TESTIMONY OF NEIL Z. AUERBACH, MANAGING PARTNER OF HUDSON CLEAN ENERGY PARTNERS, BEFORE THE
COMMITTEE ON WAYS AND MEANS
UNITED STATES HOUSE
September 22, 2011
On
"ENERGY TAX POLICY AND TAX REFORM"

Introduction

Mr. Chairman, Ranking Member, members of the Committee, thank you for the opportunity to testify here today. It is truly an honor.

My name is Neil Auerbach, and I am the Founder and Managing Partner of Hudson Clean Energy Partners. Hudson Clean Energy Partners is a global private equity firm that focuses exclusively on investing in the clean energy sector. With over $1 billion in assets under management, Hudson is a leading global investor in sectors that include wind, solar and hydroelectric energy, biofuels, biomass, smart grid, electric vehicles, energy efficiency and storage. Given our position on the front lines of these fast-growth industries, we have seen firsthand the impact of government policies on private sector capital flows in our sector, both at home and abroad. Additionally, in my early professional life, I served for almost 10 years as a tax attorney and two years as Branch Chief and Assistant to the Associate Chief Counsel of the Internal Revenue Service.

Based on this experience, I would like to offer my thoughts to the Committee on the effectiveness of renewable energy support mechanisms in the Internal Revenue Code. Additionally, I would like to offer several options for improving on the current structure in ways that would continue to provide strong support for renewable energy development while also reducing the cost to the US taxpayer.

The clean energy industry in the U.S. has been supported for the past two decades in large part by the production and investment tax credits (PTCs and ITCs). These policies have served an effective goal, resulting in substantial amounts of capital invested and an increasingly significant amount of installed renewable energy capacity. My firm's research has confirmed that small increases in scale are causing significant improvements in the cost structures of the wind and solar industries, which provide a majority of renewable power today. Wind and solar energy are more cost competitive now than ever before, having reduced costs more rapidly than any other type of conventional energy source over the last 80 years.

As technology costs have declined, some have asked why we still need the PTC and ITC for renewable energy development. There are three principal reasons. First, cost curve analysis suggests that renewable energy will be cost competitive with traditional sources of energy generation within the next few years. Wind and solar power technologies are reaching grid parity in some markets now and are projected to reach grid parity in most markets during the next five years or so– the policies are working as the market is scaling, costs are coming down and the technologies are increasingly competitive. During this transitional period when continued scale-up is pivotal to the reduction of costs, it is crucial that policy continue to enable this growth. Second, the PTC and ITC have helped to level the playing field for renewables with fossil fuels and nuclear, which have been the recipients of the vast majority of federal energy incentives over time, equating to approximately 82% of direct spending, R&D and tax expenditures from 1950 to 2006.[1] The cost savings and price stability that renewable energy will offer consumers versus fossil energy is reason to invest taxpayer dollars in its development. Finally, federal and state policies play an important role in stimulating private capital in these markets. The U.S. has the most robust capital markets in the world that are driven by the private sector. These markets have been mobilized in renewable energy markets thanks in large part to the PTC and ITC, however, in order to give the private sector the confidence that it needs to continue providing liquidity to these markets, there must be a strong and continued policy commitment, which we have not had to date.

Despite having been largely responsible for the existence and growth of the renewables industry today, current tax-based incentives are not without shortcomings. In order to create sustained market demand for low-carbon energy sources with good policy, it is time to consider options for improving the efficiency of the current suite of renewable energy incentive programs and also consider phasing in new systems, such as a permanent extension of the 1603 Treasury grant program and the implementation of competitive tenders for federal incentives.

Before I offer detailed comments on specific areas where the existing policies should be optimized and suggestions for more efficient polices, I want to explain clearly and in the simplest terms why support for clean energy[2] is critical to our energy security, and is beneficial to our economy and our environment.

Domestic clean energy development is vital to our national interest

Energy Security

Energy security is enhanced when we produce more of the energy we consume here in the U.S. The U.S. currently imports approximately 23% of its primary energy from abroad[3], including 51% of the oil that we consume[4]. In dollar terms, we shipped almost $275 billion abroad in 2010 and will ship close to $370bn abroad in 2011 in order to fuel our economy at home[5]. In order to mitigate the risks associated with our dependence[6] on foreign sources of energy, the U.S. should increase domestic production of all sources of energy. Although Congress should not pick energy winners and losers, the goal of improving our energy security is enhanced further by improving access to unlimited sources of domestic energy than by improving access to energy resources of finite duration. Increasing our production of domestic fossil fuels may

[1] Analysis of Federal Expenditures for Energy Development. Management Information Services. February 2008 http://www.misi-net.com/publications/2008energyincentives.pdf

[2] The term "clean energy" has many definitions, as many industries want the moniker of being called "clean." Here, I used the term to refer to renewable energy (wind, solar, biomass, geothermal, hydropower, biofuels) and energy smart technologies (including smart grid, building efficiency, industrial efficiency, transport efficiency and storage).

[3] EIA estimates for 2009 total US energy production (72,970 quads) and consumption (94,578 quads)
Consumption: http://www.eia.gov/totalenergy/data/annual/txt/ptb0201a.html
Production: http://www.eia.gov/totalenergy/data/annual/txt/ptb0102.html

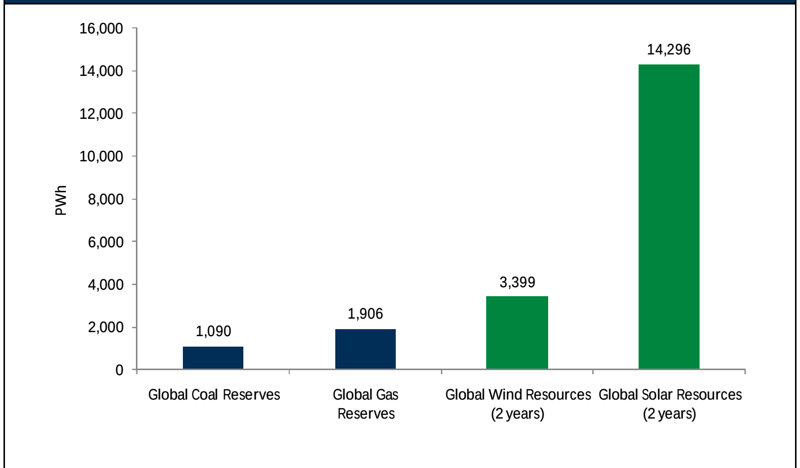
[4] EIA – "How dependent are we on foreign oil?" http://www.eia.gov/energy_in_brief/foreign_oil_dependence.cfm

[5] Assumes an average $/bbl of WTI Crude of $79.40 in 2010 and $102.67 in 2011 and net imports of 9.4 and 9.8mmbd respectively: http://www.eia.gov/emeu/steo/pub/contents.html

[6] Location of equipment manufacturing is not more relevant to energy security than location of manufacturing of an oil rig or gas turbine.

improve our energy security, but a careful analysis of resource availability shows that increases in our domestic stores of accessible fossil fuels are measured at most in decades, whereas increases in our stores of renewable energy capacity have infinite duration.[7] Figure 1 highlights the stark contrast between global coal and gas reserves and just two years worth of wind and solar supply. Our energy policy should focus on utilizing more of these clean energy resources.

Figure 1: Power Potential of Global Natural Resources



Sources: BP, Chatham House, U.S. Department of Energy, Physics Factbook, Hudson estimates

Economic Rationale

Increasing our domestic production of clean energy, along with siting a significant part of the associated manufacturing chain in the U.S., promotes US competitiveness, increases domestic jobs and creates wealth that grows our GDP and reduces our trade deficit.

Our international trading partners -- led by China -- are laying plans for massive investments in the clean economy. The clean energy market is forecast to triple in size during this decade, from $740 billion in 2009 to over $2 trillion by 2020,[8] exceeding global GDP growth even under the most conservative growth scenario. Annual capital invested in additions to clean energy generation capacity is already pulling even with fossil fuel generation capacity.[9] The vibrant markets for clean energy and energy smart technologies, such as smart grid, ultra high capacity transmission, advanced energy storage, LED lighting, and electric vehicles, will be dominated by countries encouraging investments in R&D, manufacturing and deployment. In 2010, the U.S. accounted for 14% of the clean energy market, but its pole position fell for the second year in a

[7] Proven reserves of coal in the US (260bn tons) equal roughly 200 years worth of US supply at current consumption rates (1.1bn tons/yr). Proven reserves of conventional and unconventional oil (200bn bbl) and gas (400 - 2,000tcf), however, represent only 30 and 15-80 years, respectively, of remaining oil and gas supply at current consumption rates (oil: 7bn bbl/yr; gas: 26tcf/yr). By contrast, wind and solar development sites can be upgraded every 25-30 years to continue providing renewable energy into perpetuity since there are no resource constraints. (US theoretical wind potential: 8,000GW onshore ad 2,200GW off-shore; US theoretical solar PV potential: 206,000GW) – EIA, MIT, NREL, Hudson Estimates

[8] HSBC Global Research, "Sizing the climate economy," September 2010

[9] Bloomberg New Energy Finance: annual capital invested in additions to clean energy ($187bn) and fossil fuel generation capacity ($219bn)

row. Germany and China accounted for 17% and 22% respectively in 2010, taking the number one and two positions, which belonged to the US in the two years prior.[10] Further, the U.S. lags our trading partners in terms of clean energy manufacturing capacity. For example, only 6% of global PV cell production takes place in the U.S. while 59% of global cell production takes place in China.[11] And, in terms of clean energy deployment, the US leadership has begun to wane. For example, in 2007, the U.S. installed nearly 6GW of renewable energy capacity, approximately 60% of all domestic newly installed power generation capacity.[12] China, by contrast, installed less than 5GW[13] of renewable energy capacity, approximately 6%[14] of its newly installed power generation that year. Just three years later, the picture changed dramatically. In the U.S., only 5GW of renewable energy capacity was installed in the U.S., whereas nearly 17GW of renewable energy capacity was installed in China. [15] Over the same period, China moved up the league tables of top ten manufacturers of wind turbines and solar panels (see Figures 2 & 3).

