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Before the Senate Committee on Finance

Subcommittee on Energy, Natural Resources, and Infrastructure

Hearing on Clean Energy Tax Incentives
December 14, 2011

Thank you Chairman Bingaman, Ranking Member Cornyn, and distinguished members of the Subcommittee. I appreciate the opportunity to be here today. It is an honor and a privilege to speak with you on issues that are so critical to our nation.

I am Will Coleman, a partner at the venture capital firm Mohr Davidow. We invest in early stage companies on behalf of some of the largest endowments, foundations, and families in America. Since 1983, we have funded over 250 companies, helping entrepreneurs transform new ideas into thriving businesses in information technology, life sciences, and energy.

We were one of the first mainline funds to start investing in the energy sector, and have since invested in over 15 companies in a range of sectors including bio-chemicals, solar, energy storage, gasification, and building materials, among others. As early stage investors we invest in and help build companies from the early stages of R&D to initial commercialization and deployment. Through the experiences of our companies we have seen first-hand the challenges of developing new technologies and gaining market adoption in energy. We have also seen how public policy directly and indirectly impacts the viability of emerging companies and the private sector's willingness to invest in these important industries.

I am here today to share some perspective from our experience and talk specifically about how regulatory uncertainty impacts long term investment decisions. Additionally, the energy industry as a whole faces a growing innovation gap. I will highlight the need for a more stable and supportive environment for emerging technologies in the U.S. for our country to remain competitive.

Tax policy has always been a key driver in the energy sector. For over a century it has been used to guide energy choices and investment on the premise that energy is critical to the nation's

strategic interests. Tax policy has helped drive investment in a range of activities including R&D, exploration, infrastructure, and generation projects. Today, the tax code continues to support both renewable and conventional energy technologies. In conventional energy, the tax code has encouraged continued capacity expansions to meet our energy needs. In renewables, tax provisions such as the PTC and ITC have been instrumental in mobilizing private capital to invest in the sector and have helped drive costs down by enabling technologies to scale.

We are now seeing through our companies that pricing in the market for wind, solar, and biomass is rapidly approaching cost parity with conventional resources. However, for private investors to continue to invest in these sectors, we need confidence that the government will maintain a strong commitment to these markets as these companies continue to scale and as new technologies enter the market.

The existing tax provisions continue to be important to the ongoing growth of the sector; however, we also recognize that these provisions are imperfect. It is appropriate to consider some new approaches that will improve the efficiency of the current energy tax code. We must acknowledge where tax policy is needed and where it is not. Some energy technologies are quite capable of competing without tax breaks, others are on the cusp, and others are just beginning to emerge.

We need a tax code that provides market stability in the short term, but we also need improved structures that increase the consistency between conventional and renewable frameworks, and encourage investment in new technologies that have the greatest potential to lower our energy costs over time.

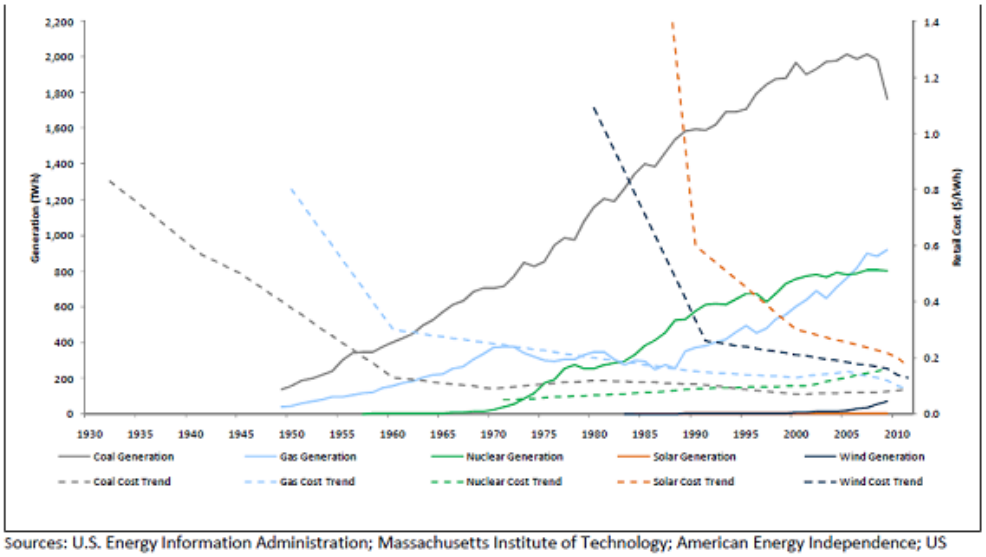
America's Diverse Energy Composition

America's economic strength over the last century has been fueled in large part by access to affordable and abundant domestic energy resources. However, the energy landscape has changed. The growth in global demand continues to strain conventional resources and drive up costs, and some of the consequences of continued dependence on conventional resources are becoming more visible. In 2010, the U.S. spent $337 billion on oil imports from foreign

