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RENEWABLE ENERGY TAX INCENTIVES: HOW HAVE THE RECENT AND PENDING EXPIRATIONS OF KEY INCENTIVES AFFECTED THE RENEWABLE ENERGY INDUSTRY IN THE UNITED STATES?

HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY, NATURAL RESOURCES, AND INFRASTRUCTURE

OF THE

COMMITTEE ON FINANCE
UNITED STATES SENATE

ONE HUNDRED TWELFTH CONGRESS

SECOND SESSION

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RENEWABLE ENERGY TAX INCENTIVES: HOW HAVE THE RECENT AND PENDING EXPIRATIONS OF KEY INCENTIVES AFFECTED THE RENEWABLE ENERGY INDUSTRY IN THE UNITED STATES?

TUESDAY, MARCH 27, 2012

U.S. SENATE,
SUBCOMMITTEE ON ENERGY, NATURAL
RESOURCES, AND INFRASTRUCTURE,
COMMITTEE ON FINANCE,
Washington, DC.

The hearing was convened, pursuant to notice, at 2:45 p.m., in room SD–215, Dirksen Senate Office Building, Hon. Jeff Bingaman (chairman of the subcommittee) presiding.

Present: Senators Cornyn, Carper, and Thune.

Also present: Democratic Staff: Ryan Martel, Staff Director, Subcommittee on Energy, Natural Resources, and Infrastructure. Republican Staff: Andrew Siracuse, Tax Counsel.

OPENING STATEMENT OF HON. JEFF BINGAMAN, A U.S. SENATOR FROM NEW MEXICO, CHAIRMAN, SUBCOMMITTEE ON ENERGY, NATURAL RESOURCES, AND INFRASTRUCTURE, COMMITTEE ON FINANCE

Senator BINGAMAN. Why don't we get started here? Thank you all very much for coming. Today, the hearing is to try to understand how recent and pending expiration of key tax incentives affects deployment of renewable energy facilities, energy efficiency measures, and advanced biofuels.

Last December, the same subcommittee met to consider the effects of short-term extensions and frequent expirations on the renewable energy industry. Almost all the witnesses argued that intermittent incentives severely stunted the promise of clean energy in the United States. They illustrated how the constant threat of expiration prevents the build-out of a robust manufacturing sector and supply chain, which are the pieces of this energy mix that create the majority of the jobs in these industries.

We undoubtedly will get some testimony on the extent of the support that is being provided. I gather the Congressional Budget Office recently issued a brief on this subject, which stated, "Tax preferences for energy were first established in 1916. Until 2005, they were primarily intended to stimulate domestic production of oil and natural gas. It was not until 2006 that an increasing share

of energy-related tax expenditures began to shift to renewables and to energy efficiency."

So, as I say, I am sure we will get testimony on this very point.

Clean energy and energy diversity, both of which I think are important goals for our country, have not always been perceived as a partisan issue. In fact, the legislation that most directly put the U.S. on the path toward clean energy and toward efficiency was the 2005 energy bill, which, of course, was conceived of and written and passed by a Republican-led Senate and a Republican-led House. It was signed by President Bush.

Much of today's discussion will center on the credit for wind that expires this year, and I think we need to understand the effect of not going ahead and extending that.

There are other important incentives for advanced biofuels, for energy efficient homes, for buildings and appliances, for combined heat and power, for fuel cells for advanced vehicles, and these are all the subject of our hearing today.*

[The prepared statement of Senator Bingaman appears in the appendix.]

Senator BINGAMAN. So let me go ahead and defer to Senator Cornyn for any comments he has, and then I will introduce our panel of witnesses.

OPENING STATEMENT OF HON. JOHN CORNYN, A U.S. SENATOR FROM TEXAS

Senator CORNYN. Well, thank you, Mr. Chairman, for holding this very important hearing today. I am pleased to join you, and I think we demonstrate bipartisan support for an "all of the above" energy policy. And this is certainly an important part of it.

I am struck a little bit by the irony, though, of what is happening on the floor of the Senate as we are talking about these particular alternative energy provisions, the so-called Repeal Big Oil Tax Subsidy Act, which will do nothing to lower the price of gasoline at the pump. It will not provide any relief for consumers at all. All it will do is raise taxes on the domestic oil and gas industry, which will then be passed on to the consumer. And, like I said, it will make things worse rather than better.