---

[10] Bloomberg New Energy Finance and Pew Charitable Trust "Who's Winning The Clean Energy Race? 2010"

[11] Solarbuzz (data includes Taiwan)
http://www.solarbuzz.com/our-research/recent-findings/solarbuzz-reports-world-solar-photovoltaic-market-grew-182-gigawatts-20

[12] U.S. EIA – Electric Net Summer Capacity
http://www.eia.gov/cneaf/alternate/page/renew_energy_consump/table4.html

[13] Bloomberg New Energy Finance Database

[14] Reuters: China installed capacity hits 710 GW in 2007
http://uk.reuters.com/article/2008/01/09/china-power-capacity-idUKPEK24321320080109

[15] Bloomberg New Energy Finance and Pew Charitable Trust "Who's Winning The Clean Energy Race? 2010"
Total installed renewable capcity: US (58GW) China (103GW) - http://bnef.com/WhitePapers/download/36

Figure 2: Top 10 Global Wind Manufacturers 2005, 2010 (Rank Order by Production - GW)

2005				2010			
	Company	Country	Production		Company	Country	Production
1.	Vestas	Denmark	3.2	1.	Vestas	Denmark	6.3
2.	Enercon	Germany	2.7	2.	GE Wind	US	6.0
3.	Gamesa	Spain	1.9	3.	Sinovel	China	5.3
4.	GE Wind	US	1.3	4.	Gamesa	Spain	4.4
5.	Seimens	Denmark	1.1	5.	Goldwind	China	3.6
6.	Suzlon	India	0.9	6.	Suzlon	India	3.5
7.	Repower	Germany	0.9	7.	Enercon	Germany	3.4
8.	Goldwind	China	0.7	8.	Dongfang	China	3.0
9.	Nordex	Germany	0.5	9.	Repower	Germany	2.9
10.	Ecotecnica	Spain	0.3	10.	Siemens	Denmark	2.9

	Europe	US	China	Other Asia
2005 Totals	10.6	1.3	0.7	0.9
2010 Totals	19.9	6.0	11.9	3.5

Sources: Bloomberg New Energy Finance (It is reported that Sinovel has overtaken GE as the second ranked manufacturer)

Figure 3: Top 10 Global PV Cell Manufacturers 2006, 2010 (Rank Order by Capacity - MW)

2005				2010			
	Company	Country	Production		Company	Country	Production
1.	Sharp	Japan	500	1.	JA Solar	China	1,900
2.	Q-Cells	Germany	420	2.	Suntech	China	1,620
3.	Suntech	China	270	3.	First Solar (TF)	US	1,502
4.	Motech	Taiwan	240	4.	Yingli	China	1,100
5.	Solarworld	Germany	200	5.	Trina Solar	China	1,000
6.	China Sunergy	China	180	6.	Q-Cells	Germany	1,000
7.	Kyocera	Japan	180	7.	Canadian Solar	China	800
8.	Isofoton	Spain	130	8.	Motech	Taiwan	600
9.	Schott	Germany	121	9.	Gintech	Taiwan	600
10.	Sanyo Electric	Japan	115	10.	JinkoSolar	China	600

	Europe	US	China (incl. Taiwan)	Other Asia
2005 Totals	871	0	690	1035
2010 Totals	1000	1502	8220	0

Sources: Bloomberg New Energy Finance

To be competitive, the US must not just maintain its edge in R&D investment, but focus even more on encouraging the growth of manufacturing and deployment at home, as are other countries around the world. America is not predestined to remain home to the most vibrant economy in the world forever. We need to rise to the challenge.

While striving to improve our global competitiveness, we must also address our most immediate concerns at home: creating jobs and reducing the cost of energy. Investments in clean energy today can support a 21st century industry in the U.S. and foster productive job creation as the country diversifies its energy mix. Interestingly, despite the recession, we are expected to see 143,000 jobs created in the wind industry and 58,000 jobs created in the solar industry.[16] Two of our trading partners, China and Germany, boast even more jobs in their home markets. China estimates that it employs approximately 1.4 million people in the clean energy sector.[17] Germany, on the other hand, estimates that it employs approximately 370,000 people in their clean energy sector.[18] A focused effort on making the U.S. a more welcome home for clean energy manufacturing and deployment can result in even more job creation here at home. Some have accused "green jobs" associated with clean energy as more myth than reality. Those jobs clearly are being created around the world, and more analysis needs to be conducted to better understand how the U.S. can increase its share of the job creation pie.

Many people mistakenly believe that wind and solar, as well as other forms of clean energy, are interesting technologies that may become scalable and affordable in the future if we make sufficient progress on the technology front. This is a serious error. More solar energy capacity was installed in 2010 around the world than nuclear power.[19] The cost of solar energy today is cheaper than the cost of nuclear energy from a Gen III nuclear power plant.[20] The pace of annual solar installations around the world will have increased nearly fifteen fold between 2005 and 2011, and installations are forecast to double again by 2015.[21]

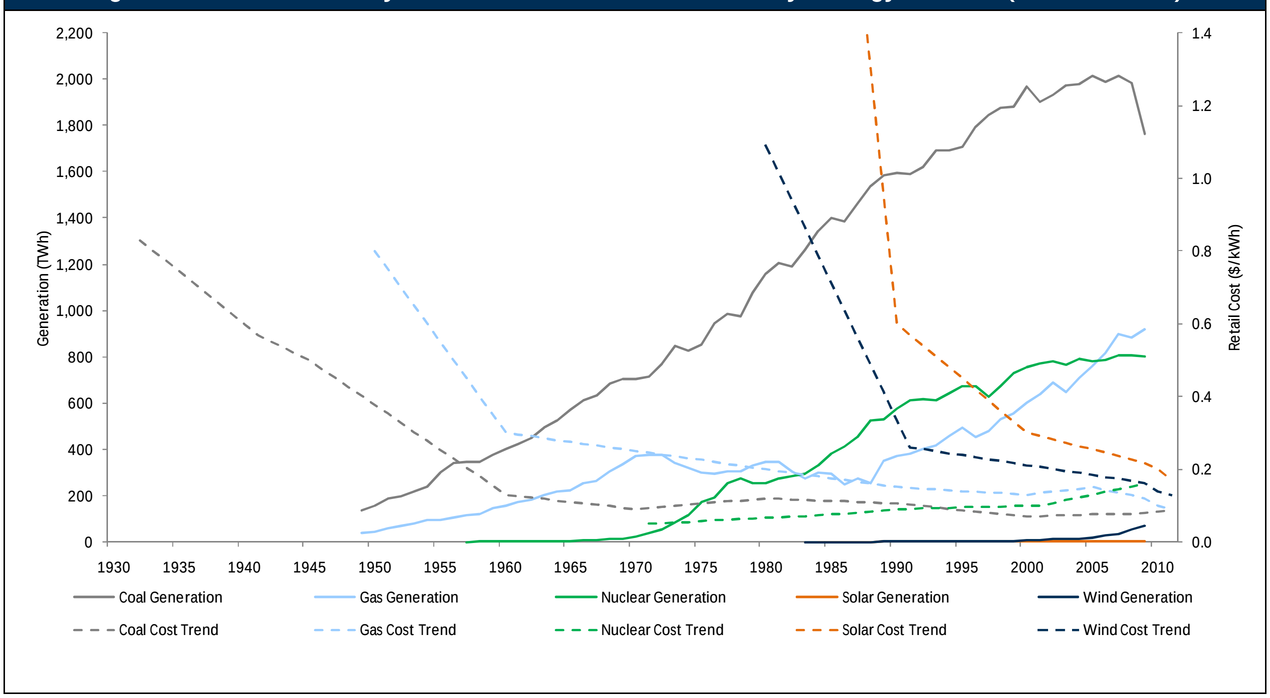
Costs of wind and solar energy have come down almost as quickly as the scale of the industries has increased. The history of the power industry reveals that all new energy sources start out expensive, and get cheaper with scale. Wind and solar are following suit today, and at a pace even more dramatic than coal, natural gas or nuclear did in their day. The cost of wind power, for example, has fallen by 30% over the past 3 years.[22] Recent anecdotes suggest that in some

[16] Lawrence Berkeley National Laboratory (LBNL) and The National Renewable Energy Laboratory (NREL)
[17] NY Times: "China Leading Global Race to Make Clean Energy"
http://www.nytimes.com/2010/01/31/business/energy-environment/31renew.html
[18] Gross employment from renewable energy in Germany in 2010
http://www.bmu.de/files/english/pdf/application/pdf/ee_beschaeftigung_2010_en_bf.pdf
[19] The World Nuclear Industry Status Report 2010-2011, Draft Version – 2010: 5GW of nuclear reactor startups
http://www.worldwatch.org/system/files/NuclearStatusReport2011_prel.pdf
[20] "Solar and Nuclear Costs – The Historic Crossover" – Solar (14-18 cents/kWh) vs. Nuclear (~20 cents/kWh)
http://www.ncwarn.org/wp-content/uploads/2010/07/NCW-SolarReport_final1.pdf
[21] Photon Consulting Database:
2005–2011 annual installations (1.8GW to 27GW); 2015 (51GW annual installation, 225GW total installed)
[22] Hudson estimates

markets, wind power is now cheaper than power generated from a combined cycle gas plant (CCGT). The progress of the solar industry in reducing costs is even more impressive. The cost of solar power has dropped approximately 15% per year over the past several years, and is expected to continue. In fact, recent industry estimates suggest that solar panel prices have dropped a whopping 33% during 2011 alone[23]. On the current pace of cost reduction, solar energy may be cheaper at distributed generation scale in many markets than power generated by fossil fuels within 3 to 5 years.[24]

The following chart, which was produced by my colleagues for an article published in the Journal of Environmental Finance[25], catalogues the history of price movements of electricity powered by coal, natural gas, and nuclear energy since 1930. History teaches us that each of these power sources has required achieving massive scale in order to achieve their current favorable cost structures. Hudson's research confirmed that small increases in scale are causing significant improvements in the cost structures of the wind and solar industries. Figure 5 clearly demonstrates that wind and solar energy have reduced costs more rapidly than any other type of conventional energy source over the last 80 years. Figure 5 projects even further progress in reducing the cost of wind and solar energy over the next several years.