countries. In other words, we transferred $337 billion of America's wealth overseas – dollars that could have been reinvested here at home.

Continuing this pattern makes little sense in the current economic environment. Many alternatives are increasingly viable. Natural gas, wind, solar, biomass and other renewables are playing increasing roles. Wind deployments grew over 400% from 2005-2010[1] and solar grew over 1000% over the same time period. The cost of solar modules has dropped 80% since 2005[2] and almost 30% to roughly $1.10/W just in the last year[3]. In comparison, the cost of coal has climbed over 50% since 2005[4], oil has climbed over 110% since 2000[5], and even natural gas is 17% higher than it was in 2000.

US 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

[1] http://www.awea.org/learnabout/publications/factsheets/upload/Market-Update-Factsheet-Final_April-2011.pdf

[2] http://www.solarbuzz.com/facts-and-figures/retail-price-environment/module-prices

[3] According to Mohr Davidow research 2013 contract module prices have dropped from $1.30/W to <$1.00/W

[4] http://38.96.246.204/totalenergy/data/annual/pdf/sec7_21.pdf

[5] http://www.eia.gov/pub/oil_gas/petroleum/data_publications/petroleum_marketing_annual/current/pdf/pmatab1.pdf

Despite these gains, wind still provides only 1.4% of our electricity and solar just 0.3% as compared to 44.9% from coal and 23.8% from natural gas. Yet the solar industry already employs over 93,000 people in the U.S.[6] while the coal mining industry employs only 86,000[7]. Solar employment has more than doubled in the last 3 years alone, while coal employment has dropped over 50% in the last two decades even though total coal production has remained steady.

A great deal of attention has been focused on the rapid emergence of shale gas and the significant projected domestic reserves. It is clear that natural gas will be an important and growing piece of the energy mix going forward, but it does not negate the need for other alternatives. We also still have significant coal and oil reserves in the U.S. It is obvious that we will continue to rely on coal and oil and we need to continue to use these resources with increasing efficiency. However, it is also worth noting that the U.S. has some of the largest wind, solar, and biomass resources in the world. The US possesses over 231,000 GW[8] of potential annual capacity from untapped wind and solar resources alone. This is over 222 times our current total electricity capacity, and it is a resource that is lost if not captured.[9]

The U.S. must continue to leverage its energy assets effectively to remain economically competitive. Conventional technologies represent the vast majority of today's production; however, we should not ignore the growing opportunity that renewables represent in this country.

Still not a level playing field

Energy – particularly the global transition to next generation forms of energy – remains one of the largest growth opportunities we have seen in our time. It is important to recognize,

[6] http://www.thesolarfoundation.org/sites/thesolarfoundation.org/files/Final%20TSF%20National%20Solar%20Jobs%20Census%202010%20Web%20Version.pdf

[7] http://www.eia.gov/coal/annual/

[8] http://www.windpoweringamerica.gov/pdfs/wind_maps/poster_2010.pdf http://www.nrel.gov/docs/fy10osti/45889.pdf http://votesolar.org/wp-content/uploads/2011/02/NREL_Solar_Tools.pdf www.nrel.gov/gis/docs/resource_maps_200905.ppt

[9] http://www.eia.gov/electricity/annual/pdf/tablees1.pdf

however, that these industries are still largely in their infancy and barriers to entry remain high. The growing market for solar in particular has fueled intense competition. This competition in combination with rapid scaling of technologies has helped drive down costs, but profit margins remain tight. While significant support has been given to the wind and solar industries over the last several years and continues to sustain them as they continue to move down their respective cost curves, the supports have been less robust than those given to their more mature competitors. According to a recent report from Nancy Pfund of DBL Investors, the average annual inflation adjusted federal spending on oil over the first 15 years of its deployment was 5 times greater than what we have spent on renewables, and nuclear was 10 times greater.[10] Yet even today, while the major oil and gas players continue to enjoy record profits, (Exxon-Mobil alone has averaged $75 billion in annual profits since 2008) fossil industries reap the lion's share of government incentives.