We can do better than that, and I, for one, believe that we need to get all of these various tax provisions on the table, as the President's own bipartisan commission recommended, and take a look at them and see which ones make sense and which ones do not.

One of the challenging issues we have is that many of these tax provisions, albeit temporary at the time they were passed, have been renewed without enough scrutiny, and that is why I think this hearing is so important, examining whether they are needed in order to get infant industries started and new technology, or whether the time has long since passed for us to sunset them.

Finally, I just want to mention, also, the Keystone XL pipeline, which I am, unfortunately, disappointed that the President has continued to not approve, despite his appearance at Cushing, OK the other day, where he talked about the one-third of the pipeline

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*For more information, *see also,* "Present Law and Analysis of Energy-Related Tax Expenditures," Joint Committee on Taxation staff report, March 23, 2012 (JCX–28–12), *https://www.jct.gov/publications.html?func=startdown&id=4414.*

that does not require his permission to be completed and which does not provide additional oil.

My constituents in the Port Arthur area, where we have some of the largest refining capacity in the country, would love to have 700,000 barrels of Canadian oil come through the Keystone XL pipeline so that they could refine that into gasoline and other petroleum products.

In Texas, like New Mexico, we know the importance of a stable, secure supply of affordable energy, and we are blessed with a diverse array of energy sources and industries providing solid employment to Texans, while supplying the Nation.

Many, of course, will argue for extensions of valuable tax incentives for their industry, and I get that, I understand that, but I think the question should be—and I trust our witnesses will address this—are we getting the best bang for our buck? And which ones should we extend? Which ones should we modify? Perhaps which ones should we sunset, and which ones should we eliminate? That remains the duty of Congress to answer.

An analysis by the Congressional Research Service for energy-targeted tax incentives shows that, while the majority of U.S. primary energy production comes from fossil resources, the majority of energy tax-related revenue losses are associated with provisions designed to support renewables. And that is perhaps predictable, because the oil and gas industry, an established industry, does not need these tax credits or subsidies, as the President sometimes uses the word. It does not deserve to be treated any better or any worse than other business in America. But the fact is, most of the tax-related revenue losses are associated with renewable sources.

If we want to put all the tax reforms on the table, then I think these are some of the relevant considerations. And I mentioned the President's own fiscal commission that argued that, in order to make our tax code and America more competitive—we will have the highest corporate tax rate in the world once Japan lowers its rate—we need to eliminate a lot of tax expenditures, flatten the code, make it more growth-oriented, and make us more competitive in a global economy.

I look forward to hearing from the witnesses. And thank you, again, Mr. Chairman.

Senator BINGAMAN. Let me briefly introduce our four witnesses here. Starting on the left there is Mr. Ethan Zindler, who is the head of policy analysis for Bloomberg New Energy Finance here in Washington. Second is Mr. John Purcell, who is vice president of wind energy with Leeco Steel. Thank you for being here. Dr. Benjamin Zycher is a visiting scholar with the American Enterprise Institute. Thank you for coming today. And Mr. John Ragan is the vice president of business development and government affairs with TPI Composites in Scottsdale, AZ.

If each of you could take 5 or so minutes and give us the main points you think we need to understand about this set of issues, and then I am sure both Senator Cornyn and I will have some questions.

Mr. Zindler, did you want to go first?

STATEMENT OF ETHAN ZINDLER, HEAD OF POLICY ANALYSIS, BLOOMBERG NEW ENERGY FINANCE, WASHINGTON, DC

Mr. ZINDLER. I will. Thank you very much, Senator. In the interest of time, I am going to read most, but not all of my written remarks, and all of that will go in the record.

Good afternoon, Senators and fellow committee members, ladies and gentlemen. Thank you for the invitation to allow me to share my thoughts here today.

I come here today in my role as head of policy analysis of Bloomberg New Energy Finance, a market research firm focused on the clean energy sector. Our clients include major investment banks, wind, solar, and other clean energy equipment makers, venture capitalists, and project developers, plus major energy companies and the oil majors. Our primary mission as a firm is to provide timely, accurate, and actionable data and insight on investment technology and policy trends in clean energy.