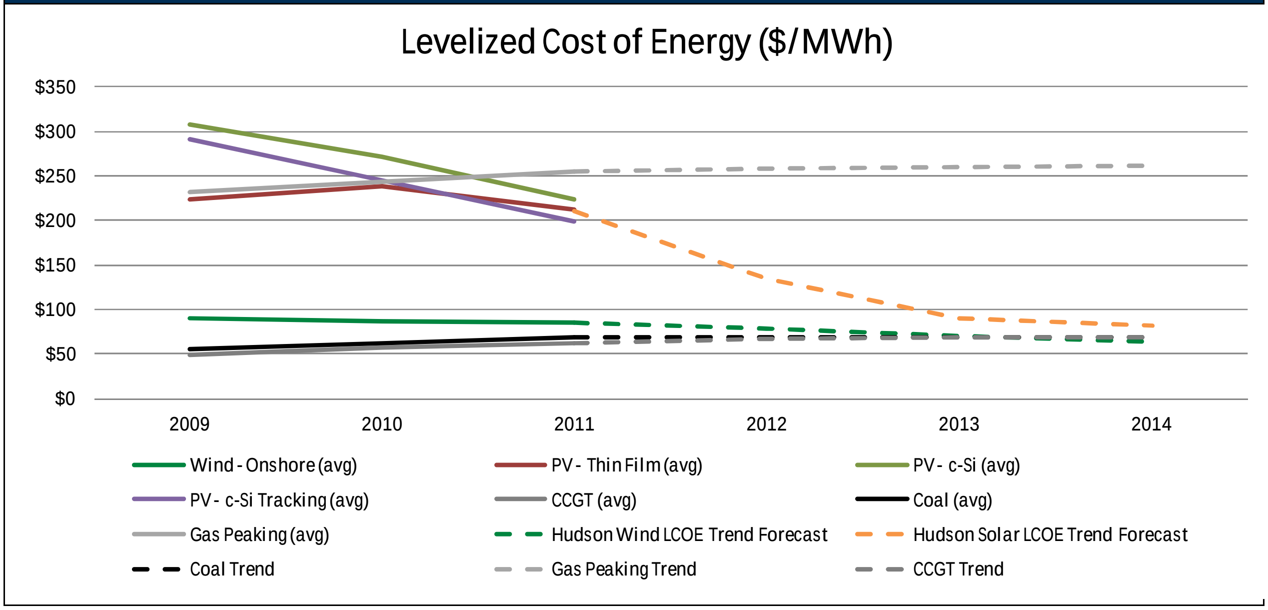
Figure 4: U.S. Electricity Generation and Retail Cost by Energy Source (1930 – 2011)



Sources: U.S. Energy Information Administration; Massachusetts Institute of Technology; American Energy Independence; US National Renewable Energy Laboratory; "The Economics of Nuclear Reactors: Renaissance or Relapse," Cooper, 2009; Hudson estimates

[23] Bloomberg New Energy Finance
[24] See comments of Mark Little, research director of General Electric, reported in http://www.bloomberg.com/news/2011-05-26/solar-may-be-cheaper-than-fossil-power-in-five-years-ge-says.html
[25] Environmental Finance, "Making the Case for Clean Energy", December 2010 - January 2011

Figure 5: U.S. Renewables making marked progress towards grid parity



Sources: Lazard, Bloomberg New Energy Finance, Maxim Group, Hudson Estimates

The rapid reduction in clean energy's cost structure is projected to continue, and will bring these technologies into grid or retail parity with conventional power sources over time, even cheaper than conventional power sources in more and more markets over time.

Two solar companies in our portfolio illustrate the dramatic progress being made in reducing the cost of solar energy.

Calisolar is a California-based manufacturer of silicon, wafers and cells that are sold to manufacturers for use in making solar panels. Calisolar is unique in its ability to manufacture silicon feedstock that is much cheaper than conventional silicon without compromising quality. In its new manufacturing plant recently announced to be built in Mississippi, Calisolar will manufacture its silicon far cheaper than most of its industry peers[26]. And in an all-too-rare industry role reversal, our American company is already exporting its product to China. We expect Calisolar to be able to manufacture at below $20/kilogram as compared to the current industry average of $34/kg on volume-weighted basis/kilo,[27] and therefore we believe that Calisolar will become the lowest cost manufacturer of silicon in the world when it completes construction of its Mississippi manufacturing facility.

Another innovative company dramatically reducing the cost of solar energy is SoloPower, a California based manufacturer of unique lightweight, flexible, high-power solar panels that possess critical advantages for both rooftop and ground mount solar market applications. By flexible, I mean thin, bendable, and utterly unlike the traditional flat-plate solar panels familiar

[26] http://www.calisolar.com/news/press/expand_production.php
[27] Photon Consulting Database, Hudson Estimates

to most people attending today's hearing. This unique form factor expands the total addressable market for solar energy given that approximately three quarters of commercial and industrial rooftops in sunny environments are not designed to bear the load of rigid glass solar panels, which weigh about five times as much as SoloPower's panels. SoloPower's product can be integrated into a roofing membrane and unrolled on a rooftop much like carpeting. Alternatively, it can be adhered directly to a rooftop without the need for physical penetrations or racking systems. This speeds installation time and reduces balance-of-system ("BOS") cost, delivering an industry-leading levelized cost of energy that is competitive with retail electricity prices in many regions of the world. We expect that SoloPower rooftop solar systems will bring the cost of delivered electricity to approximately 10 cents/kwh, below the cost of retail peak power in many power markets in the U.S. Solopower is currently building its first high volume manufacturing facility in Oregon and expects its product to be priced competitively and profitably in comparison to incumbent foreign solar panel manufacturers.

Environmental

Finally, clean energy is more beneficial to our environment than energy derived from fossil fuels. There are a wide variety of environmental hazards associated with utilizing fossil fuels for energy generation. The largest contributors to air and water pollution are automobiles and industry because of their reliance on fossil fuels. Burning oil, gas, and coal produces waste streams that include sulfur dioxide, nitrogen dioxide, carbon monoxide, airborne particulates, and volatile organic compounds that cause acid rain and urban smog. Acid rain is among the worst contributors to estuary, bay and water table contamination, while urban smog and particulates cause serious respiratory problems in humans and have adverse effects on wildlife and agriculture. The fossil fuel that is most deleterious to the environment is coal. Of particular relevance here is the impact of coal combustion on mercury levels in the atmosphere and water, as well as sulfur and nitrogen compounds. It is projected that mercury and acid gas regulations for coal fired, utility scale power plants will lead to a significant reduction of these plants in the near term. Furthermore, the majority of the scientific community views the buildup of greenhouse gases in our atmosphere from fossil fuels as a serious environmental hazard. By contrast, the environmental impact of clean energy on air, water, and land is the most benign of any natural energy source.

Policy makers must balance the environmental risks associated with increased production of fossil fuels with the economic and energy security benefits they offer. The idea that we must choose between cheap energy and our environment is false. We can have both.

Renewable energy support mechanisms in the Internal Revenue Code

I would now like to refocus my testimony on the effectiveness of renewable energy support mechanisms in the Internal Revenue Code. Much of the assessment and analysis of these mechanisms in my testimony has been previously published in a Bipartisan Policy Center paper, which I led as a commissioner for the organization's National Commission on Energy Policy (NCEP).

Recent years have seen a surge of interest in, and support for, renewable energy technologies as a means to address climate change and other environmental concerns while at the same time diversifying the U.S. electricity supply mix, promoting advanced technologies, and supporting local economic activity and job creation. As we enter the fourth quarter of 2011, however, the outlook for the renewable energy industry going forward appears increasingly uncertain. On the one hand, 29 states and the District of Columbia have adopted renewable portfolio standards (RPS) that will require a growing fraction of electricity delivered in those states to be generated using renewable resources. On the other hand, Congress, which has debated various proposals to establish a similar policy at the national level, looks increasingly unlikely to act on either climate or renewable energy legislation any time soon.[28] Moreover, concern about the national debt is putting increased pressure on all forms of public support for clean energy technologies in the years ahead. Against this backdrop of patchwork state requirements and continued federal paralysis, the question is whether existing policies and market drivers will be sufficiently strong and sufficiently stable—especially in the near term and especially in the current environment of high economic and regulatory uncertainty—to overcome the still formidable financing challenges that confront many renewable energy technologies. Absent a federal RES and with growing pressure on federal and state budgets, new approaches are needed to ensure that the public resources available for clean energy are being used as effectively as possible to help new renewable industries move down the learning curve and achieve greater economies of scale.

To date, growth in those industries has been highly dependent on federal incentives. In fact, a few federal tax policies have been responsible for most of the financing directed to renewable energy projects in this country for some time—specifically the Production Tax Credit (PTC) and the Investment Tax Credit (ITC). Other incentives, such as accelerated depreciation (MACRS) and interest deductions, have also been important. And although the industry has made significant progress toward reducing costs and increasing efficiencies over the last two decades, many renewable projects would still be uneconomic in today's marketplace absent federal incentives. At the same time, current incentive programs have significant drawbacks—many of which have been underscored by the recent economic downturn.[29] The Section 1603 cash

[28] In 2009, the House of Representatives passed H.R. 2454, which includes a federal RES, and the Senate Committee on Energy and Natural Resources passed an energy bill, S. 1462, that also includes a national RES. The House version would establish a 20% RES by 2020, while the Senate proposal would set a 15% RES by 2021. In late September, 2010, Senators Bingaman, Brownback, Dorgan, and Collins introduced S. 3813, which includes a RES similar to that of S. 1462 (that is, a 15% RES by 2021). In a similar vein, Senator Lindsey Graham introduced S. 20 in September 2010, which would establish a national clean energy electricity standard of 20% by 2020 that would include renewables, nuclear, and CCS coal power plants.

