Wind Power and the Production Tax Credit: An Overview of Research Results

Testimony Prepared for a Hearing on
"Clean Energy: From the Margins to the Mainstream"
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Mr. Chairman and members of the Committee, thank you for inviting me to testify today. My name is Ryan Wiser, and I am a Scientist at Lawrence Berkeley National Laboratory (Berkeley Lab). Since 1995, I have conducted renewable energy research at Berkeley Lab; research that has been funded in large part by the U.S. Department of Energy. I am an author of over 200 research reports, articles, and book chapters, many of which can be found at: http://eetd.lbl.gov/ea/ems/. I am honored to be able to share with you my views as a researcher and as a private citizen.

I am here today to report on the findings of recent and ongoing work that I have helped manage and conduct that may inform your deliberations on the possible fate and extension of the Section 45 Production Tax Credit (PTC), especially as it pertains to wind power. These studies, many of which are still in progress, suggest that renewable electricity development is beginning to accelerate, that the potential for renewable electricity production in the U.S. is enormous, and that there may be significant benefits to both a longer-term extension of the PTC and to certain revisions to the PTC. That said, there are also very real costs to the Treasury of these changes that will need to be balanced against the potential benefits, and the benefits and costs of tax incentives for renewable energy might also be judged in comparison to the costs and benefits of providing tax incentives to other industries.

To be clear, I am here to report the results of my recent research and analysis, and though I hope that my remarks will help inform your deliberations, I am not here to take a specific policy position on the use of tax policy to support renewable energy. Let me also note that my remarks are my own, and do not necessarily represent those of Berkeley Lab or the U.S. Department of Energy. I am here on my own time, and neither my time nor my expenses are being charged to the Department of Energy.

The Nation's Renewable Electricity Resource Base

Renewable electricity, excluding hydropower, supplied just 2.7% of the Nation's electricity needs in 2006, and consisted of biomass and municipal waste (60%), wind (25%), geothermal (14%), and solar (0.5%). Including hydropower, the contribution of renewables increases to roughly 10% of U.S. retail electricity sales.

Despite this modest contribution, new renewable electricity investments have been accelerating in recent years, after a lull in the 1990s. Figure 1 illustrates the recent growth in renewable electricity capacity in the United States, excluding hydropower.