My remarks today represent my views alone as a clean energy industry analyst. They do not represent the corporate positions of either Bloomberg LP or Bloomberg New Energy Finance. In addition, they do not represent specific investment advice and should not be construed as such.

The subject of today's hearing is the role of tax credits in today's development of technologies related to power generation and efficiency and those related to transport fuels. I would argue that tax credits have played different roles in these two areas and should be addressed separately.

Before touching on the tax credit issue, however, I would like to update the committee on clean energy investment trends globally. Last year, the industry set a record, attracting $260 billion in new outside investment, up from $54 billion in 2004. In the fourth quarter of last year, we counted the 1 trillionth dollar of new investment in clean energy globally.

The U.S., despite featuring strong supports in some States, has not enshrined long-term national targets or goals for clean power generation. Still, the U.S. actually led the world in attracting new investment last year for clean energy with over $55 billion in new funds deployed here, mostly in private money. This marked the first time since 2008 that the U.S. did not finish second to China in new clean energy capital attracted, and we will detail more of this in a report with the Pew Center in a few weeks.

There is little to suggest that the U.S., however, will maintain its leadership position this year or next. Last year's surge in private U.S. investment was a direct reaction to policies that were due to expire in 2011 or 2012. These included the 1603 Treasury grant program, the 1703 loan guarantee program, and the production tax credit, or PTC, which benefits primarily the wind industry. And these three programs had the effect of frontloading U.S. renewables investment into calendar year 2011. In 2012 and 2013, the echo effect of this frontloading will almost certainly be felt.

With that as context, let me turn to the PTC, which has long played a critical role in the development of the U.S. wind industry since being established by Senator Grassley and others in 1992. The credit has expired 3 times in the last dozen years. On each oc-

casion, the result has been a sharp drop in new installations for wind.

We are now on a course for another such fall next year. Bloomberg New Energy Finance forecasts approximately 9,500 megawatts of new power generating capacity will be installed in 2012, but just 500 megawatts will be installed in 2013. That would see the industry go from registering one of its best years on record to one of its very worst since 2004.

What is likely to make the upcoming PTC expiration more dramatic is that the U.S. now has substantially more manufacturing capacity on its own soil. When the PTC expired at the end of 2003, resulting in a sharp drop in installations in 2004, there was insufficient domestic manufacturing to meet wind turbine demand, meaning project developers were importing final goods, mostly manufactured in Denmark, Germany, or Spain. When the PTC expired then, manufacturers in Europe mostly felt the pinch.

This time, the U.S. has over 13,000 megawatts or 13 gigawatts of final turbine assembly capacity on its soil. Again, without the PTC, we expect just .5 gigawatts of demand for that equipment in the U.S. in 2013.

All of that said, I would note that extending the PTC will not be a panacea for the U.S. wind market, which will remain at overcapacity in 2013, regardless of the tax credit. We forecast that, if Congress would extend this credit now, approximately 3.5 gigawatts of new capacity would get built in 2013. This falls far short of matching the over 13 gigawatts of domestic manufacturing capacity.

The wind industry has made major strides in both improving the efficiency of industrial scale equipment and reducing capital costs. The result is that wind developers can now sell their power at between $30 and $70 per megawatt hour and earn respectable returns in the U.S.

In some part of the world, including some parts of the U.S., wind can already compete and beat out its fossil rivals on cost, without the benefit of subsidies. However, the industry today finds itself under pressure from low electricity prices due to both relatively weak economic conditions and to unusually cheap natural gas, which today is trading at its lowest level in 2 decades.

The expiration of the PTC would add a third negative factor. It would make what is likely to be a challenging year considerably more difficult for the industry.

And with that, I see that my time is up, and I will conclude my remarks. I am happy to answer any questions on the subject matter touched on in the second half of my written statement.

[The prepared statement of Mr. Zindler appears in the appendix.]

Senator BINGAMAN. Thank you very much.

Mr. Purcell?