[29] For example, the tendency of the PTC and ITC to cycle from expiration (or near-expiration) to short-term extensions has resulted in a destructive stop-start pattern of investment. Furthermore, because renewable energy project developers typically do not have sufficient

grant program allows renewable energy developers to convert the PTC to an ITC and then receive a cash grant equal to the amount of the ITC as a way to overcome diminished investor demand for tax credits as a result of the recession. Other ARRA tax credit provisions, such as the 48C Manufacturers Tax Credit (MTC), have also proved useful to larger clean energy manufacturers, but have been extremely difficult for smaller, entrepreneurial industry participants to monetize.

Some of these drawbacks, of course, have been addressed on a short-term basis by the American Recovery and Reinvestment Act (ARRA) of 2009—most notably through the Section 1603 cash grant program, which is widely viewed by industry participants as the most effective and efficient federal support mechanism to date for renewables in the U.S. The economic efficiency of the Section 1603 cash grant program is further explained below, and is a key reason why I believe that extension of the grant would be an act of fiscal prudence.

The rest of my testimony evaluates the existing incentive programs for renewables, takes note of how they have worked in practice, and identifies several options for improving on the current structure in ways that would continue to provide strong support for renewable energy development while also reducing costs to the U.S. taxpayer.

Although my testimony focuses exclusively on reforming renewable energy incentive programs, it must also be noted that numerous programs have evolved over the course of many years of state and federal involvement in the energy sector that incentivize or otherwise extend special treatment to a particular technology, fuel, or niche actor. In effect, virtually *all* forms of energy receive public support in one form or another—too often without scrutiny and public accountability. As I originally stated, the fossil fuel and nuclear industries have been the recipients of the vast majority of federal energy incentives over time, equating to approximately 82% of direct spending, R&D and tax expenditures from 1950 to 2006.[30] Given the fiscal environment that lies ahead, an opportunity exists to reexamine all public incentive in the energy sector to ensure that they promote cost effective production and make good use of taxpayer resources.

The evolution of renewable energy finance policies

Over the last decade or so, a convergence of state and federal policies, manufacturing and technology cost reductions, and private-sector investment have contributed to impressive growth for renewable energy sources, particularly for wind and solar photovoltaics (PV). Like

---

taxable income to benefit from tax credits, they often need to partner with financial intermediaries ("tax equity providers"—typically large financial institutions) that barter their tax capacity to monetize these credits. The recent recession exposed the limits of tax equity providers' capacity to provide sustainable funding, however, and debt capital—which is also critical to clean energy deployment at scale—has likewise been relatively scarce (though the situation has begun improving).

[30] Analysis of Federal Expenditures for Energy Development. Management Information Services. February 2008 http://www.misi-net.com/publications/2008energyincentives.pdf

nearly all important energy sources, renewable energy technologies have benefited from federal and state incentives with differing success rates. The most notable federal government finance incentives have been the PTC in the case of wind and geothermal and the ITC in the case of solar.[31]

The federal PTC provides qualifying projects with an inflation-indexed, per-kilowatt-hour (kWh) tax credit over a 10-year production period.[32] The federal ITC, on the other hand, allows project owners to claim a one-time tax credit equal to 30% of a project's capital costs.[33,34]

PTC and ITC Changes in the ARRA

The Recovery and Reinvestment Act (ARRA) that passed into law in February 2009 included important modifications to the PTC and ITC programs.[35]

- The PTC eligibility date was extended for wind projects in service by December 31, 2012 and for biomass, geothermal, and other renewable energy projects in service by December 31, 2013;
- Renewable energy projects are now allowed to opt for either the ITC or the PTC;[36]
- Project owners may receive a cash grant from the Department of Treasury in lieu of an ITC for projects that begin construction in 2009, 2010 or 2011[37]

Of these changes, the most notable is the Section 1603 cash grant program, which allows developers to receive upfront cash in lieu of tax credits. The goal of this modification was to simplify financing for renewable energy projects and improve access to capital during a time when tax burdens were inadequate to capitalize on tax-based incentives and debt financing was both scarce and expensive. The Section 1603 cash grant has in fact delivered on its original promise to simplify financing, cutting out the middle-man, eliminating incentive transaction costs, and enhancing market liquidity, resulting in significant capacity build out.

---

[31] It should be noted that the interplay between state and federal incentives for wind and, in particular, solar has had a powerful impact on the growth of these industries. While federal tax incentives have been essential to the growth of renewables to date, the expansion that occurred in the last decade would likely not have been possible in the absence of state-based regulatory requirements and/or incentives. The markets for Renewable Electricity Credits (RECs) created by state-level RESs (also called Renewable Portfolio Standards or RPS) have also helped support renewable energy projects. Less fortunate, from the standpoint of nurturing nascent renewable energy industries, is the fact that RES requirements vary considerably from state to state. This has created a patchwork of relatively thin markets for RECs.

[32] As authorized by the Energy Policy Act of 1992, Section 45 of the Internal Revenue Code provides a PTC for eligible projects.

[33] The ITC is included in Section 48 of the Internal Revenue Code.

[34] Although a project owner is able to claim this tax credit at one time (usually the quarter of the year that the project is placed into service), there are many rules affecting what income this tax credit can actually count against (e.g. passive income rules). There are also rules that restrict the transfer of ownership interests in the project for a period of time after commercial operation (the "tax recapture period").

[35] In addition to the ARRA, important changes were made to the ITC and PTC as recently as September 2008 under HR. 1424, The Emergency Economic Stabilization Act of 2008. As part of this legislation, the ITC was extended for 8 years and the PTC for 1 year.

[36] If the ITC is chosen, the election is irrevocable and requires the depreciable basis of the property to be reduced by half of the amount of the ITC.

[37] To be eligible for the Section 1603 cash grant program, projects must commence construction or incur 5% of project costs by December 31, 2011. The Section 1603 cash grant is excluded from the gross income of the company and the depreciable basis of the property must be reduced by half of the grant amount.

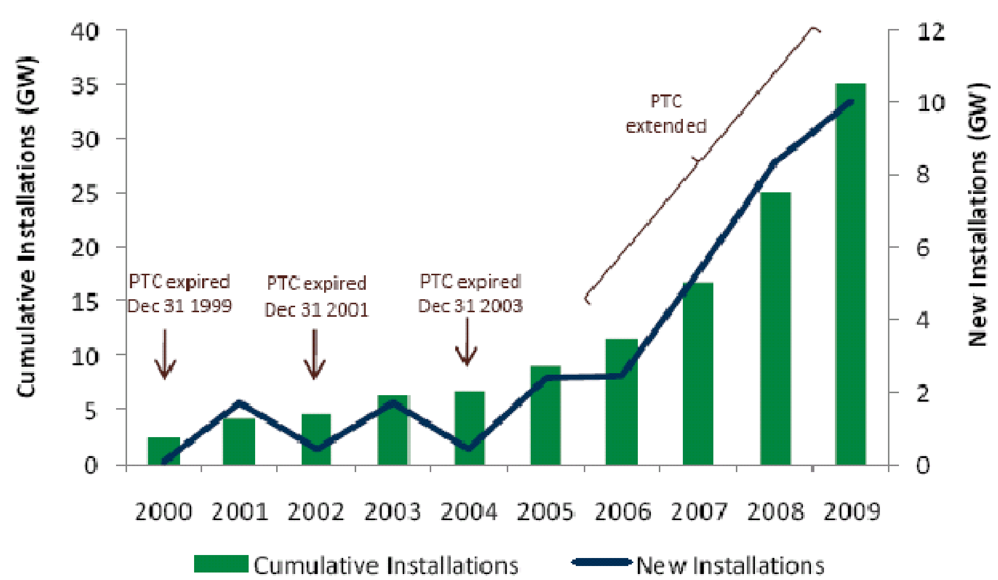
Current relatively short -term tax policies are inadequate to support the achievement of ambitious renewable energy goals

Although the 1603 cash grant program addresses the short-term challenge of inadequate tax capacity in the current market environment, there are also more persistent challenges with tax-based incentives that warrant review. Two major challenges have hindered the effectiveness of federal renewable energy tax credits: (1) the stop-start cycle of investment attributable to repeated extensions and expirations of these programs and (2) the structural challenges of these tax-based incentives — namely a limited investor pool with limited liquidity, which in turn creates higher financing costs and ultimately requires more tax dollars per megawatt of clean energy installations.

Stop-Start Policies Result in Stop-Start Investment

The problems with inconsistent financing incentives have been well documented ever since the PTC was first allowed to expire in 1999. In recent years, the window during which projects could qualify for the PTC has been extended for at most two to three years at a time and on five occasions since 1999, the credit has expired before being renewed. The stop-start nature of the PTC has created boom-and-bust cycles for the renewable industry, constraining consistent growth in renewable energy capacity and complicating project supply chains. In effect, it has pushed turbine manufacturers to locate in offshore markets with more certain incentives. Similar uncertainty has characterized the PTC for geothermal energy and the ITC for solar power.

Figure 6: U.S. Relationship of PTC to Growth in U.S. Wind Capacity



Source: American Wind Energy Association

As is illustrated in Figure 6, every time the PTC has been allowed to expire, renewable energy capacity growth has dwindled to a fraction of the growth that occurred when the tax credit was in place. For instance, when Congress let the program expire in 2000, 2002, and 2004, wind capacity installations in those three years fell 93%, 73%, and 77%, respectively, from the previous year.