The Congressional Joint Committee on Taxation (JCT) estimates that from 2010-2014, the federal government will spend upwards of $74 billion on an array of **direct** subsidies to support domestic oil and gas development and production, which far outpaces support for emerging technologies.[11] These incentives include exploration credits, depletion credits, royalty relief, and several others. In addition, the O&G industry enjoys many **indirect** tax incentives that most people don't recognize as part of the energy tax equation. Tax advantaged structures such as MLPs, which are targeted at oil, gas, and natural resource projects, have grown from just $2 billion in 1994 to over $220 billion in 2010. Section 199 credits created in 2004 which provide relief for "qualifying production activities" reduce the corporate tax rate by approximately 3% according to the American Petroleum Institute.[12] Foreign Tax Credits, 40% of which are used by

[10] Nancy Pfund & Ben Healey. *What Would Jefferson Do? The Historical Role of Federal Subsidies in Shaping America's Energy Future*. DBL Investors, Sept. 2011 (forthcoming).
[11] Joint Committee on Taxation. *Estimates of Federal Tax Expenditures for Fiscal Years 2010-2014*. Government Printing Office, 2010.
[12] American Petroleum Institute. *Repealing the 199 Manufacturing Deduction for Oil and Gas Companies Puts Jobs at Risk*. February 2011.

the petroleum industry, provided an additional $42 billion in relief in 2008 alone.[13] These are just a few of the current incentives.

My point is not to question the appropriateness of these incentives. Many of these direct and indirect supports have been essential to expansion of our domestic resource production, and were implemented at times when US oil companies were struggling to compete at $20 per barrel of oil. However, as we now strive to diversify the fuel sources that supply America's energy, we must acknowledge the role these "legacy" incentives have in the market to be able to rebalance the current energy tax code.

Challenges with the current code

The current energy tax code is an amalgam of policies woven together over several decades. As investors seeking to identify new technologies that can significantly reduce costs, increase performance, or replace existing technologies, we are acutely aware of how the tax code impacts the market and our investing options. The current production and investment tax credits have been instrumental in stimulating a market for renewable technologies, particularly in wind and solar. The existence and growth of this market has spurred tremendous new investment in capacity expansions and technology developments that have driven the cost reductions referred to earlier. Many of the long-term venture investments in new technology also would not have been made if not for the increasing confidence in the growth of the renewables markets.

However, the future of U.S. renewables markets is in question. The situation that renewables now face is emblematic of the broader flaws in the current approach to energy tax policy for two reasons:

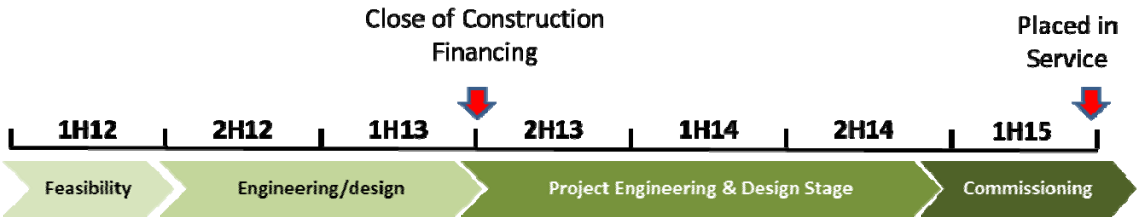
1) Uncertainty over extension of current clean energy provisions is undermining short and long term investment in the market just as some of these technologies are beginning to reach commercial viability.

[13] Internal Revenue Service. Statistics of Income Tax Stats, 2008. Corporation Complete Report Publication. Accessed May 26, 2011.

2) The current tax code does not support ongoing innovation in substantially new technologies that would continue to drive down the costs in both emerging and conventional energy sectors.

The cost of uncertainty

The need for certainty is a common refrain in the energy industry. Unlike in the oil and gas sector where the current credits are almost all "permanent" and provide investors and corporations with enough certainty to make long term investments, almost all of the credits designed for the renewables sector are temporary and set to expire in the next few years. The lack of certainty itself is a major challenge for developers, manufacturers, and investors. The easiest way to understand the implications is by looking at a typical development timeline.