STATEMENT OF JOHN PURCELL, VICE PRESIDENT–WIND ENERGY, LEECO STEEL, LISLE, IL

Mr. PURCELL. Thank you, Chairman Bingaman, Ranking Member Cornyn, and subcommittee members. My name is John Purcell, and I serve as vice president–wind energy for Leeco Steel. I appreciate the opportunity to speak briefly today about the impact on

Leeco Steel in the U.S. and the U.S. wind energy sector due to the impending expiration of the renewable energy production tax credit.

We at Leeco Steel feel it is imperative that the PTC is extended in its full form as presented in S. 2201, the American Energy and Job Promotion Act, which was recently introduced by Senators Grassley and Mark Udall.

Leeco Steel is a wholly owned subsidiary of O'Neal Steel, the largest privately held metals distribution company in the United States, which is headquartered in Birmingham, AL. Leeco is headquartered in Lisle, IL, a western suburb of Chicago. Leeco Steel is a carbon, high-strength, low-alloy steel plate distributor and processor, serving the United States, Mexico, and South America from seven locations throughout these regions. We have distribution facilities in Portage, IN, Oshkosh, WI, Pittsburgh, PA, Chattanooga, TN, and Fort Worth, TX.

Leeco Steel first began delivering steel plates and fabricated plate products into the wind industry in 2004. Revenues from the wind industry now account for nearly 40 percent of our company's total revenue. The wind business for Leeco has become a keystone of our overall business and a driver for development of our company. Leeco Steel has provided hundreds of thousands of tons of steel plates to 12 tower manufacturing facilities in 12 States across the U.S., most of which have been built in the past 8 years.

The PTC has helped us to expand our company in the wind industry and into new markets, and has helped us weather the recent economic downturn. Since the early development of our wind business, we have hired over 70 people in Leeco Steel to help maintain these growth strategies that we have planned for our company.

In the past 6 years, when there has been a certainty to the PTC, our wind business and the wind industry overall have been a major job creation success story. Of the 12 tower factories mentioned above, 10 of these factories did not exist before 2002. Taking an average of 250 employees per factory, that is 2,500 new good-paying jobs that were created in a very short amount of time within our supply chain alone. This does not take into account the thousands of additional jobs that exist in the supply chain that supplies goods and services to each of these 12 factories.

Because of the PTC, the U.S. wind industry overall has seen tremendous growth and innovation. Wind energy now provides nearly 3 percent of America's electricity, with that number surpassing 20 percent in the State of Iowa.

Overall, wind energy has accounted for 35 percent of all new electric generating capacity in the last 5 years. The wind industry has generated investment upward of $20 billion annually, which is greater than the economic impact on U.S. GDP from Colombia, Panama, and the South Korea free trade agreements combined.

Since the PTC was last allowed to expire, there was approximately only 25 percent domestic content in each wind turbine that was erected. Today, we have approximately 60 percent domestic content in each installed turbine.

With the uncertainty of an extension of a PTC, many of Leeco's expansion plans are at risk. There have been high-level discussions

to increase the amount of steel plate capacity for the wind business in the coming years. However, those discussions have now gone silent, as there needs to be business case certainty to move forward with such huge capital investments.

In similar fashion, over the years, many plans to increase wind tower production in the U.S. have been scrapped due to the business case uncertainty caused by the on again-off again nature of the PTC. The wind industry as a whole has already seen layoffs as a result of this uncertainty.

Many plans to add existing facilities or invest in new facilities are on indefinite hold or have been scrapped altogether. Industry-wide, 37,000 jobs will be lost if the PTC is not extended.

It is my opinion that the supply chain was built and billions of dollars invested in this industry due to companies' expectations of a long-term PTC in place that would allow for stable growth in the wind energy sector for many years to come. Major factories have been established from coast-to-coast, and many North American headquarters have been established in cities such as Chicago, Portland, OR, and Denver. Without an extension of this PTC, all the assets are at premium risk of being shuttered or dramatically downsized.

With an immediate extension of the PTC, the development and construction of these turbines can continue as planned. The tens of thousands of jobs that can be created with this extension will allow the wind industry not only to continue to be a leader in job creation, but help secure our Nation's energy future by lessening the reliance on foreign sources of energy. The PTC is also crucial for regaining our Nation's leadership in new technology innovation that will keep our economy competitive.