By failing to encourage steady, long-term investments, U.S. policies have not fostered stable industry growth. As a result, domestic manufacturers have not captured all possible reductions in technology costs, thereby undermining the long-term competitiveness of renewable energy options. Additionally, intermittent incentives have discouraged long-term planning for complementary investments in manufacturing capacity, transmission infrastructure, and private-sector technology R&D and have hindered the growth of the skilled workforce needed to build and service renewable energy projects.

Structural challenges of the ITC and PTC

The tax-based nature of the ITC and PTC limits their effectiveness: tax incentives are complex instruments that are difficult to utilize and are accessible to only a small fraction of US investors (i.e. tax equity providers). These limitations constrain the industry's access to a small pool of corporate investors, whose numbers were further reduced during the recent economic downturn.

Investors who utilize the ITC and PTC are called "tax equity" investors. Tax equity is a term used to describe the passive financing of an asset or project, where an investor receives a return on investment based not only on cash flow from the asset or project but also on federal income tax deductions (through the utilization of tax credits). Tax equity providers are typically large tax-paying financial entities that can use the tax incentives to offset future tax liabilities. Renewable energy developers themselves typically do not have sufficient taxable income to benefit directly from these tax credits and must partner with tax equity providers in order to finance projects. Typically, they participate in a partnership structure that "flips" ownership of the project from the tax equity investor to the developer-owner once the tax benefits are realized.[38]

- Tax equity has a limited market: The limited number of U.S. corporate entities in a position to forecast their tax situation for the duration of the period over which renewable energy tax credits can be monetized means that only the largest and most sophisticated financial firms and utilities can be considered likely investors. As a result, the investor pool for these

[38] In a flip structure the tax equity partner is the majority equity partner in the early years of the partnership (during which the tax equity investor receives a priority return, composed of tax benefits and cash, until the investment hits a negotiated yield target). After that, the tax equity partnership interest "flips" to a minority position. The flip exists because the tax equity investor is essentially an "accommodation" partner looking for a shorter maturity on its investment and an ability to monetize the tax credit. After the pay-back period, the tax equity partner typically retains only a nominal equity interest as allowable by law.

types of projects has historically been relatively small. Moreover, the recent recession has reduced this pool even further: the number of tax equity providers declined from approximately 20 in 2007 to 13 in 2008 and only 11 in 2009. The associated decline in overall tax equity financing provided to renewable energy projects was equally dramatic, falling from $6.1 billion in 2007 to $3.4 billion in 2008 and $1.2 billion in 2009. [39]

Figure 7: Tax Motivated Investor Market

2007	2008	2009	2010	2011
JP Morgan	JP Morgan	JP Morgan	JP Morgan	JP Morgan
Union Bank of California	Union Bank of California	Union Bank of California	Union Bank of California	Union Bank of California
Wells Fargo	Wells Fargo	Bank of America	Bank of America	Bank of America
New York Life	New York Life	GE Capital	GE Capital	GE Capital
Bank of America	GE Capital	Credit Suisse	Credit Suisse	Credit Suisse
GE Capital	empra Energy	Morgan Stanley	Morgan Stanley	Morgan Stanley
Morgan Stanley	Morgan Stanley	Citi	Citi	Citi
HSH Nordbank (1)	Bank of America (1)	Wells Fargo (1)	Google	Google
Key (1)	US Bank (1)	US Bank (1)	MetLife	MetLife
Northern Trust (1)	HSH Nordbank (1)	Key (1)	PNC	PNC
John Hancock	Key (1)	Northern Trust (1)	PG&E	PG&E
Prudential	Northern Trust (1)		Wells Fargo (1)	Wells Fargo (1)
Northwestern Mutual	SunTrust (1)		Northern Trust	Northern Trust
Citi			Key (1)	Key (1)
ABN Amro*			US Bank (1)	US Bank (1)
Fortis*				
Lehman Brothers*				
Wachovia*				
AIG*				
Merrill Lynch				
$6.1 billion	$3.4 billion	$1.2 billion	$3.2 billion	$3.6 billion

Departed tax equity base during 2008-2009 due to insufficient taxable income or bankrptcy

*Pemanent departure

Sources: U.S. Partnership for Renewable Energy Finance (PREF)[40]

(1) These firms only participate in small-scale solar financings

The tax code limits renewable energy investors to a small slice of the U.S. taxpayer base and creates barriers for passive investors (such as those who can participate through energy Master Limited Partnerships or MLPs) and overseas investors who cannot take advantage of U.S. tax credits. In contrast, more than 140 project financiers actively invest in clean energy projects in Europe where renewable energy investment is not limited to participants with specialized expertise and sufficient tax capacity.[41]

- Tax equity is expensive: As a consequence of limited participation in the tax equity market, financial intermediaries charge renewable energy developers a premium (or add a friction cost) to use their tax capacity. Consequently, tax equity financing is typically more expensive than other financing options because of this additional friction cost associated

[39] Sources: Bloomberg New Energy Finance, GreenTechMedia, JPMorgan and Hudson Clean Energy Partners.

[40] US PREF canvassed all of the leading tax equity market participants, asking each of them to project the supply of tax equity capital that their institution would have available for the balance of 2010, 2011 and 2012. A bottoms-up analysis of these projections produced an estimate of approximately $3 billion of available tax equity capacity in 2011 and 2012, assuming current market conditions persist. However, if the economy and/or credit market revert to 2009 conditions, the available amount of tax equity would be expected to shrink accordingly

[41] Source: Hudson Clean Energy Partners estimates

with tax equity instruments in contrast to cash transfers. In 2009, my team at Hudson calculated that the premium charged for tax equity financing adds approximately 300 to 800 basis points, or 3%–8%, to the typical cost of project finance debt.[42] The additional friction cost reduces the amount of production capacity that can be installed per dollar spent—a cost that is borne by taxpayers and electricity ratepayers.[43] By contrast, renewable energy projects financed with project debt and cash-based incentives are usually cheaper and easier to finance.

- The tax equity market is illiquid: Tax-based project investment is rigid and hampers the ability of markets to create securities that would deepen the market and widen the pool of potential investors. For example, the tax code restricts the transfer of asset ownership using tax equity financing for significant time periods. Furthermore, each tax equity investment is structured to meet the individual tax strategy and appetite of the originating investor. This limits the fungibility that is necessary for the formation of a viable secondary market.

Comparing the effectiveness of tax incentives to cash grants

The Treasury Cash Grant Program introduced under the ARRA was designed to deal with the shortage of tax equity that is currently available for renewable energy projects and to address, at least temporarily, many of the financing challenges created by the recent economic downturn. As described previously, this program provides cash payments directly to developers for 30% of the cost of capital for eligible projects. The ARRA grants were set to expire at the end of 2010 but were provided a one-year extension as part of the Tax Relief, Unemployment Reauthorization, and Job Creation Act of 2010. If Congress does not extend this program, the PTC and ITC will again be the primary incentive mechanisms in place for overcoming renewable energy financing challenges.

Because those challenges were so acute during the recent economic downturn, the BPC commissioned Bloomberg's New Energy Finance (BNEF) to assess how effectively the tax-based system was leveraging taxpayer resources. Specifically, BPC asked BNEF to examine two narrow questions: (1) how efficient is the PTC in leveraging private sector investment and spurring clean energy development and (2) what would equivalent incentives cost the government if the aid was disbursed in cash, rather than via tax credits?[44] BNEF found that in most circumstances, cash grants are significantly more effective, and could be less expensive, than the PTC or ITC.[45]

---

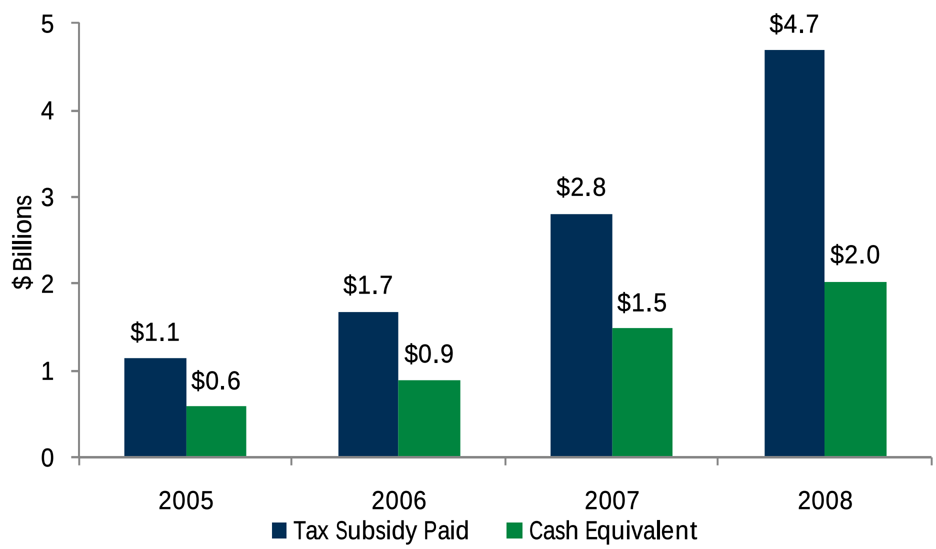
[42] Source: "Private Sector Perspective on New Government Initiatives", REFF Wall Street, June 2009

[43] Every 100bps increase in cost of debt adds $2.50 - $5.00 per MWh to renewable energy generation. Source: Ibid

[44] It should be noted that the BNEF analysis did not assess the ARRA cash grant program specifically. Rather, it sought to identify the amount of cash needed at the outset of a project to give developers the same rate of return they would get with the PTC. The ARRA program gives *all* projects a cash grant equal to 30% of eligible capital costs.

[45] This holds true for most of BNEF's scenarios. However, BNEF's model shows that if electricity prices drop below around $55/MWh, the PTC accounts for a larger portion of total project revenue and becomes more effective than the cash grant.