In the case of an advanced biorefinery, as represented in the chart above, initial planning, siting, and permitting can commence 3-4 years in advance of commissioning. The significant capital outlays begin when the project has to secure financing, initiate engineering, and begin ordering equipment. In the case, above that is 2.0-2.5 years in advance of commissioning. The production tax credit will only provide for gallons produced before the credit expires. Investors are unlikely to support a project expected to commence near or after the credit expiration date until they have some assurance that the credits will be in place when the plant is commissioned. Therefore, each time Congress waits to renew these credits a financing gap is created in the project financing market. In the past, investors had reasonable confidence that these provisions would be renewed and often took some capital risk to compress timelines and be ready for the renewals. However, given the increasing uncertainty about renewal, developers and investors are unable to depend on the credits when making their investing decisions, negating the credit's value as an incentive.

While the project development process can take 3-4 years for a "proven" technology that has already been demonstrated to work in the field, the path to market is even longer for new "innovative" technologies. A new technology must be demonstrated at a smaller, less economic scale before being deployed in the kinds of commercial projects supported by most of these credits. Such demonstration projects can often take longer to permit, longer to finance, and longer to engineer and construct than larger commercial projects. These projects also often use novel or custom equipment that can require longer ordering lead times. These demonstration projects are the critical link for commercializing new technologies, and early stage investors must account for the 2-4 years required to demonstrate a technology before it can be fully deployed commercially.

Yet the real seeds of innovation start even earlier. Most novel technologies require significant funding and time to prototype and pilot post basic R&D. This process can take an additional 3-5 years. Therefore, early stage investors are making investment decisions in companies and sectors ideally 3-5 years before they begin the commercialization process, but often more on the order of 7-10 years before large scale commercialization begins. As a result, short term extensions of demand side credits such at the PTC and ITC do not provide the long term certainty necessary to incent early investment in innovation.

Continued innovation is critical to continued cost reductions in any sector. However, unlike in oil and gas where most credits are permanent and enable long term investment decisions, early stage investors in alternative energy sectors cannot take into account temporary demand side credits when making investment decisions. The short term visibility on credits also has a significant impact on enabling infrastructure. In Texas, the legislature saw the growing opportunity in wind and solar and voted in 2006 to support a $6 billion transmission line expansion. In addition to the political process, it will take 7-9 years to site and construct those lines. This type of infrastructure is critical to new power developers, and yet with ongoing uncertainty prevailing over the long-term future of market credits, states and cities are unlikely to invest in these long lead time projects.

We are rapidly approaching the point where alternative technologies can compete with conventional energy sources on a level playing field in the absence of subsidies. In some parts of the country, solar, wind, biomass and other alternatives are already more economically viable than conventional options. Some of my fellow panelists will likely make the case that even a temporary extension of renewable credits will have significant impacts on the long term viability of these sectors. I agree with this perspective; however I am not arguing that the current credits should be made permanent leaving taxpayers on the hook for years-to-come. As a technology investor, I believe the goal should not be to prop up industries to keep them competitive indefinitely, but rather to support the innovation and scaling necessary for them to be competitive in the long-term without supports.

Just as over the last few years we have seen the costs of alternatives drop significantly, we expect scale and continued innovation in renewables to continue to drive this trend. Eventually these industries should not need support. The challenge is that the current credits treat these industries as homogeneous technologies. Within subsectors of the industry, different companies are on different cost curves and are reducing costs at different rates. The current credits do not differentiate between technologies that need credits and those that do not, and they only indirectly encourage investment in the more innovative, longer-term solutions that drive the greatest cost reductions over time.

So while we want to be careful not to throw the baby out with the bathwater, we believe that the current approach to energy tax incentives needs significant reform to make it more consistent, more accessible, more durable, and more effective at driving innovation and long term cost reductions. A hard stop on the current incentives would send a shockwave through the industry. But ultimately, the industry needs to move to structures that acknowledge the different stages of readiness of both existing technologies and new entrants, and more efficiently drives industries to a point of market competitiveness.