The wind industry is on the verge of becoming competitive without the PTC, but failing to extend the PTC immediately will prevent us from finishing the job.

Again, thank you for the opportunity to be here today to hopefully give a little insight into the role of manufacturing that has been created in this country to support an industry that is on the cusp of being fully competitive with all major sources of electricity generation.

Thank you.

[The prepared statement of Mr. Purcell appears in the appendix.]

Senator BINGAMAN. Thank you.

Dr. Zycher, go right ahead.

STATEMENT OF DR. BENJAMIN ZYCHER, VISITING SCHOLAR, AMERICAN ENTERPRISE INSTITUTE, WASHINGTON, DC

Dr. ZYCHER. Well, thank you, Mr. Chairman and Ranking Member Cornyn. I am very pleased to have this opportunity to offer my views on why renewable energy subsidies should be abandoned.

I have submitted a formal statement for the record on the economics and policy analytics of renewable electricity. Today I will concentrate on three central themes, which generally are applicable to biofuels and related topics as well. At the end, I will be very pleased to address any questions that you may have.

The first theme: Despite very substantial policy support in the form of direct and indirect subsidies at the Federal and State lev-

els, renewable electricity has only a small share of the electricity market, with poor prospects for growth. This is due to three inherent problems that public policies can overcome only at very substantial cost to taxpayers, ratepayers, and the economy as a whole, with the additional adverse effect of significant market distortion.

These inherent problems can be summarized as the unconcentrated energy content of wind flows and sunlight; siting constraints and the higher transmission costs that result; and the intermittency and unreliability problem, which yields very large additional costs for backup generation. Each of these inherent problems is discussed in detail in the testimony that I have submitted for the record, but the central effect can be stated quite simply. We have achieved the perfect green trifecta—higher costs, less reliability, and more pollution.

The second theme: The five central rationales that usually are offered in defense of policy support for renewables are deeply problematic. First, the infant industry rationale—subsidies are needed to achieve scale economies and learning efficiencies—is inconsistent with the existence of an international capital market and with the cost evidence published by the Energy Information Administration and by the Department of Energy.

Second, the level playing field rationale—subsidies for renewables are needed as an offset for subsidies enjoyed by conventional generation—simply is incorrect. The subsidies per megawatt hour enjoyed by renewable power are far greater than those received by conventional electricity, both on average and on the margin.

Third, the pollution or externality rationale ignores the large effects of our environmental policies. It ignores also the cost of backup generation imposed by renewable power upon the electricity market, an adverse effect far greater than even the highest estimates of environmental costs of conventional generation reported in the peer-reviewed literature.

Fourth, the resource depletion or sustainability rationale is incorrect simply as a matter of basic economics and is inconsistent with the historical evidence in any event.

Finally, the green jobs rationale borders on the preposterous. It confuses benefits for particular groups with costs imposed upon the economy as a whole. It ignores the adverse employment effects in the industries that lose when government attempts to pick winners. There are, after all, no free lunches. It ignores the adverse employment effects of increases in electricity costs. It ignores the adverse employment effects of the taxes needed to finance current and future subsidies, and it is utterly oblivious to the starkly adverse experience in Europe, which also was mesmerized by the green jobs mirage.

Under the green jobs analytic framework, we could create a lot of employment if we outlawed the use of heavy equipment for digging ditches and mandated instead the use of shovels or, for that matter, spoons. That sounds pretty ridiculous, does it not? Well, there is no analytic difference between inefficient ditch-digging and inefficient power generation as tools with which to pursue increased employment—none.

The third theme: Ongoing and prospective developments in the market for natural gas will worsen the already poor competitive po-

sition of renewable electricity. Because of the dramatic increase in natural gas supplies attendant upon the application of hydraulic fracturing technology, the EIA projection of gas prices over the next 20 years has declined by about 20 percent, and the EIA projection of non-hydroelectric renewable generating capacity also has declined by about 20 percent, specifically because of reduced competitiveness.

There was a headline in the *Wall Street Journal* dated August 22, 1978 that read, "Solar power seen meeting 20 percent of needs by 2000, Carter may seek outlay boost." That forecast had a lot of company. In 1971, the National Academy of Sciences argued that, "It will take only another 50 years to use up the great bulk of the world's supply of recoverable petroleum liquids and natural gas."