Figure 8: Total federal government cost of supporting U.S. wind with tax credits vs. assumed substitute cost of using cash grants ($ billion)



Source: "Cash is King: shortcomings of US tax credits in subsidizing renewables," Bloomberg New Energy Finance, January 20 2010.

From 2005 to 2008, wind projects totaling almost 19 gigawatts (GW) of new generating capacity were installed in the U.S., incurring a liability to the federal government of about $10.3 billion in tax credits. BNEF found that the same results could have been achieved with approximately $5 billion in cash grants issued directly at the time of each project's commissioning. This suggests that an incentive financed through tax equity markets is twice as expensive as a cash grant incentive. Put another way, one dollar in cash would have gone nearly twice as far as one dollar in tax credits.[46] Although some in the renewable energy industry have argued that BNEF's estimate of the cash grant amount needed to achieve an equivalent result is too low, there is little disagreement that while the tax-based incentive system has been enormously supportive for the renewable energy industry, it is also a sub-optimal tool and will likely be unsustainable as the industry matures.[47] As such, there appears to be ample opportunity to improve the effectiveness of current renewable incentive policies as the nation seeks to facilitate an ambitious transformation to a low-carbon energy system without adding to our nation's long-term debt burden.

[46] An important point to note is that the PTC did not exist until the Energy Policy Act of 1992. Prior to the Act, wind received an ITC. Congress changed this incentive to a production-based credit because a significant number of developers were collecting the ITC after constructing wind projects but then leaving them idle. The PTC was designed to ensure that electricity production—not construction—was incentivized. If ITC or cash grants supplant the PTC going forward, it will be important to ensure that such incentive mechanisms are not open to fraud and abuse.

[47] Though the period analyzed by BNEF ends in 2008, the recent financial crisis further exacerbated the shortcomings of the tax-based incentive system. Liquidity in general was a problem during the crisis, and although liquidity in the tax equity market has since begun to improve, the market contraction of 2008–2009 likely further diminished the effectiveness of tax credits as compared to direct cash grants.

The next generation of supply-side renewable energy incentives

Given the shortcomings of tax-based incentives and a renewed impetus to cut federal expenditures, it is time to consider options for improving the efficiency of the current suite of renewable energy incentive programs. This is particularly important as the nation lacks a coherent overarching policy that would create sustained market demand for low-carbon energy sources. Such options should be weighed with the following goals in mind:

1. The policy framework for renewable energy incentives should be predictable, transparent and stable over long timeframes. A five-year policy horizon would provide significantly greater certainty and predictability for project developers; 10 years would be even better.

2. Incentives should be adequate to enable renewables to compete against conventional energy sources but they should also be structured to provide incentives for continued technology improvement and cost declines over time. One way to do this is to gradually sunset incentive programs in an orderly and predictable fashion; another is to award incentives on a competitive basis.

3. Policies should serve to tap a variety of sources of capital. A broader investment pool will create a more liquid market, lower financing costs, and attract more investment.

Although there is no one single, simple mechanism that serves all these objectives perfectly, several options exist for a next generation of renewable energy financing incentives that could be more efficient for both project developers and taxpayers. These options are discussed below:

Long-term predictability

As discussed previously in this testimony, the current suite of tax credits is less efficient than it could be. One way to address this issue is to extend renewable energy tax credits for longer periods of time than the one- to two-year extensions that have been typical over the last decade. The stop-start pattern of recent years is driven by political dynamics more than anything else. As in other policy realms, the overt politicization of renewable energy incentives has produced inconsistent policies and frequent last-minute, short-term extensions. By contrast, long-term predictability would allow manufacturers and project developers to engage in long-term investment planning, which in turn would stimulate investment throughout the renewable energy supply chain and accelerate the addition of new capacity. Many developers and investors have indicated that they would accept smaller incentives in exchange for longer-term policy certainty.

Increase the pool of investors who are in a position to monetize tax credits

The other central deficiency of the current tax credit system is that it limits the potential investor pool. To increase capital availability and support a deeper, more liquid market, the investor base must be broadened. One way to expand the pool of capital would be to broaden the eligibility of those who can claim renewable energy tax credits against income. Currently, only corporations with significant and predictable levels of taxable income can engage in this market. Enabling other institutional investors and high net-worth individuals to claim the economic benefit of the tax credits (i.e. either by collecting their cash equivalent or allowing the tax credit to be claimed by individuals) would greatly expand the pool of capital available for renewable energy investments.

Another option would be to enable renewable energy developers to utilize a financing/ownership structure known as a master limited partnership (MLP). MLPs can be used to create companies with two important features: (1) a limited liability ownership structure and (2) access to certain tax benefits that allow them to raise capital by selling securities (in essence, stock). MLPs enable individual investors to use the tax advantages of limited partnership investments, while also allowing them to pool and raise equity to invest in large, capital-intensive projects. Traditionally, MLPs have been used to pursue capital-intensive projects in natural resource development, real estate, and commodity distribution. Extending MLPs to renewable energy projects and related infrastructure would open access to a much larger and broader pool of equity. In effect, the general public would be able to make direct investments in clean energy projects by buying stock in MLPs that then use that equity to develop renewable energy projects.[48] This would help address the liquidity challenges of capital markets by broadening the pool of eligible investors beyond tax equity investors to the general public. Because MLPs would only increase the eligible investor pool, however, by themselves they would most likely not supplant the tax incentives currently in place. Additional reforms to the current tax-based incentives would still be needed. Extending MLPs to renewable energy projects would also require several changes in the tax code.[49]

[48] It should be cautioned, however, that MLPs are typically used to finance mature technologies with stable cash flows—not projects involving technologies that have yet to be widely commercialized and may carry significant technology risk. Thus, consideration will need to be given to which kinds of projects and technologies can benefit from the MLP approach and how this type of program can be structured to create a viable investment vehicle for different categories of renewables.

[49] Apart from changing the definitions of eligible activities under these rules, other changes would need to be made to section 469 of the tax code, which governs "passive activity rules," and to Section 465, which governs "at-risk" rules.

Reform the current tax-based incentives

Cash grants

The 1603 cash grant program, which substitutes upfront cash for the PTC or ITC, revived the renewable energy industry in 2009 when projects had all but ground to a halt. Cash grants have simplified financing structures for almost all renewable projects and made the renewable industry less dependent on tax equity investors. This has attracted a broader pool of lenders and reduced transaction costs. As such, cash grants have been significantly more efficient than other tax-based incentives, so much so that the BNEF analysis found that the federal government would need to spend about half as much in cash grants to support a comparable project receiving the PTC. Because cash grants reduce financing hurdles, a properly structured cash grant program offers an attractive incentive mechanism going forward.

Though there is a real question as to whether the cash grant program will be extended beyond 2011, there are several ways that the momentum it has generated could be sustained. One option would be to extend the grant program for several years but use a more targeted mechanism (such as a reverse auction) to determine the least amount of upfront funding needed to induce private investment in renewables projects. A similar, but modified option would be to make the tax credits refundable, or to provide the credit as a loan until the project begins generating taxable income at which point the loan could be repaid. A refundable tax credit would allow the owner of a renewable energy facility to receive a cash payment from the government if applicable tax credits are worth more the owner's tax liability (most renewable energy project developers/owners do not have taxable income, which is why they require tax equity investors). Currently, the PTC and ITC can only reduce a producer's tax liability to zero—they cannot be converted to federal payments if the credits are worth more than the producer's taxable income. Similarly, a loan structure would enable the company to receive upfront capital if it lacked sufficient tax liability against which to utilize the credit. In this case, the capital would be available in the form of a loan, repayable once the company began generating taxable income.

One downside to cash grants (or refundable tax credit / loan given upfront) is that it rewards capital investments, not electricity generation. Thus, there is a risk that the grant may not directly incentivize improvements in operating capacity and efficiency, which ultimately lower costs— but rather incentivizes maximum capital expenditures. One potential change to the cash grant program would be to ensure that developers are rewarded for efficient production. A grant (or refundable tax credit / loan) that declines over time or requires developers to compete for incentives (e.g. through a reverse-auction) would be one way to encourage technology innovation and low-cost production.

Feed-in tariffs

Feed-in-tariffs (FITs) allow eligible projects to receive a guaranteed price for the electricity they deliver to the grid. The tariff amount is typically set by law or regulation (usually on a per-kWh basis). Renewable energy projects that meet FIT requirements are usually eligible for a long-term contract for the power they produce (for example, contracts on the order of 20 years are typical). Assurance of a predictable, long-lived cash revenue stream greatly simplifies project financing. Because FITs create certainty around a project's future cash flow, associated financing structures tend to be simpler, cheaper and more attractive to lenders. FIT projects are often financed with one tranche of debt, which avoids the complicated financing structures associated with U.S.-based tax equity instruments. FITs have been popular in European countries over the last decade where they have been a key driver in stimulating the growth of domestic renewable technology and manufacturing industries, as well as clean energy deployment.[50] In the U.S., the California Solar Initiative—which is akin to a FIT—has also been very successful in prompting solar energy development. Other FIT programs have recently been implemented around the country, in places like Gainesville, Florida, and Oregon where they are attracting considerable interest from project developers who have filled subscriptions to each of these FIT programs. Additionally, over the last year, China announced that it will be supporting an enormous amount of renewable energy deployment in all regions of the country through a combination of four fixed wind FITs, a new national fixed feed-in tariff for biomass, and a new solar FIT.[51, 52,53]

FITs present two potential challenges. First, it is difficult to set a "correct" feed-in price. If prices are set too high, the program is inefficient in its use of government resources and can strain federal or state budgets as governments are obligated to pay for all eligible renewable energy that comes online. Overly high prices also discourage technology improvement and innovation. As a result, some countries have established tariff digressions—and have even, in certain cases, accelerated these digressions when the installed cost of renewable energy declined more rapidly than expected. Germany, for example, recently accelerated the digression rate for its solar FIT in response to a substantial decline in the cost of solar modules and domestic budgetary concerns. Second, implementing a FIT poses a political challenge as a wires charge—a fee levied on power suppliers or their customers for the use of the transmission or distribution wires—is usually used as the funding source to pay for the incentive. In a slow economy and a gridlocked political environment, passing any new

[50] Germany, Spain, Denmark and Portugal have all used FITs to successfully deploy significant amounts of renewable energy, particularly wind and solar. It should be noted, however, that many of the EU FIT programs have been criticized as overly generous to renewables and quite costly to national budgets.
[51] The wind FITs were announced August 2009. Source: "China Wind Market Outlook Q1 2010", Bloomberg New Energy Finance, February 2010
[52] "A boost for biomass: new feed-in tariff level announced in China", Bloomberg New Energy Finance, July 2010
[53] Bloomberg New Energy Finance Low Carbon Policy Database

consumer fee will be difficult. Nevertheless, FITs provide an intriguing option for shaping U.S. renewable energy incentives going forward, not least because this mechanism has emerged as the policy tool of choice for some of the largest foreign power markets in this sector, including China.