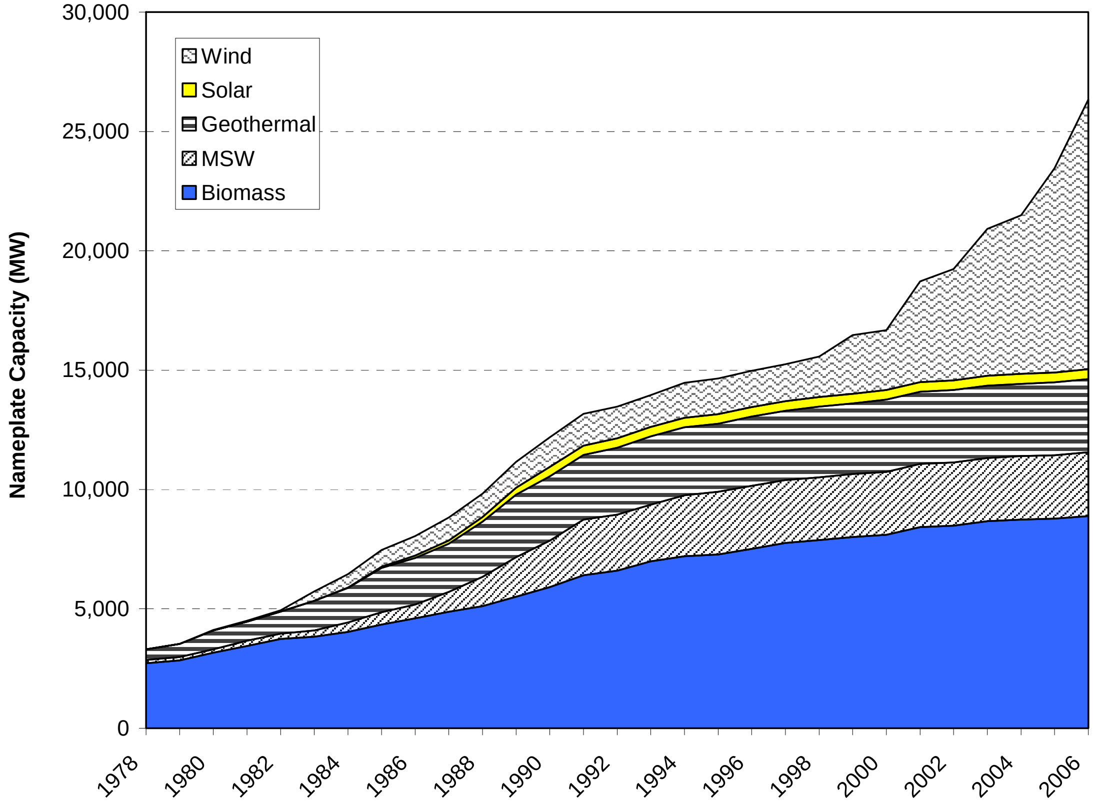

Figure 1. Cumulative U.S. Renewable Electricity Capacity, Excluding Hydropower
(Source: Black & Veatch 2007)

Figure 1 clearly shows that recent growth in the U.S. renewable electricity sector has been led by wind power. In fact, the year 2006 was the largest on record in the U.S. for wind power capacity additions, with over 2,400 MW of capacity added to the U.S. grid (see Figure 3, later). 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. New wind plants contributed roughly 19% of the new capacity added to the U.S. grid in 2006, compared to 12% in 2005. On a worldwide basis, 15,200 MW of wind capacity was added in 2006, up from 11,500 MW in 2005, for a cumulative total of 74,200 MW.

The recent growth in U.S. and worldwide use of renewable electricity is not restricted to wind power. Geothermal energy development in the Western U.S. has accelerated in recent years, and biomass power also has great potential. Solar power, though contributing relatively little to the Nation's electricity supply at present, holds substantial technological promise both through the use of photovoltaics and with solar-thermal electric facilities; the U.S. is currently the world's third largest market – behind Germany and Japan – for solar photovoltaics.

It is also undeniable that the United States is endowed with a very sizable renewable resource base, a resource base that is technically and physically able to meet the Nation's full energy needs. I won't go through the evidence in detail here, but suffice it to say that we have enormous physical resources to harness, including wind, solar, biomass, and geothermal energy, though of course not all of these resources will be cost effective.

Other countries, with far less attractive resource bases, have already made significant strides towards using substantial amounts of renewable energy. Denmark meets roughly 20% of its electricity needs with wind alone, while Spain is at 10% and Germany is at 7%. These countries have chosen to employ aggressive governmental policies to reach these levels of penetration. Despite having a much more robust wind resource, and despite recent growth, the U.S. currently meets less than 1% of its electricity needs with wind power (Figure 2).

