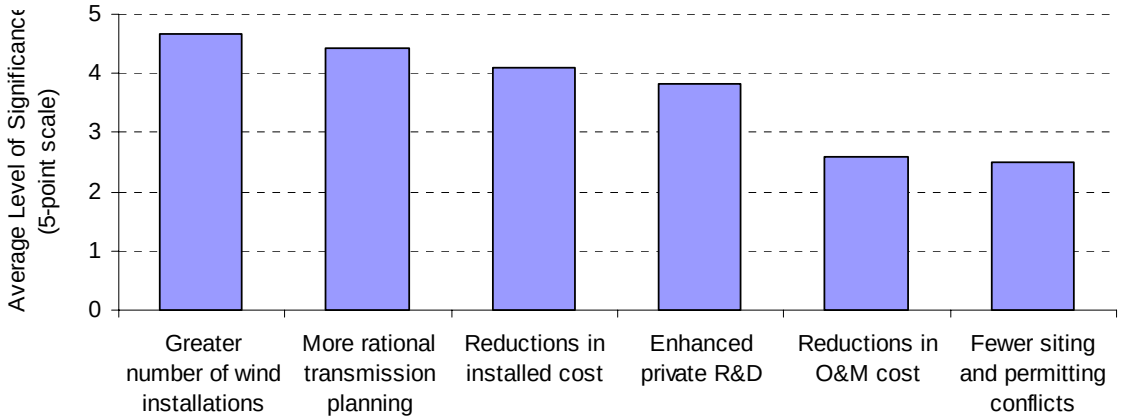


Figure 2. Potential Benefits to the Wind Industry of a 5- to 10-year PTC Extension

Finding #2: A Longer-Term PTC Extension Is Expected to Encourage Growth in Domestic Wind Turbine Manufacturing

As the wind power business becomes more global in scope, turbines and components will be increasingly manufactured in areas where labor and materials are relatively inexpensive. Given transportation costs, however, some degree of local manufacturing will remain. In part because of the uncertain availability of the federal PTC, however, U.S.-based manufacturing of wind turbines and components remains somewhat limited. This is true despite recent progress in increasing local manufacturing of certain components by both domestic and international firms.[15]

Industry members were asked to estimate the proportion of U.S. wind project costs currently sourced from or manufactured in the United States, as well as expected trends in domestic manufacturing in the coming ten years under both an uncertain (i.e., short-term) PTC environment and under a single 10-year PTC extension.

Though responses show a range of opinions on the magnitude of future domestic manufacturing, directional consistency is clear: a longer-term PTC extension is expected by industry to yield a sizable increase in domestic wind turbine and component manufacturing (Figure 3). Under the

[15] In 2006, for example, new wind power manufacturing plants sprung up in Iowa (Clipper), Minnesota (Suzlon), and Pennsylvania (Gamesa). GE has also maintained a significant domestic wind turbine manufacturing presence. Already in 2007, several new manufacturing investments have been announced in Colorado (Vestas), Texas (CTC/DeWind), and Iowa (Acciona and Siemens).

present uncertain (i.e., short-term) PTC extension path, domestic manufacturing content is expected to remain largely constant over time at its current base of roughly 30%. A single, 10-year PTC extension, on the other hand, yields a median expected domestic manufacturing share of over 70%, bringing with it jobs and local economic development benefits.