In 1977, the Executive Office of the President argued that "supplies of oil are diminishing, and world oil will become very scarce and very expensive in the 1980s." In 1978, the executive director of the International Energy Agency argued that, "All available evidence points to a serious energy crisis in the middle or late 1980s."

In 1979, the Central Intelligence Agency argued that, "The world can no longer count on increases in oil production to meet its energy needs." In 1980, the Secretary of Energy argued that, "Oil supplies will be running out in a couple of decades." In 1979, the chairman of Exxon argued that, "We're going to be facing shortages and higher prices for years." In fairness, the Exxon chairman made that statement on New Year's Eve.

There is a dual theme common to all such predictions: first, the substitution of the musings of experts, policymakers, and professional commentators in place of market forces and, second, a batting average of zero. As we look back, we find the 1944 Synthetic Liquid Fuels Act; the 1954 Atomic Energy Act; Project Independence in the 1970s; the 1978 National Energy Act; the 1980 Synthetic Fuels Corporation Act; the 1980 Magnetic Fusion Energy Engineering Act; the 1992 Energy Policy Act and the production tax credit; the 1993 Partnership for New Generation Vehicles (the 80-mile-per-gallon car was just around the corner); the 2005 Energy Policy Act implementation of the renewable fuel standard, otherwise known as the corn ethanol boondoggle; the 2007 Energy Independence and Security Act; the 2008 Energy Improvement and Extension Act; and the energy provisions of the 2009 American Recovery and Reinvestment Act, that is, the stimulus legislation.

The eternal truth is that government subsidies for renewable energy are swimming against a strong tide of market forces and are doomed to the same failures that we have experienced time and again. Moreover, such policies have the more subtle effect of inducing ever more interest groups to seek favors from government—not a salutary outcome.

Thank you again, Mr. Chairman, Ranking Member Mr. Cornyn, and I will be, again, very pleased to address any questions that you may have.

[The prepared statement of Dr. Zycher appears in the appendix.]

Senator BINGAMAN. Mr. Ragan, why don't you go right ahead?

STATEMENT OF JOHN P. RAGAN, VICE PRESIDENT OF BUSINESS DEVELOPMENT AND GOVERNMENT AFFAIRS, TPI COMPOSITES, SCOTTSDALE, AZ

Mr. RAGAN. Good afternoon, Chairman Bingaman, Ranking Member Cornyn, members of the committee. Thank you for your leadership on this matter and for the opportunity to join you this afternoon to discuss the effect that the expiration of the production tax credit, the PTC, will have on wind energy companies like TPI Composites. I would also like to thank Senator Grassley for reintroducing his bill, which will extend the PTC.

I appear before the committee as the vice president of business development and government affairs of TPI Composites and as a corporate member of the American Wind Energy Association.

TPI is a manufacturer of blades for wind turbine makers, including GE Energy and Mitsubishi Power Systems. With roughly 1,400 U.S. employees, TPI is headquartered in Scottsdale, AZ and operates factories in Rhode Island, Massachusetts, Mexico, China, Turkey, and in Newton, IA, formerly the home of Maytag appliance manufacturing.

The wind energy industry is a U.S. manufacturing success story. U.S. wind experienced significant growth from 2004 to 2009, primarily due to a growing economy where energy consumption increased, coupled with State and Federal policies promoting production of renewable energy, State renewable portfolio standards, and the Federal PTC creating reasonable stability for wind developers and suppliers to invest in wind farms and manufacturing plants.

That growth led to the industry creating over 75,000 U.S. jobs and several thousand small to large U.S. companies participating in the chain. It also led to the wind industry becoming a significant provider of energy to consumers. Over the past 5 years, wind represented 35 percent of all new generating capacity installed. For 5 consecutive years, wind has been second only to natural gas as a source of new electrical capacity.

Through this time, investments in wind assets have topped $20 billion a year. According to the U.S. Department of Energy report just published during the George W. Bush administration, wind power could provide 20 percent of U.S. electricity needs by the year 2030. It is estimated that meeting this goal from wind would create 500,000 U.S. jobs and reduce the current electric sector and natural gas consumption by nearly 50 percent.