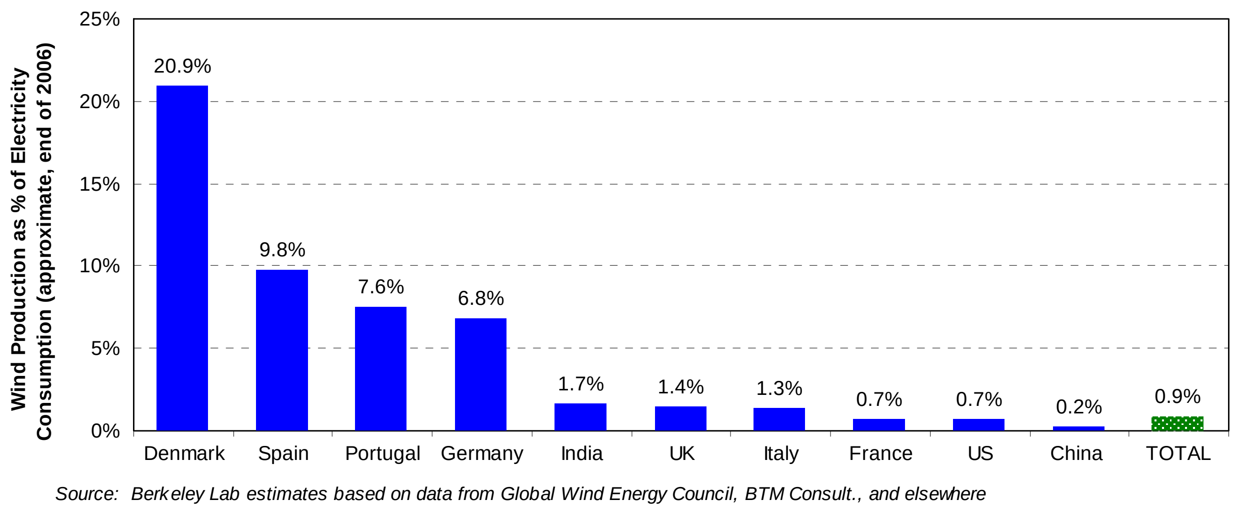

Figure 2. Wind Power as a Percentage of Total Electricity Sales for the Ten Top Wind Power Markets

Concerns have sometimes been expressed about the difficulty of accessing and using these resources; due, for example, to the complexity of integrating wind energy into electrical grids, and the cost of transmitting wind power from resource areas to load centers. These concerns are not entirely unfounded, but a growing number of sophisticated and credible research studies, as well as experience in Europe, show that not only is the integration of a substantial amount of wind power into electrical grids technically feasible, but that the costs of doing so are manageable. Similarly, while transmission availability is often a contractual or physical barrier to wind development, innovative tariff designs and growth in transmission infrastructure are possible and need not be overwhelmingly expensive. A common barrier is uncertainty over who will pay for new, large, and often multi-state transmission lines, the so-called "cost-allocation" issue. Solving this issue in not technical, but rather involves agreements being reached jointly by the affected states, as well as with FERC and state regulatory bodies. These barriers are not entirely unique to renewable energy; some of the same issues arise when accessing certain conventional sources of power, such as coal, which are also often located remote from load centers. Though there are surely very real barriers to the growth of the renewable electricity industries in the U.S., the opportunities are also great.

The Renewable Energy Industries Are Maturing but Policy Is Still Likely to Be Needed if Rapid Growth is Desired

The renewable energy industries are maturing. The wind power manufacturing sector, for example, now includes GE, Siemens, Vestas, and other major international firms. A number of large companies have recently entered the development side of the business as well, including AES, Goldman Sachs, Shell, BP, and John Deere, joining existing players such as FPL, PPM, Iberdrola, and others. The increased acceptance and maturity of the wind sector has also attracted interest by electric utilities to own wind assets, with 25% of the total U.S. wind additions in 2006 owned by local electrical utilities. Similar growth and industry development is occurring in other segments of the renewable energy sector.

Despite these advances, analyses funded by the Federal government, by non-profit organizations, and by the private sector consistently suggest that, if renewable resources are chosen to be harnessed at a significant scale in the United States (particularly at a rate faster than the normal multi-decades natural growth that will occur regardless as technology costs continue to decline), supportive policy will be needed.

The U.S. DOE's Energy Information Administration, for example, projects that existing Federal policies (assuming that existing tax policies, including the PTC, expire on schedule) will only be enough to increase the amount of non-hydro renewable electricity used in the U.S. to 3.9% of electricity supply by 2030. Work at Berkeley Lab, meanwhile, shows that if existing *state* renewable energy purchase standards are fully achieved, renewable electricity use would meet roughly 6% of the Nation's electricity supply by 2020. Recent and ongoing work by the DOE and the wind industry to evaluate the feasibility of achieving 20% of the Nation's electricity supply from wind has also found that policy actions are critical to the pursuit of such aggressive targets.

To be clear, it is not my role to argue that Federal or state policies are warranted on policy grounds – policymakers must consider both the potential costs and benefits of these policies, as well as the alternative uses of the funds required to support them. But, one point is evident based on the research, and that is that *if* deploying renewable energy on a significant scale in this Nation is desired (above the much slower rate of uptake that analysts predict will occur absent new/expanded policies), then policy efforts, in concert with private sector ingenuity and investment and R&D advancements, will likely be needed.