Declining, production-based cash incentives program

Another policy proposal, called "Incentives for Renewable Energy Generation" (IREG), combines the incentive properties of the PTC (in the sense that it is production-based and hence rewards actual output, while also encouraging cost discipline for project developers) with the advantages of a cash payments approach.[54] At the outset, renewable energy project developers would have two options. They could elect to receive currently available tax credits—the PTC or ITC depending on which type of tax credit the project were eligible for—or a production-based cash payment. Under the latter option, eligible projects placed in service during a specified time period would receive cash payments on a quarterly basis for 10 years. This would provide a predictable, long-term revenue stream. Under IREG's cash payment option, projects that would otherwise qualify for the current PTC would receive payments equivalent in value to the PTC for every kWh of electricity produced. Solar and fuel cell projects that would otherwise qualify for the current ITC would receive a one-time IREG payment equal to 30% of the tax basis of the project eligible for the investment credit. Over time, however, the ITC-equivalent IREG incentive would shift to a production-based payment so as to reward electricity production rather than sums of capital invested. For all types of projects, tax-based incentives would be phased out and IREG incentive payments would adjust gradually downward over time.

The IREG approach differs from the European-style fixed FIT in that it would be a supplemental tariff received *in addition* to the electricity price negotiated under a power purchase agreement (PPA). This ensures that only those projects that can generate sufficient electricity at an appropriate level of cost are connected to the grid, thus avoiding the need to cap or otherwise limit the IREG program. Funding for the program could from a range of sources although an adjustable rate surcharge on retail electricity sales—i.e. a wires charge—would be an obvious choice. This would avoid the annual appropriations process thereby ensuring funding consistency. As already noted, however, the political hurdles to mandating a nationwide wires charge remain steep.[55]

---

[54] Hudson Clean Energy Partners issued a white paper describing the IREG in 2009.

[55] Wires charges have already been proposed in several U.S. energy bills—for example, the "Renewable Energy Jobs and Security Act" proposed by Representative Inslee in July 2010—but have yet to gain significant political traction.

Competitive tendering policies – reverse auctions, a more efficient way to grow our domestic clean energy industry

Reverse auctions are a mechanism for competitively distributing government contracts and incentives to private entities. In essence, reverse auctions require private firms to submit bids that stipulate the minimum price or incentive level they would accept for an eligible output.[56] The entity tasked with managing the reverse auction—typically a governmental agency—then reviews all bids and accepts the lowest ones. As a mechanism for distributing clean energy incentives, the reverse auction approach would require any potential incentive recipient or beneficiary (in this case, renewable energy developers) to compete for public resources on a cost basis. The appeal of the reverse auction concept is that it is designed to maximize the returns from a given expenditure of scarce public resources, and that it provides continuous incentives for further technology innovation and cost reductions.

Several government entities in the U.S.—among them the Department of Defense, the General Service Administration, the U.S. Postal Service, and some state governments—have established successful reverse auction programs and used this mechanism to achieve substantial reductions in program costs. In addition, other countries have applied this approach specifically to promote clean energy development. For example, from 1990 to 1999 under a United Kingdom program to distribute incentives for non-fossil fuel electricity, the use of a series of competitive auctions is credited with helping to stimulate significant cost reductions in the renewables industry over that time period.[57] Similar applications of the reverse auction concept to clean energy deployment, meanwhile, are gaining traction in several U.S. states. For instance, the California Public Utilities Commission (CPUC) recently issued guidelines to establish a reverse auction program for 1GW of small-scale solar power projects.[58] Under California's program, the state's investor-owned utilities will be required to hold biannual auctions for power purchase agreements with small, ready-to-build solar energy projects—essentially, creating a reverse auction for feed-in tariffs.[59] Solar project developers have already expressed considerable support for the California program and it is expected to be widely subscribed.

Although reverse auctions have many attractive incentive features, they must be carefully designed to address a number of specific concerns and potential disadvantages.[60] One important concern is that reverse auctions tend to favor technologies that represent the least-

[56] The incentive itself can take a variety of forms—for example, tax credits, grants, or FITs could all be distributed using a reverse auction mechanism.

[57] Newell, R. "Climate Technology Deployment Policy." Resources for the Future, 2007.

[58] http://www.cpuc.ca.gov/PUC/energy/Renewables/hot/Renewable+Auction+Mechanism.htm

[59] The California reverse auction will be limited to projects 20 MW or smaller. To "bid," projects must be ready-to-go in the sense that construction can be completed and they can come on line within 18 months. The program aims to add 1000 MW of decentralized solar power generation (such as rooftop projects); it included a size cap, in part, to prevent a few large solar companies from dominating the market. California utilities have separately entered into a number of long-term contracts with large-scale centralized solar power producers. For more information regarding CA's Renewable Auction Mechanism please see: http://docs.cpuc.ca.gov/efile/PD/122407.pdf.

[60] For a more complete discussion about design aspects of reverse auctions, see Richard Newell's discussion of tendering policies in his chapter, "Climate Technology Deployment Policy," contained in the report: *Assessing U.S. climate Policy Options,* Resources for the Future (2007).

cost option today, rather than newer technologies that may have the potential to achieve significant performance improvements and cost reductions as they reach economies of scale in the future. To address this concern, it may be necessary to, on the one hand, establish separate programs designed to help emerging technologies bridge the divide from demonstration to early commercial deployment, while at the same time gradually broadening the portfolio of technologies considered eligible to participate in the reverse auction over time. Another concern is that large, sophisticated firms will dominate reverse auction markets because of their size and experience. Ensuring that a reverse auction gives smaller firms and newer technologies a fair chance to compete on the merits therefore represents another critical design issue. Lastly, reverse auction programs must include safeguards to ensure that winning projects are actually completed on time and—in cases where the incentive being offered is not output based—that they also actually produce what they committed to.

Fortunately, it seems likely that all of these concerns can be substantially addressed through thoughtful program design. Moreover it is worth recognizing that similar concerns would apply to most (if not all) other incentive delivery mechanisms. The incentive program that is 100% efficient and completely free of flaws or potential to expend funds on failed projects likely does not exist. But in the current context of large budget deficits and limited resources at all levels of government, not to mention public distrust of many government spending programs, the advantages of competitive tendering mechanisms, like reverse auctions, begin to look especially compelling. As an option for distributing taxpayer (or ratepayer) funds in a way that also maximizes output per public dollar spent, fosters private-sector competition, and drives down technology costs, such mechanisms deserve increased attention as lawmakers look to design more effective clean energy policies in the years ahead.

Reverse Auction Mechanism Proposal in H.R. 909

I would now like to focus my testimony on the Reverse Auction Mechanism for Renewable Energy Generation in Title III of H.R. 909, specifically how it can be designed to be more efficient than existing incentives for clean energy.

I believe that a reverse auction, properly structured, can be a more efficient policy to grow our domestic clean energy industry than the current system of tax incentives. Reverse auctions are conducted by buyers to encourage sellers to sell at the lowest price. The history of reverse auctions suggests that they work to lower cost.[61] In addition to the benefits of placing a market-driven auction mechanism at the heart of Federal clean energy policy, H.R. 909's Reverse Auction Mechanism offers other tangible improvements over the current system. First, without the need to resort to a limited market of tax equity lenders, the U.S. market for clean energy project finance would become much more liquid, resulting in lower funding costs. In

[61] Bloomberg New Energy Finance, "Wind tender analysis in Brazil: Winner's Curse?"

addition, without the specter of perennial expiry of Federal tax incentives, the comfort of a solvent trust fund as envisioned by H.R. 909 would give all market participants, including manufacturers of value chain products, more confidence in the longevity of the U.S. market, increasing capital commitments to the sector with long term payoff profiles. The market values of most companies with significant clean energy investments in the U.S. would likely improve.

The U.S. Federal Government is not alone in its interest in the use of reverse auctions to support clean energy deployment. Earlier this year, Brazil completed two reverse auctions for capacity to be built in one and three years. Contracted power under Brazil's previous feed-in tariff incentive policy, PROINFA, averaged $136/MWh. One year later, under the new reverse auction mechanism, wind power prices came down precipitously to an average of $74.4/MWh, over 40% lower than under the previous feed-in tariff regime. In subsequent auctions, developers agreed to sell wind power at an average price of 99.58 reais ($62.70) a megawatt-hour, lower than the average price for natural gas in Brazil and the cheapest price for wind anywhere in the world.[62] Many other Latin American countries are following suit in an effort to reduce overall system costs.[63] Argentina, Mexico, Peru, Honduras, Uruguay, in addition to China, Morocco, and Egypt, all developing markets with an interest to displace more expensive fossil generation, have recently conducted reverse auctions for wind power. These countries are finding that reverse auctions are particularly attractive because they offer price discovery through competitive bidding that often leads to dramatic price reductions.