The Innovation Gap

We are fortunate to have a strong, diverse natural resource base. However, much of our competitive advantage over the last two centuries has come from our ability to innovate – to develop new, lower-cost or advantaged technologies such as oil, nuclear and now renewables, ahead of our global competitors. According to a report released by the Department of Commerce, "Technological innovation is linked to Three-quarters of the Nation's post-WW II growth rate. Two innovation-linked factors – capital investment and increased efficiency – represent 2.5 percentage points of the 3.4% average annual growth rate achieved since the 1940's."[14]

Over the last 30 years the tax code has become an increasingly popular vehicle for energy incentives. However, very little of the code has been effectively targeted at jumpstarting the innovation that fuels long term economic growth. Most of the oil and gas credits such as depletion allowances, expensing of drilling costs, and domestic production credits focus merely on expanding the current resource, and even the alternative energy credits focus primarily on enhancing the economics of current technologies. Almost all the energy credits in the code are only accessible to large, mature corporations with sizable balance sheets and cash flows. This approach creates two problems: (1) it biases investment decisions toward tax advantaged primary production rather than the innovations that can significantly impact cost or performance; and (2) it makes it more difficult for new entrants to enter the market and compete.

The energy industry is already slow to adopt new technology. According to a 2007 National Petroleum Council report, "If U.S. production levels are to be maintained, new technologies will be needed." However the report states, "There is little incentive for such global supply companies to innovate or adopt step-change Technologies."[15] In 2010 the five largest oil companies spent just $3.6 billion on R&D which represents less than 2 percent of profits and

[14] U.S. Department of Commerce, *Patent Reform: Unleashing Innovation, Promoting Economic Growth & Producing High-Paying Jobs.* 2010

[15] National Petroleum Council Global Oil & Gas Study, "Topic #26: Oil & Gas Technology Development" July 18, 2007

less than 0.4 percent of total expenditures.[16] In the utility sector, the major utilities employ on average less than 5 people in R&D roles per 1000 employees. This is the lowest level of any industry.[17] These numbers are a result of many industry dynamics, but also reflect how little incentive exists for energy companies to invest in new technology. The current tax code perpetuates the status quo.

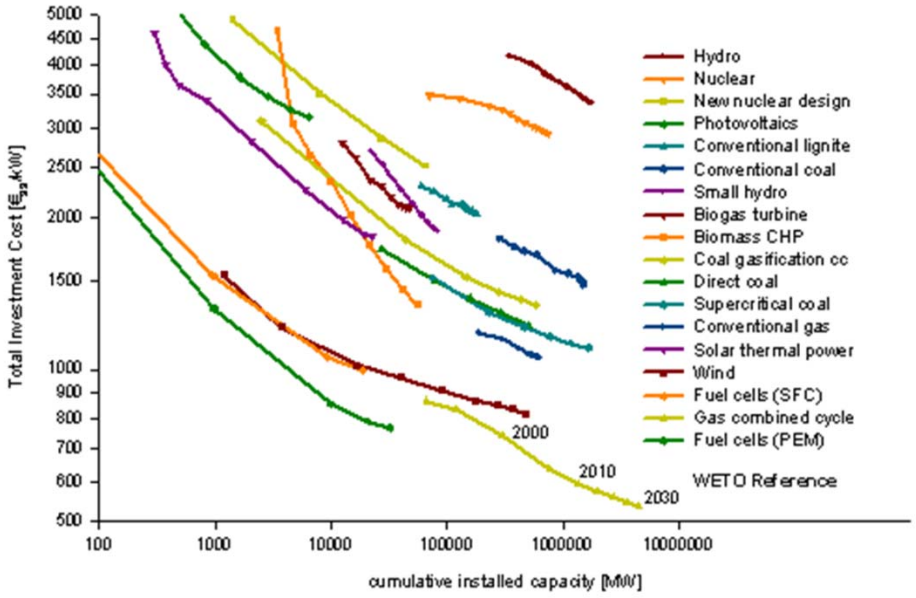
The challenge to investing in new energy technologies has not been a lack of technology solutions or the underlying economics; it has been overcoming the resistance in the market to invest in and adopt new technology. A tax code that fails to support innovation simply compounds this market failure.

One fundamental premise of technology development is that each technology reduces its costs over time through a combination of technical innovation and scaling. The result is that each technology undergoes a "learning curve" that drives costs down. Different technology solutions – even within the same vertical – can have different learning curves and development trajectories.

[16] Congressional Research Service. *Research and Development by Large Energy Production Companies.* August, 2011.