History of the Production Tax Credit

As you are all very much aware, the U.S. Congress has a long history of providing tax incentives for energy development, including renewable electricity. The PTC was established by the Energy Policy Act of 1992 to stimulate use of renewable technologies for power production. At the present time, the PTC provides a 10-year credit of 1.9¢/kWh (adjusted upwards, in future years, for inflation) 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. Projects must be in service by the end of 2008 to be eligible for the current PTC. Presumably, the PTC intends to support renewable energy due to the environmental, economic development, and energy security benefits that these sources provide, and perhaps as a way of compensating for the Federal incentives that have historically been offered to conventional energy sources.

Since 1999, the PTC has expired on three occasions, and has been extended on five occasions. Typically, the PTC has been reinstated for 1- to 2-year periods, with resource eligibility rules and other statutory details often also witnessing some change. Table 1 shows the legislative history of the PTC, along with its impact on wind project development.

Table 1. History of the PTC and Related Development Activity

Legislation	Date Enacted	PTC Eligibility Window	Effective Duration (considering lapses)	Wind Capacity Built in PTC Window (MW)
Section 1914, Energy Policy Act of 1992 (P.L. 102-486)	10/24/92	1994-June 1999	80 months	894
Section 507, Ticket to Work and Work Incentives Improvement Act of 1999 (P.L. 106-170)	12/19/99	July 1999-2001	24 months	1,764
Section 603, Job Creation and Worker Assistance Act (P.L. 107-147)	03/09/02	2002-2003	22 months	2,078
Section 313, The Working Families Tax Relief Act, (P.L. 108-311)	10/04/04	2004-2005	15 months	2,796
Section 1301, Energy Policy Act of 2005 (P.L. 109-58)	08/08/05	2006-2007	24 months	5,454*
Section 201, Tax Relief and Health Care Act of 2006 (P.L. 109-432)	12/20/06	2008	12 months	3,000**

*5,454 MW based on 2,454 MW installed in 2006, and AWEA projection of 3,000 MW to be installed in 2007.
**Estimate assuming AWEA's 3,000 MW 2007 projection holds throughout 2008.

Impact of the PTC on Wind Power Development to Date

The PTC reduces the cost of wind power by roughly one-third (~ 2 cents/kWh), thereby making wind more attractive to electric utilities and other investors. In fact, with the PTC, wind power is now economically attractive in some regions of the country relative to more-conventional electricity sources. The PTC, coupled with the rising cost of conventional fuels, R&D advances, and a variety of state policies, has stimulated significant growth in the use of wind power over the past 10 years, as shown in Figure 3. It is difficult to overstate the importance of the PTC to the wind industry over this timeframe, as well as the negative consequences of PTC expiration for the industry in 2000, 2002, and 2004.