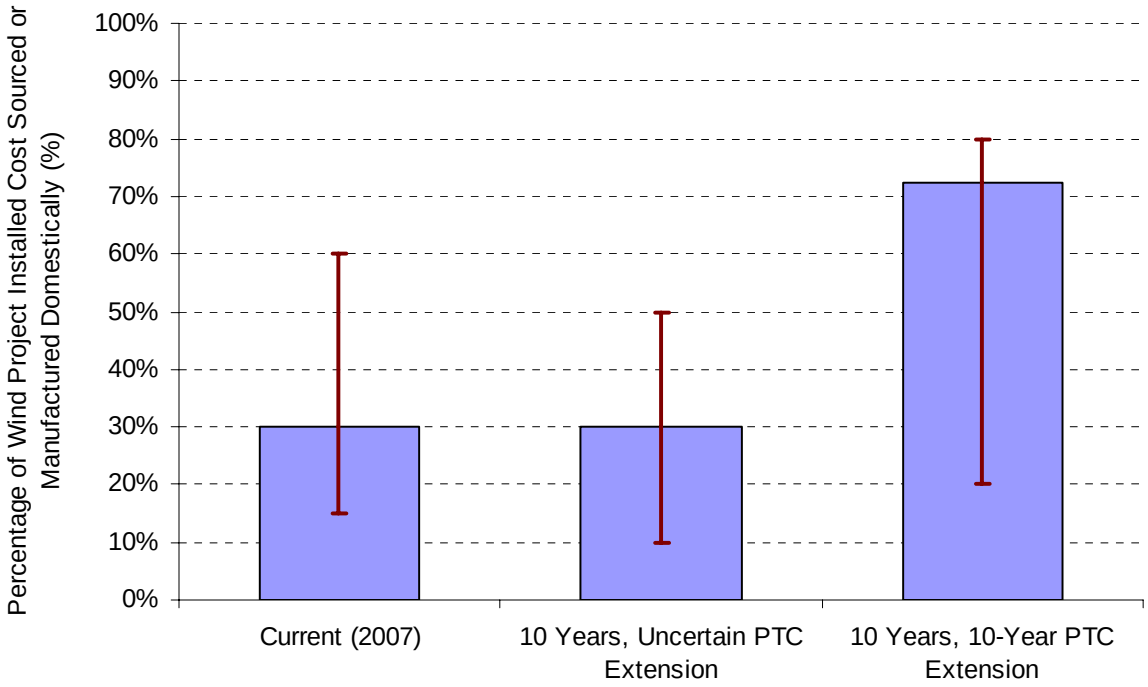


Figure 3. Domestic Manufacturing Expectations Under Two PTC Extension Scenarios (median, min, max)

Finding #3: Installed Cost Reduction <u>Potential</u> Is Significant, with a Median Expected Cost Decline of 5-10% for a 5-Year Extension and 15-20% for a 10-Year Extension

All of the industry stakeholders that responded to the survey agreed that a longer-term extension of the PTC could help reduce the installed cost of wind projects in the United States (for reasons discussed below in the next finding), but there is some disagreement on the magnitude of those possible cost reductions.

Almost universally, survey respondents believe that the potential cost reduction is greater under a 10-year extension than under a 5-year extension. Under a 10-year extension, projected cost reductions range from a low of 5-10% (4 respondents) to as high as 25-30% (1 respondent). Under a 5-year extension, cost reductions are projected to range from 0-5% (3 respondents) to 10-15% (5 respondents).

Despite this healthy range of responses, the median value of all responses shows that a 5-year extension is projected to yield cost reductions of roughly 5-10% ($86-170/kW), while a 10-year

extension is expected to result in a 15-20% reduction in installed wind project costs ($266-340/kW). These results are reasonably consistent with those estimated earlier by Berkeley Lab.[16]

Finding #4: Major Contributors to Cost Reductions Include Greater Efficiencies in Capital and Labor Deployment, Enhanced R&D, Reduced Exchange Rate Risk, and Transportation Savings

We also asked what factors would likely be the most significant causes of cost reductions that result from a longer-term PTC extension, and the subsequent more-stable industry growth. Figure 4 summarizes the results.

Overall, the survey respondents believe that the most important cost-reducing influences of those offered are:

1. More-efficient labor deployment and greater investment in supply-chain capital, including lower risk premiums for manufacturing investment.
2. Enhanced private R&D expenditures that improve wind technology.
3. Cost savings from a de-linking of U.S. prices to the Euro-US dollar exchange rate, due to increased domestic manufacturing.
4. Transportation savings created by increased domestic manufacturing of turbines and components.
5. Reductions in other project development and financing costs that are currently inflated due to rushed development schedules.