[17] National Science Foundation, Research and Development in Industry: 2006-07 (Arlington, VA: National Science Foundation, 2011), 130-131. Table 31 and 261. http://www.nsf.gov/statistics/nsf11301/pdf/nsf11301.pdf

Historical Learning Curves by Technology (over volume)



Source: European Commission. *World Energy, Technology and Climate Policy Outlook 2030*. 2003. P.71

If we as a nation want to reap the benefits of continued cycles of innovation, our focus should be on getting new technologies down their respective cost curves and to a point of maturity where they can compete on their own two feet.

All emerging technologies need a market that rewards long term performance. Almost all new technologies start out with much higher cost bases than their mature competition. Over time, with technology iterations and scale, these costs are reduced. As venture investors, we deploy our capital to unlock the rapid cost reductions that come from new invention. However, a significant portion of the cost reduction comes from scaling technology through demonstration and early commercial deployment. In the energy industry, it is the demonstration and early commercial stages when technologies are still not yet economical but start to require significant capital. Many potentially transformative innovations never overcome this transition. For tax policy to effectively drive domestic innovation, it will need to address scaling challenges and accommodate the financial constraints of smaller emerging companies.

A Complementary Incentive Structure

Continued innovation is needed in both emerging sectors and conventional energy technologies to keep the United States competitive. Ideally the tax code would be more consistent across both conventional and emerging energy categories, and enable new and improved technologies (in all sectors) to access the market and compete. The tax code would be more durable if it could more flexibly accommodate the best performing new technologies that emerge from the private sector while allowing the market to determine winners and losers. Most importantly, the tax code needs to address the scaling challenges associated with new energy technologies if we are going to unlock ongoing cost reductions and performance gains in the U.S. energy industry.

There are relatively simple ways to reform the tax code to provide more consistency, technology neutrality, and flexibility over time and to encourage investment in new and improved technologies. One approach would target early manufacturing of technologies and then roll-off as these technologies hit commercial scale. Such a volume based tax credit could be provided to individual companies as their technologies scaled and only to the point where they should achieve costs that would be competitive in the marketplace. A credit with these characteristics could be made permanent without creating dependence, and would rely on the private market to invest based on the long term viability of these companies. If such a structure were permanent it would provide certainty to investors across all stages and help to attract capital required to fill development gaps in the commercialization process. The approach would be focused on the supply side of the market much like current oil and gas incentives, and could be complementary to the existing PTC and other downstream incentives – or might ultimately replace them. Such an incentive would simplify the code and reduce the long term dependence on incentives that has plagued many energy tax provisions.

Conclusion

Let me conclude on a note of urgency. The global energy landscape is changing. New technologies are emerging, and the economic strength of our economy over the next several decades will depend not just on how effectively we use existing resources, but on how we choose to cultivate newer sources of energy. Tax credits are a central tool in the American policy framework to incentivize innovation. If we do not get them right, it is not just that we forego a better way of doing things. If we do not get them right, we may in fact cripple America's ability to compete effectively in a huge and growing international marketplace.

The current clean energy policies under discussion have been vital to the development of the clean energy market and continue to be important to sustaining the progress that has already been made. However, the energy industry as a whole must continue to innovate and adopt new technologies to provide the strong economic base that the U.S. needs to remain competitive. To do so requires a new way of thinking about tax policy that can be applied consistently across the entire energy industry and provides the long-term certainty that investors and corporations require to make rational decisions.

This committee has held many hearings on the deteriorating competitive position of the United States in new energy markets *vis a vis* China, Japan, Korea, and Germany, so I will not recount those details here. As the U.S. emerges from recession it is critical that resources should be targeted at the most effective ways to strengthen the American economy. We need to remember that the Internal Revenue Code plays a critical role in whether American new energy companies succeed in that competition, so reducing the uncertainty of our current tax credits for alternative energy technologies and exploring the creation of innovation, performance-based tax credits could not be more important or urgent.

I believe we have a rare opportunity to streamline the tax code to make it more efficiently support the development of the next generation of technologies. The focus must shift to

accelerating the rate of innovation, continuing to reduce the costs to taxpayers, and reducing the long-term dependence on government support. Such a transformation need not be complicated. The tools and approaches already exist. But we must work to rationalize these structures to better support the innovative companies that fuel our economy. We have the talent, the capital markets, and the capacity to lead in energy technology. I hope this committee will move forward quickly on some of these important reforms and I look forward to the opportunity to work with you on them in the months ahead.