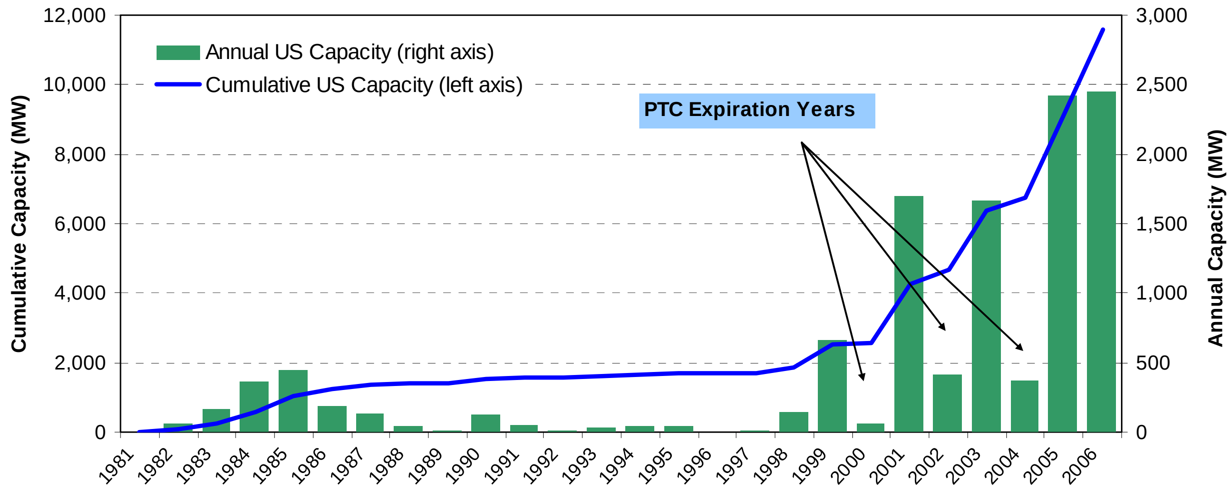

Figure 3. U.S. Wind Power Capacity (annual and cumulative)

In part as a direct result of the PTC, the U.S. has led the world in wind power additions for the last two years, with roughly 16% of the worldwide wind capacity installed in 2006 coming from the United States. Moreover, nearly $4 billion was invested in U.S.-based wind capital additions in 2006 alone. Since the PTC began in 1994, wind plant additions in the U.S. have resulted in an aggregate investment of roughly $13 billion.

As shown in Table 2, major state beneficiaries of the PTC are regionally diverse, and include Texas, Washington, California, Iowa, Minnesota, Oklahoma, New Mexico, and New York. A total of 20 states had more than 50 MW of wind power capacity at the end of 2006.

Table 2. Wind Power Capacity, by State

Cumulative Capacity (end of 2006, MW)		Incremental Capacity (2006, MW)	
Texas	2,768	Texas	774
California	2,361	Washington	428
Iowa	936	California	211
Minnesota	895	New York	185
Washington	818	Minnesota	150
Oklahoma	535	Oregon	101
New Mexico	497	Kansas	101
Oregon	439	Iowa	100
New York	370	New Mexico	90
Kansas	364	North Dakota	80

As evidence of the importance of the PTC to the U.S. wind sector, wind capacity additions have seen pronounced lulls in 2000, 2002, and 2004 (see Figure 3). In each of these years, the PTC expired for some period of time before being subsequently extended. Though some wind development will surely occur even without the Federal PTC, this historical experience suggests that the PTC, or some alternative policy, is crucial if significant near-term growth of the wind market in desired.

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 wind power. Due to the series of shorter-term, 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 manufacturing capacity in the U.S., and variability in equipment and supply costs. Recent work at Berkeley Lab suggests that this boom-and-bust cycle has made 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 shorter-term, 1- to 2-year extensions of the PTC on the wind industry are as follows:

1. **Slowed Wind Development:** Data in Figure 3 demonstrate that the risk of PTC expiration can slow wind development in certain years. Even in years in which the PTC is secure, uncertainty in the 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 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 2002, however, costs have risen. Based on data collected by Berkeley Lab, the average installed cost of wind projects in the U.S. in 2006 was roughly $1,600/kW, up from roughly $1,300/kW in 2002. There is reason to believe that these increased prices have been caused, in part, by the erratic market cycle of frenzied investment alternated with market collapse that has been created by the 1- to 2-year extensions of the PTC 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. Instead, the U.S. remains reliant, to a significant degree, on wind turbines and components manufactured in Europe and, in the future, perhaps China and elsewhere, thereby reducing opportunities to grow the domestic manufacturing sector.

4. **Difficult to Rationally Plan Transmission Expansion:** Accessing substantial amounts of wind energy will require investments in the transmission grid, and most analysts believe that the U.S. has under-invested in transmission in recent years. 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. In turn, since transmission projects take many years to plan, permit, finance, and construct, uncertain demand for the line itself may prevent needed transmission projects from taking place.

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.

Potential Benefits of a Longer-Term PTC Extension

Recent research at Berkeley Lab and elsewhere has sought to investigate, with more specificity, some of the possible benefits of a longer-term (5-10 year) PTC extension, or other more-stable form of promotional policy. Preliminary analysis in late 2006 by Berkeley Lab, for example, suggested that a longer-term PTC extension may be able to drive the installed cost of wind down by 5% to more than 15%, relative to a continuation of the present cycle of 1- to 2-year extensions. More recent analysis of historical wind capital costs also suggests the possibility of a capital cost premium of up to 12% as a result of the present boom-and-bust cycle.