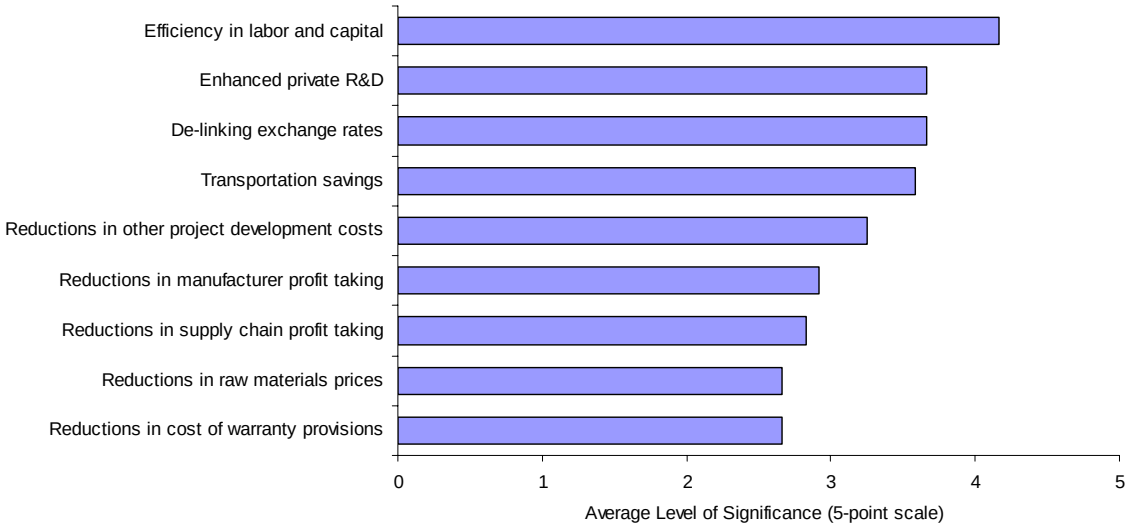


Figure 4. Factors Underlying Cost Reduction Potential

A number of additional survey questions were asked to further explore the sources of possible cost savings that may result from a 10-year PTC extension. Though the detailed survey results

[16] Op. cit. footnote 13 and 14.

are not presented here, Figure 5 provides a breakdown of the median cost-savings estimate, by source. These estimates largely confirm the earlier findings: increased investment and labor efficiencies, augmented private R&D expenditure, reduced transportation costs, a de-linking of Euro-dollar exchange rates, and reduced profitability throughout the turbine manufacturing supply chain are all predicted to play roles in future cost reduction. Raw materials and energy costs, which have helped drive wind costs higher in recent years, are not expected by most respondents to be affected by the duration of PTC extension.

Also of note is that these survey results suggest that the 15-20% savings estimate provided earlier (for a 10-year PTC extension) might be considered a conservative lower bound. In particular, summing the median savings values shown in Figure 5 results in predicted overall savings of 22% ($380/kW) under a 10-year PTC extension.

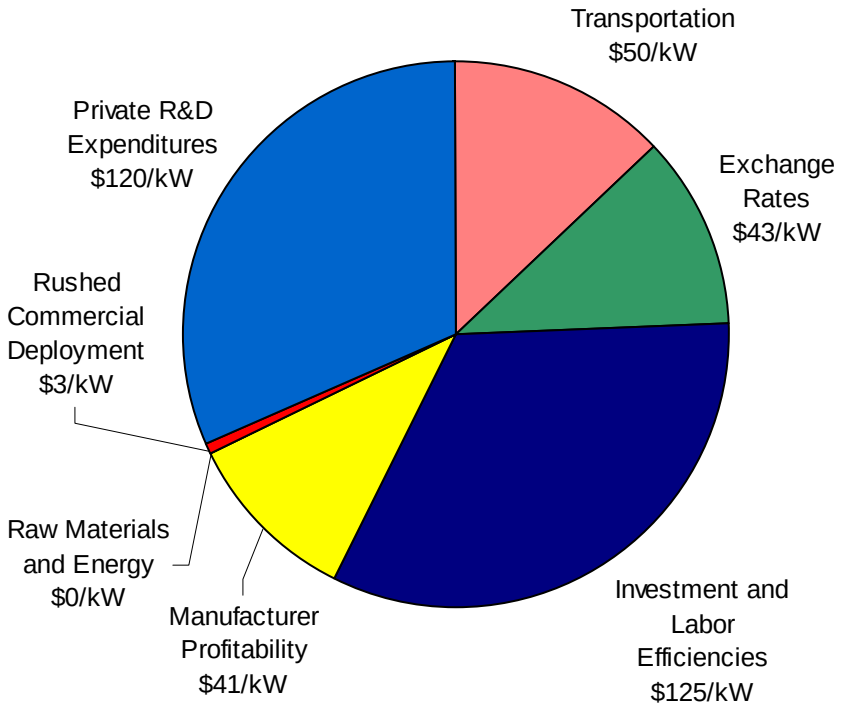


Figure 5. Relative Importance of Factors Underlying Cost Reduction Potential, Median Values

6. Other Design Considerations

The four key survey findings reported above suggest that the benefits of a longer-term PTC renewal may be significant, and that the benefits of a 10-year extension are likely to be greater than those of a 5-year extension. In addition, other PTC design considerations, beyond the duration of any extension, deserve consideration by Congress.