TPI Composites recognized the market opportunity years ago and opened its first dedicated wind blade plant in 2002. Since that time, we have added dedicated U.S. plants in Newton, IA and a blade development center in Fall River, MA.

An important factor in our company's growth has been stable and pro-market growth policies on the Federal and State levels. During most of the 2000s, the Federal PTCs allowed companies like ours to invest and grow supply chain plants around the country, as demonstrated in the chart to my left. The result is over 470 factories across 43 States in the U.S. providing wind components.

The resurrection of Newton, IA is, we think, a terrific American story. Newton is a city of roughly 16,000 residents located 35 miles east of Des Moines. For many years, Maytag manufactured wash-

ers and dryers and maintained its corporate headquarters in Newton, employing about 3,500 people at its peak.

After being acquired by Whirlpool in 2006, plans were made to consolidate manufacturing into existing facilities in Ohio and Mexico. The remaining 1,900 employees in Newton lost their job, the last on October 25, 2007.

Because of the growth in the wind industry—and much of it stimulated by the Federal PTC—TPI built a plant in Newton in 2008 and today employs almost 800 people in the Jasper County region.

TPI was not the only company who recognized the opportunity. Soon after our arrival in Newton, Trinity Towers opened its facility on the abandoned Maytag campus and has hired at least 125 employees to provide towers to many of the same customers, wind farms, to which TPI supplies blades.

Second only to Texas for installed megawatts of wind, the State of Iowa is now getting 20 percent of its electricity from wind energy, which employs thousands of citizens across the State. Newton and Iowa are shining examples of how to create a U.S. wind energy hub, none of which could have occurred without the PTC.

The opportunity to fulfill the wind energy industry potential is too important and too large for the U.S. not to forge ahead. Our work is not done yet. To achieve this desired economic and energy growth, I urge the U.S. Congress to pass a short-term extension of the PTC immediately, followed by long-term debate on wind policy as part of structural tax reform.

Wind energy has been a source of important economic growth over the past 7 years, but the outlook for 2013 is bleak due to the pending expiration of the PTC. This tax credit has expired 3 times since 1999, leading in each case to dramatic declines, 70 to 90 percent in new wind power development.

Although the PTC technically expires at the end of 2012, practically, it already has expired, as the delay in extending the credits is reducing investment in wind energy projects scheduled to come on line in 2013. Wind power plants and the component supply chain require months, if not years of planning. Wind investors and suppliers like TPI want to know what tax policies will apply before they commit to projects for the next calendar year.

A recent study by Navigant Consulting concluded that 37,000 jobs are likely to be lost with the effect of expiration of the tax credits, along with more than $11 billion in clean energy investment.

The PTC is an effective tool that drives as much as $20 billion a year in private investment and is at the heart of one of America's fast-growing manufacturing sectors. The PTC is not a handout. It is a business tax credit with funding based solely on project performance, not evaluation by government officials.

With a stable, low rate, American wind power has provided more than a third of all new electric generating capacity across the U.S. in recent years and has kept the industry on track toward supporting 500,000 jobs by 2030.

The Federal tax code, as it exists today, is not a broad-based proportionate system where every industry pays its own fair share. Rather, it has specific tax incentives for all forms of energy, most

of which are set in policy to promote economic growth. Trying to eliminate the PTC would place the wind industry at a tremendous disadvantage compared to other energy industries.

While an immediate, short-term PTC extension is needed to stabilize the wind market, I also urge this committee and Congress to work on long-term extension of the PTC as it considers overall structural reform of the tax code.

I know there has been broad support that exists across the political spectrum for extending the PTC. It is critical that the Congress act quickly to find a way through the current impasse and enact an immediate extension. We believe this is a starting point for U.S. job creation, a healthier economy, and a clean energy future.

I would be more than happy to answer any questions you have.

[The prepared statement of Mr. Ragan appears in the appendix.]

Senator BINGAMAN. All right. Well, thank you all very much for your testimony. Let me start with a few questions.

Mr. Zindler, you have a projection there that in 2013, if the PTC is not extended, you would see the wind energy installations being reduced to 500 megawatts in 2013, I guess, from 9,500 in the current year. Is that an accurate description?