Because these initial analyses were crude, and the resulting estimates uncertain, we also sought to confirm the results through a survey of wind industry members. Through the survey, we also hoped to develop a better understanding of some of the specific benefits of a longer-term PTC extension (or alternative policies that would bring more long-term certainty to the industry). Importantly, this was an industry survey, and did not seek to address other relevant perspectives on the benefits and drawbacks of longer-term PTC renewal. I therefore encourage you to think of the results as useful inputs to policy determination, but by no means a comprehensive analysis of the advantages and disadvantages of such an extension.

Survey respondents represent a diverse set of industry stakeholders, including two wind turbine manufacturers, three components suppliers, four developers/O&M providers, and one construction contractor. We may receive more responses in the weeks ahead, so the results presented here should be considered preliminary.

Some of the key findings of this work are provided below.

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 respond to 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 installations expected to result from that policy stability (Figure 4). 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, at least to my knowledge.

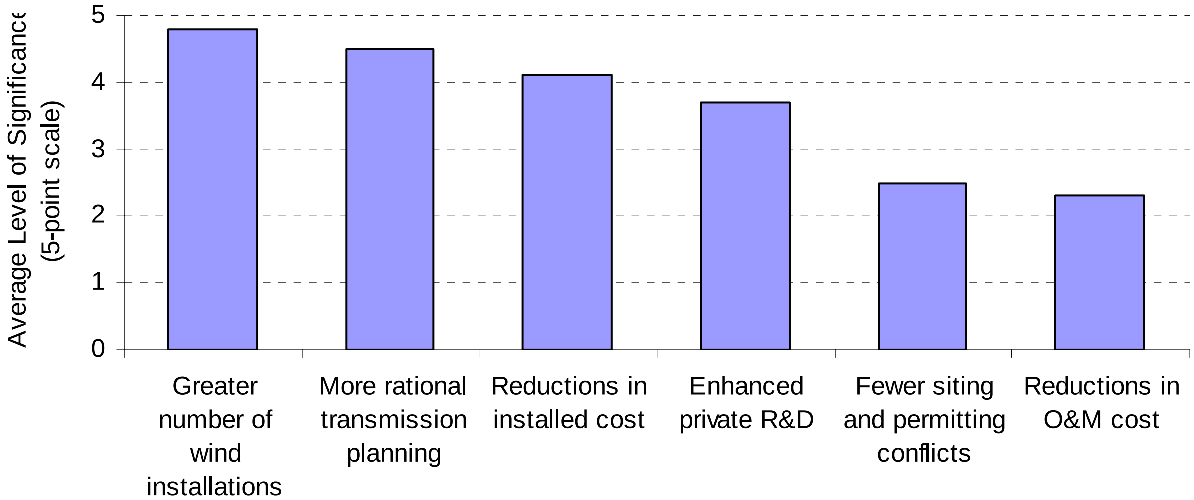

Figure 4. Potential Benefits to the Wind Industry of a 5- to 10-year PTC Extension

Finding #2: A 5- to 10-Year PTC Extension May Encourage Growth in Domestic Wind Turbine Manufacturing

U.S.-based manufacturing of wind turbines and components remains somewhat limited, in part because of the uncertain availability of the Federal PTC. This is true despite recent announcements and investments to increase local manufacturing of certain components by both domestic and international firms. In 2006, for example, new wind-related manufacturing plants were established in Iowa (Clipper Windpower), Minnesota (Suzlon), and Pennsylvania (Gamesa). And GE Energy, the Nation's most prominent wind turbine manufacturer, captured 47% of domestic wind turbine sales in 2006.

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 PTC environment and under a 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 5).

Under the present uncertain PTC extension path, domestic manufacturing is expected to remain largely constant over time, and not grow substantially from its current base of roughly 30%. As one point of reference, the nascent wind power market in China has already achieved a 70% local manufacturing share, with virtually all of the major turbine manufacturers (including GE) making substantial manufacturing investments in that market. A 10-year PTC extension, on the other hand, yields a median expected domestic manufacturing share of over 70%, on par with China's current share, bringing with it jobs and local economic development benefits.