The California Public Utilities Commission also recently approved a reverse auction mechanism that will apply to the state's three largest investor-owned utilities. Although we will need to wait for the results of California's experience, the CPUC has indicated that it expects the mechanism to "allow the state to pay developers a price that is sufficient to bring projects online but that does not provide surplus profits at ratepayers' expense, providing a clear and steady long-term investment signal rather than providing a pre-determined price [via] a competitive market."[64] Developers and industry groups alike have expressed enthusiasm for the upcoming auctions because the program is anticipated to spur the development of many 1 – 20MW projects across the State.

Positive attributes of the Reverse Auction Mechanism Proposal in H.R. 909

The Reverse Auction Mechanism as designed in Title III of H.R. 909 includes many positive attributes. It would provide for consistent and efficient support for renewable generation. By establishing a dedicated source of funding through the creation of the American-Made Energy Trust Fund ("Trust Fund"), the bill would provide the kind of long-term certainty absent from

[62] Bloomberg New Energy Finance
[63] Id.
[64] New York Times, "A 'Reverse Auction Market' Proposed to Spur California Renewables"
http://green.blogs.nytimes.com/2009/08/28/a-reverse-auction-market-proposed-to-spur-california-renewables/

the current tax credit approach. Through the Trust Fund mechanism, renewable developers would be able to rely on a steady source of support without the need for Congressional appropriations, or any other action by Congress. Moreover, the cash flowing to a particular project from the Trust Fund would reflect a market-driven assessment of the actual amount of cash flow required by the project developer to complete the project, rather than an amount prescribed by Congress, as is currently reflected in the tax code. This amount invariably would be lower than the amount currently funded by taxpayers. Rather than relying upon complicated ways to transfer tax benefits to financial institutions, accessing cash flow from the trust fund would be far simpler, encouraging the development of a more liquid project finance market, resulting in even lower costs for clean energy to rate payers.

H.R. 909's reverse auction mechanism incorporates a host of features that seek to avoid the design mistakes of other reverse auctions, including the recent Brazilian auction experience. For example, H.R. 909 calls for security requirements at the time of the bid submission, to ensure that bidders have the requisite financial resources to deliver on their contractual promises. Additionally, to ensure that the reverse auction mechanism furthers the goal of diversifying our energy sources, the Bill calls for separate reverse auctions conducted in different regions of the country, and also requires that no more than 60% of the awards can come from one type of renewable technology and no more than 90% come from two technologies.

To provide for flexibility, the language provides that a winning bidder be able to generate in excess of their specified annual amount and earn credits to be used for insufficient generation in the subsequent two years. If a winning bidder fails to generate the quantity of electric energy guaranteed in four successive years, the Authority may terminate the contract. The awards from the Trust Fund would be capped each year at the amount of energy to be generated under the contract.

Finally, to prevent double dipping, the language provides that a winning bidder would not be eligible for tax credits under Sections 45 or 48, and would not be eligible for a loan under the Loan Guarantee Program. A developer would need to make a choice. Moreover, the award would not be included in gross income to ensure that the developer's tax bill does not increase.

Suggested improvements to the Reverse Auction Mechanism Proposal in H.R. 909

Although the Reverse Auction Mechanism in H.R. 909 is thoughtfully designed, there is room for improvement. At present, some design flaws might prevent the system from working at all. Other improvements can be made to make the system work even more efficiently. Allow me to offer more concrete examples.

As currently drafted, H.R. 909 requires the renewable generator to identify a purchaser for the electric energy before participating in the reverse auction. This could be particularly problematic, since developers generally enter into PPAs only once they know whether they can earn their target return on equity. Thus, requiring that a bidder secure a PPA before it can submit a bid would likely prevent that bidder's participation in the reverse auction since, without securing a trust fund allocation, the renewable generator would not meet its required return. One way to solve this problem would be to empower a Reverse Auction Authority (RAA) to be directed to purchase energy from generators under long-term PPAs, as well as to allocate money from the trust fund. The RAA could hedge its risk from entering into long term PPAs by selling electricity into wholesale and bilateral power markets. Guidelines could be established around the RAA's purchase and sale of electricity to limit risk taking. The Trust Fund could then be used to cover any losses from power trading, with gains returned to the Trust Fund.

In addition to empowering the RAA to purchase and sell power, another improvement to the Reverse Auction Mechanism in H.R. 909 would be to empower RAAs to purchase and sell renewable energy credits ("RECs"), which often represent a vital income stream to renewable energy developers. Therefore, I propose that the Reverse Auction Authority be required to offer to purchase RECs from renewable energy developers and resell them in the market, returning any gains to the Trust Fund. Renewable developers could bid in RECs as part of its project price, and the RECs then could be resold to entities that have REC obligations. Inclusion of RECs in the reverse auction would have the effect of lowering REC prices, thereby benefiting ratepayers in states with renewable portfolio standards. In effect, inclusion of REC trading within the mandate of the RAA would immediately bring many of the benefits of a national renewable energy standard without imposing a Federal mandate.

Therefore, the limitation contained in H.R. 909 of the use of the reverse auction to the distribution of monies from the Trust Fund should be eliminated. A more complete use of the reverse auction, along with expanded powers by the RAA, would further the goal of reducing the cost of clean energy.

In thinking about how this reverse auction would work, it seems to me that the amount of energy and RECs to be purchased could be determined by the RAA based on (i) the amount of funds available in the Trust Fund and (ii) the amount of interest expressed by entities for the purchase of Federal RECs. To ensure that there is sufficient interest in the reverse auction – particularly in the early years – I would recommend that Federal agencies be directed to purchase all their REC needs through the reverse auctions. Moreover, I would recommend that each State regulatory authority in states that have a renewable portfolio standard be directed to conduct a proceeding to consider permitting utilities in their state to purchase "Federal RECs" to satisfy, in whole or in part, their utilities' state REC obligations under their RPS. While

States are engaging in such proceedings, the RAA would be permitted to sell "regional RECs" in addition to Federal RECs. Regional RECs are RECs from a generator located either inside the state in which the purchaser is located or outside the state, but within the same region, as the state in which the REC purchaser is located. Most states with RPS requirements currently permit their utilities to satisfy their RPS obligations with regional RECs. This approach would allow for the establishment of a truly national REC market, lowering the compliance burden on utilities and the cost to ratepayers, without the need for a Federal mandate.

H.R. 909 proposes that the Secretary of Energy conduct the reverse auction through an office within DOE. Since I am proposing that the RAA's functions be expanded to include the purchase of power and RECs, I am concerned that the approach would impose on DOE a responsibility it current does not have – the purchasing and selling of power and associated RECs. Instead, I propose that the functions be delegated to a private entity with the expertise to conduct such auctions. DOE would be given oversight responsibilities.

Finally, H.R. 909 provides that monies from the Trust Fund would be subject to appropriations Acts. The intent of the reverse auction process is to provide for consistent, economical and long-term support for the renewable industry. One of the key challenges in relying on federal tax credits for support has been the cycles of expirations and extensions. During each period leading up to expiration, investments in renewable generation have fallen dramatically. I am concerned that subjecting the amounts in the Trust Fund to annual appropriations would have the same chilling effect on renewable development. I therefore propose that language be added to assure that the Trust Fund provides renewable developers with a steady source of support without the need for Congressional appropriations, or any other action by Congress.

Conclusion

Absent a coherent, long-term national climate and energy policy, targeted incentives for renewable energy will continue to be very important in maintaining strong industry growth in the U.S. Although renewable energy tax credits have had a complex history, overall, they have been vitally important in deploying renewable energy capacity and driving down technology costs. However, as the industry continues to grow, a tax-based incentive system faces increasing costs and complexity, and may be a suboptimal mechanism for achieving sustained, large-scale deployment goals. It is therefore time to begin thinking about a different approach, one that achieves desired policy outcomes as efficiently as possible and at the least cost to the public. This means looking, in an integrated fashion, at the full suite of policies and incentives being used to promote renewable and other low-carbon energy technologies to understand how these policies and incentives interact, how they could be made more effective, and how their overall cost could be reduced. Practically speaking, the effort to bring about a long-term transformation of the U.S. energy mix will likely entail continuing and improving on the current set of largely supply-side renewable energy incentives in the near term while a national consensus emerges on the future direction of broader climate and clean energy policies. Once such policies are in place at a level where they create substantial market demand for renewable energy, public incentives should begin to taper off to avoid overlapping incentives.

In this era of increasing fiscal austerity, paying for any large-scale incentive program will require a dedicated source of reliable funding. Any of the incentive mechanisms discussed above could be funded in one of two ways: through general tax revenues or through targeted revenues. Options for targeted revenue sources include: reducing or eliminating current incentives to well-established fossil fuel industries, creating an oil import fee, or collecting a wires charge on sales of electricity. Although any of these revenue sources could generate enough funding to pay for even the largest incentive program, all have unique political pitfalls. To provide long-term predictability and certainty, Congress will need to take the difficult step of establishing a stable funding source.[65]

Moreover, because government funding will likely be scarce going forward, any renewable support program must create incentives for continued cost reductions and technology improvements, while also promoting public accountability. Awarding payments on a competitive basis, through mechanisms such as reverse auctions, will help ensure that any support program allocates public resources effectively and efficiently. Given that federal and state government agencies have established successful reverse auction programs in a variety of domains, it seem likely that this approach could be effectively utilized at the federal level to promote renewable energy generation while also driving continued technology innovation and cost reductions.

As the U.S. emerges from recession and grapples anew with its most important long-term challenges—confronting a burgeoning national debt, addressing looming energy and environmental risks, and retaining a leadership position in the high-tech global marketplace—it is clear that federal incentives for renewable energy development will need to be reexamined. This testimony highlights some of the most promising policy approaches that could be used to incentivize renewable energy development more effectively in the future. These options deserve deeper exploration. I hope that this written testimony sparks a fresh dialogue in the policy community and contributes to the broader energy and climate policy debate in 113th Congress.

[65] Newly created clean energy deployment programs in place in China, Europe, and other countries appear to provide such funding stability.