Credit Offset Rules

First, the PTC contains what are commonly known as "credit offset" or "anti-double-dipping" provisions that reduce the amount of the tax credit available to any eligible project that also

benefits from certain types of government grants, tax-exempt bonds, subsidized energy financing, and other Federal tax credits. The design and application of these rules has been refined and clarified, over time, by legislative guidance and IRS rulings. Importantly, most individual states that offer financial incentives to encourage wind project development structure their incentives so as not to trigger the PTC's credit offset provisions.

In contrast, the Federal government has, in recent years, offered grants to qualifying wind projects, through the USDA's "Section 9006" program, that do trigger the credit offset. Recent work by Berkeley Lab suggests that the percentage of a Section 9006 grant lost to both income tax payments (since the grant is considered to be taxable income) and the PTC's credit offset can range from 31% to 83% of the face value of the grant, with a base-case scenario falling in the middle of that range at a combined loss of 58% (37% due to income tax payments, and 21% due to the credit offset).[17]

To the extent that this potential conflict in Federal policy goals is considered adverse, possible remedies might include eliminating the credit offset provisions altogether (the offset is currently capped at 50% of the value of the PTC), exempting certain smaller renewable energy projects (i.e., those targeted by the USDA program) from the offset provisions, or alternatively restructuring the USDA Section 9006 incentives so that they do not trigger the PTC's credit offset provisions. Any of these "solutions" would increase the value of the Section 9006 grants available to smaller, community-owned renewable energy projects.

Investment Restrictions

The PTC has also sometimes been criticized as being too narrowly applicable, thereby restricting the types of investors that can efficiently make use of it. Most obviously, as a tax credit, the PTC is not available to entities that do not pay taxes (e.g., publicly owned electric utilities, rural electric cooperatives, government bodies, and non-profits). Furthermore, due to several design features, the PTC is also not easily accessible by certain tax-paying entities as well.[18] These restrictions have led to a concentration of wind project ownership in the hands of relatively few entities with sufficient tax liabilities to make use of the credit, as well as a proliferation of relatively high-transaction-cost ownership structures designed to maximize the value of federal tax incentives.[19] The result may be some inefficiency in the use of the PTC, and certainly some lack of parity in what types of entities can realistically participate in wind project ownership.

If so desired, Congress could expand the potential universe of wind project equity investors by making a few structural changes to the PTC. Most obviously, allowing the PTC to be traded or sold for cash would enable non-taxable entities and smaller developers to more easily and directly reap value from the credit. Several states, including Iowa, Oklahoma, and Oregon, have

[17] Mark Bolinger. 2006. "Avoiding the Haircut: Potential Ways to Enhance the Value of the USDA's Section 9006 Program." LBNL-61076. Berkeley, Calif.: Lawrence Berkeley National Laboratory.

[18] For example, individuals who are passive investors in a PTC-eligible project will typically only be able to use the PTC if they have additional (other) forms of passive income (i.e., not wage or interest and dividend income) against which to take the credit. In addition, those individuals and corporations subject to the alternative minimum tax (AMT) will likely only be able to use the PTC during the project's first four years (during which time the PTC is exempt from AMT limitations).

[19] John Harper, Matt Karcher, and Mark Bolinger. 2007. "Wind Project Financing Structures: A Review & Comparative Analysis." LBNL-63434. Berkeley, Calif.: Lawrence Berkeley National Laboratory.

experience with tradable tax credits for wind projects. In addition, the PTC's current 4-year exemption from the alternative minimum tax (AMT) could be extended to the full 10-year term of the PTC. Finally, Congress could ease the passive loss and passive credit rules that currently limit the ability of individuals to passively invest in wind projects, and thereby complicate the replication of "community wind" development models that have proven popular in Europe.

Alternatively, Congress could achieve some of the same goals by implementing or expanding parallel programs targeted at entities unable to directly benefit from the PTC. For example, the Clean Renewable Energy Bond (CREB) program created by the Energy Policy Act of 2005 is one attempt to level the playing field for non-taxable entities unable to use the PTC. The Renewable Energy Production Incentive (REPI) is another such policy with a longer, though marred, history: because REPI payments are subject to annual (and therefore uncertain, and often insufficient) Congressional appropriations, the REPI is widely considered to be relatively ineffective at stimulating new renewable generation. If the PTC is not made tradable, then Congress may wish to consider a longer-term renewal and allocation of funds to the CREB program, or revisions to the REPI to make it a truly predictable and more-effective incentive.