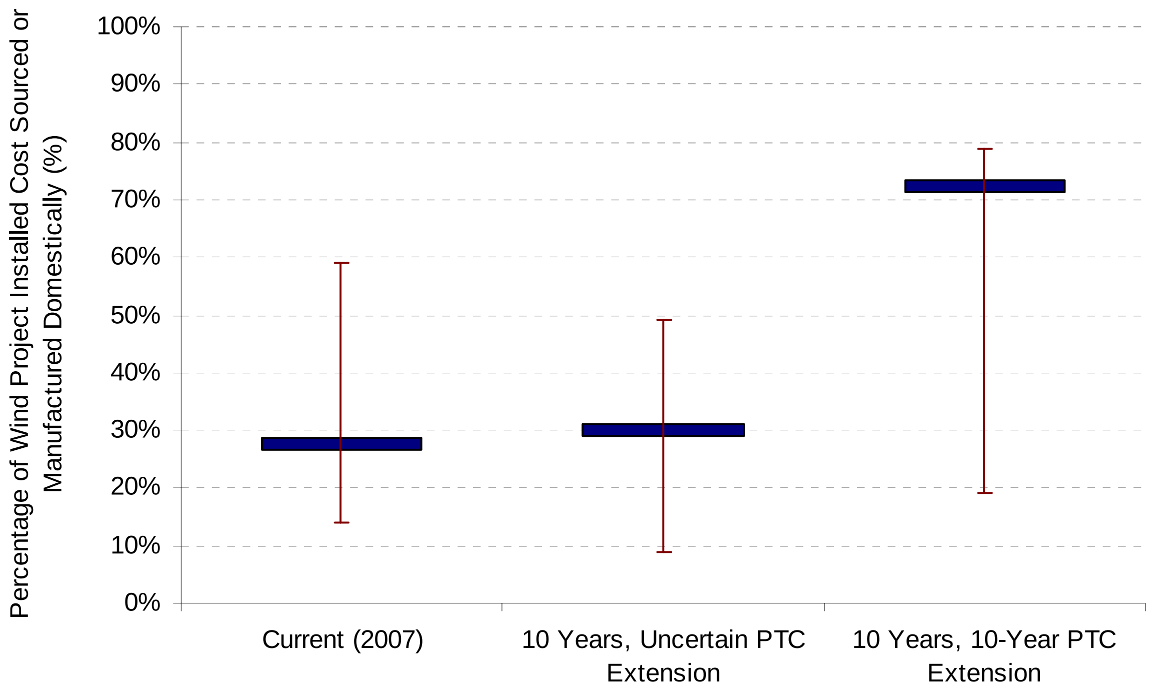

Figure 5. Domestic Manufacturing Expectations by Industry Under Longer-Term PTC Extension (median, min, max)

Finding #3: Installed Cost Reduction Potential Is Significant, at 8% (5-year extension) to 15% (10-year extension), on Average

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 in the United States, 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% to as high as 20-25%; under a 5-year extension, cost reductions are projected to range from 0-5% to 10-15%. Averaged over all responses, a 5-year extension is projected to yield cost reductions in the 8% (~$135/kW) range, while a 10-year extension may result in ~15% reductions in installed wind project costs (~$255/kW). Other survey results, not presented here, suggest that these savings estimates might be considered a conservative lower bound. Either way, these results are reasonably consistent with those estimated earlier by Berkeley Lab.

Respondents believe that the most important cost-reducing influences that may come from a 5- to 10-year extension include:

1. More efficient labor deployment and greater investment in supply-chain capital; lower risk premiums for capital investment in the supply chain.
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 driven higher by currently rushed development schedules

Summary of Findings

The 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. I want to very clearly acknowledge, however, that these possible benefits must be judged against the costs to the Treasury of a longer-term PTC extension, as well as the alternative uses of the funds required to support such an extension. In addition, it should be understood that the above survey results derive from the views of wind industry participants, who have a natural self-interest in a PTC extension.