Treatment of Non-Wind Renewable Sources

The implications of a short-term PTC extension cycle are even more severe for eligible non-wind renewable energy technologies. This is because the 12-24 month development window created by shorter-term PTC extensions is simply not long enough to directly and significantly spur the development of other PTC-eligible technologies, such as geothermal and biomass. Both of these technologies require longer development periods than does wind. As such, a longer-term extension of the PTC, in the range of at least 5 years, may well be necessary for the PTC to provide value to the biomass and geothermal industries that is equivalent to that which is provided to the wind industry.

Furthermore, some non-wind renewable technologies have only become PTC-eligible within the last few years, yet have already endured legislative changes to the length and/or value of the available credit. By making it hard to plan and arrange financing, such policy changes exacerbate the challenge of bringing non-wind renewable projects online within the short development window afforded, and thereby have further limited the effectiveness of the PTC for non-wind technologies.

Moreover, because PTC incentive levels vary by technology, some eligible renewable sources are unlikely to see much growth even with a longer-term extension to the policy. As such, in addition to a longer-term extension, Congress may wish to better-tune PTC incentive levels to the market needs of the various renewable technologies. In particular, it may be appropriate to apply the higher (2.0¢/kWh) PTC incentive level to a broader range of renewable technologies, including traditional open-loop biomass; a lower incentive might be reserved for renewable resources that are closer to economic competitiveness.[20]

[20] It is also apparent that some renewable technologies – most notably solar (which for a brief period was eligible for the PTC), but also including smaller, residential wind systems – are better suited to investment-based support such as through the current investment tax credit for solar.

Treasury Impacts

The PTC imposes a cost to U.S. taxpayers in the form of foregone federal tax revenue. Claims for the PTC have increased significantly over time, from just $4 million in 1995 (real 2005$) to over $210 million in 2004. Wind projects accounted for over 90% of the dollar value of PTC claims through 2004. Assuming that the PTC's availability for new projects ends in 2008, as currently scheduled, PTC claims have been estimated at $850 million in 2007, increasing to a maximum of $1.4 billion in 2009. From 1994 through 2007, estimated claims for the PTC total a cumulative $2.7 billion. The Joint Committee on Taxation has estimated that a 4-year extension of the credit, as proposed in the House-passed H.R. 3221, would reduce revenue to the Treasury by $6.6 billion over the duration of PTC claims.[21]

Of course, renewable electricity is not the only energy source to receive federal fiscal incentives. Though tallying federal subsidies is tricky business, one recent estimate pegs average 2006 federal fiscal subsidies for energy at nearly $75 billion, with over 85% of those subsidies going to fossil fuels ($49 billion), nuclear energy ($9 billion), and ethanol ($6 billion).[22]

Because many of the design and extension options discussed here would, if addressed, lead to increased renewables development and a correspondingly higher PTC budgetary impact, it is worth considering how to contain the cost of the policy within acceptable limits while still achieving as many policy goals as possible.

One way to potentially accomplish this goal is to gradually reduce the level of the PTC over the extension period, presumably in concert with renewable technologies becoming more mature and cost-competitive and/or the replacement of the PTC with an alternative form of support. Though such an approach deserves consideration, one caution is that wind power costs have risen substantially in recent years, eroding the competitive position of wind relative to other generation options. Care is therefore warranted so as not to reduce the PTC to a level that is unable to support new project development.

7. Conclusion

Though the purpose of this article has not been to defend any particular policy outcome, the analysis presented here suggests that a longer-term extension of the federal PTC may provide a number of benefits, and that several other design changes to the PTC deserve consideration. If a longer-term PTC extension proves impossible, politically or otherwise, similar benefits may be gained from alternative policies that provide the necessary industry stability. Given the risk imposed on investors of any transition away from the PTC and to an alternative policy mechanism, however, Congress may wish to avoid in all instances a rapid reduction or elimination of the PTC. Of course, the possible benefits of a longer-term PTC extension, or the use of an alternative policy approach, must be judged against the costs of those policies, as well as the alternative uses of the required funds.

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[21] Fred Sissine. 2007. "Renewable Energy: Background and Issues for the 110th Congress." Congressional Research Service.

[22] Doug Koplow. Forthcoming. "Subsidies in the US Energy Sector: Magnitude, Causes, and Options for Reform." *Subsidies and Sustainable Development: Political Economy Aspects.* Organization for Economic Cooperation and Development.