Production Tax Credit Design Considerations

Based my work, and the work of other colleagues at Berkeley Lab, I would also like to raise for your consideration several different elements of the design of the PTC. While, again, I take no formal position on the proper design of the PTC or whether it should be extended, I do hope this discussion will help identify several design elements that you may wish to consider.

Credit Offset Rules

First, Section 45 (b)(3) of the Internal Revenue Code contains what are commonly known as "credit offset" or "anti-double-dipping" provisions that reduce the amount of the PTC 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. To date, most individual states that have offered financial incentives to encourage wind project development have structured 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).

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 (by, for example, making the payment performance-based). 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), though due to several design features, the PTC is also not easily accessible by certain tax-paying entities as well.[1] 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. 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. 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 and expanded by the Tax Relief and Health Care Act of 2006 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. It is perhaps worth noting that both the REPI and CREB programs would be largely unnecessary if the PTC were made tradable. If the PTC is not made tradable, however, 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

Earlier in this testimony I discussed some of the possible negative consequences of the recent history of 1- to 2-year PTC extensions for wind power. The implications of this extension cycle are even more severe for eligible non-wind renewable energy technologies, such as biomass and geothermal. This is because the 12-24 month development window created by shorter-term PTC extensions does not appear to be 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

[1] 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).

PTC, in the range of 5 years, may well be necessary for the PTC to provide value to the biomass and geothermal industries that is equivalent to the value provided to the wind industry. It is also apparent that some renewable technologies – most notably solar, but also including smaller, residential wind systems – are better suited to investment-based support such as through the current investment tax credit. Of course, it is up to policymakers to determine whether an acceleration of the deployment of these renewable resources is desired.

Treasury Impacts

Finally, since many of the design and extension options discussed in this testimony would, if addressed, likely lead to increased renewable generation 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. For example, a 10-year PTC extension might start at current levels ($15/MWh not adjusted for inflation) for projects built during the first year of the extension, but then decline in value over the extension period, such that projects built later in the 10-year period would receive a reduced PTC. The long-term nature of such an extension would provide the industry with the certainty that it seeks, while the declining incentive level would help contain the cost to the Treasury. Though such an approach deserves consideration, one caution is that wind power costs have risen substantially in recent years, and care is therefore warranted so as not to reduce the PTC to a level that is unable to support new project development (assuming, again, that increased renewable energy development is the goal of the PTC).

Conclusion

Mr. Chairman and members of the Committee, to conclude I want to re-emphasize that I am not here to advocate for any particular policy outcome from this Committee. Instead, I hope that the data and analysis that I have presented today will be helpful as you consider the desirability of accelerating the use of renewable electricity in this Nation’s energy supply, the possible benefits and costs of policies that provide greater certainty and stability to the renewable energy sector, and the advantages and disadvantages of certain policy design features.

Brief Biography - Ryan Wiser

Ryan Wiser is a scientist in the Electricity Markets and Policy Group at Lawrence Berkeley National Laboratory. He leads research in the planning, design, and evaluation of renewable energy policies, and on the costs, benefits, and market potential of renewable electricity sources. Through his work at Berkeley Lab, Dr. Wiser has become a well-known expert on the development and design of a variety of different types of renewable energy policies. Ryan's recent analytic work has included studies on the economics of wind power; the treatment of renewable energy in utility integrated resource planning; the cost of state-level renewables portfolio standards; trends in solar costs in California; the risk mitigation value of renewable electricity; and customer surveys of willingness to pay for renewable generation. Dr. Wiser regularly advises and consults with state and federal agencies in the design and evaluation of renewable energy policies; is an advisor to the Energy Foundation's China Sustainable Energy Program; and is on the Corporate Advisory Board of Mineral Acquisition Partners. Dr. Wiser has published over two hundred journal articles and research reports. His work has been quoted in the Wall Street Journal, USA Today, Washington Post, New York Times, LA Times, and numerous other publications. Prior to his employment at Berkeley Lab, Dr. Wiser worked for Hansen, McOuat, and Hamrin, Inc., the Bechtel Corporation, and the AES Corporation. He received a B.S. in Civil Engineering from Stanford University and holds an M.S. and Ph.D. in Energy and Resources from the University of California, Berkeley.