Mr. ZINDLER. Yes. That is accurate and in keeping with what some of the panelists said. It is not that difficult to forecast, only in the sense that you do have to place your order for a wind turbine pretty far in advance, and we track the contracts. And there are basically almost no orders for 2013 at this point.

Senator BINGAMAN. You are saying also, as I understand it, that if we go ahead and extend the production tax credit and do that in the near future, that you would still project that the U.S. installation of wind power would just total 3.6 gigawatts of capacity in 2013 as compared to 9.5 gigawatts in 2012.

Can you explain why, regardless of the extension, even if Congress were to extend it, why you would expect such a reduction in wind power projects next year?

Mr. ZINDLER. Yes. The industry is being hit by a couple of factors. Most importantly, electricity prices are down due to a less than robust economy and due to the fact that there has been a surge of natural gas capacity that has come on line.

Those two factors are depressing power contract prices and are making it unusually difficult for the wind industry to compete, which is despite the fact that the industry has been dramatically improving its efficiency and bringing down its costs.

Not to go on too long, but the one factor that could kind of very quickly change this picture is if the economy were to grow faster than is anticipated and/or if natural gas prices would pick back up, and many predict that natural gas prices will rise, because the current cost—and I checked this morning—of about $2.30 per million btu, in many cases, is below the cost of production for producers of natural gas.

So that price, at least according to the Energy Information Administration and others, is not sustainable. So longer-term, we think things pick back up in 2014, 2015, but next year will be a difficult year for the reasons I just mentioned.

Senator BINGAMAN. All right. Dr. Zycher, we did not ask you to address it and you did not address it, I do not believe, in your testi-

mony, but I take it, from your basic perspective, you would not favor us maintaining any of the various subsidies that are in the tax code for production of any kind of energy—oil and gas, coal, anything else. Am I accurate about that?

Dr. ZYCHER. As a crude generalization, that is correct, yes.

Senator BINGAMAN. So you think we should just eliminate all tax credits and subsidies in the energy area and allow different types of production to compete as they will?

Dr. ZYCHER. Well, to the extent that the subsidies are specific to the energy subsectors and not generally applicable to all industries, and to the extent that there is not an economic case to be made for any given one, yes. There may be some specific subsidies that I am not familiar with, various depreciation wrinkles and things like that that one might be able to make an argument for. But, again, as a generalization, I would eliminate all the subsidies that are specific to energy and let these different technologies compete on an equal basis.

Senator BINGAMAN. All right. Mr. Ragan, let me ask you and Mr. Purcell this, since you are both involved in businesses that relate to wind energy. If Congress were to decide that we are going to extend the wind energy production tax credit and decided we wanted to do so for a set period of years and perhaps phase it out over 5 years or over 8 years or whatever and reduce it somewhat each year until that phase-out is complete, is that kind of a proposal that you think would make sense, or do you think that we should be maintaining the production tax credit at its current level indefinitely?

Mr. Ragan, why don't you go first, and then Mr. Purcell?

Mr. RAGAN. Sure, Mr. Chairman. Obviously, the most important thing is to pass an immediate extension to stabilize the 2013 market. As I mentioned before, I think, certainly, from TPI's perspective, that I hope industry and Congress come together to work on and reevaluate the PTC and a time period of a longer-term extension and to have those discussions.

What the answer is today, I am not sure, but I think that would be very valuable in the context of tax reform. And I think there are many things going on in the marketplace with new technologies that, from our perspective, material selections are getting better.

I think, though, our technology is driving the costs of wind down in the supply chain. So, coupled in that discussion with where the PTC is and the time limit and how much ought to occur, I think that is a valuable discussion to have.

Senator BINGAMAN. Mr. Purcell?

Mr. PURCELL. Yes. I think, Mr. Chairman, the eventuality is that it will no longer be needed, based on the technologies that are coming forth in the wind business, and I think we are starting to see that evidenced today.

However, my company is in the most basic part of this, which is providing steel to the tower manufacturers, and on every level we are looking to get cost out of the product, and that is certainly part of our job, doing that at our company and with our steel mill partners just to provide a product that is stronger, maybe lighter steel, less steel, which sounds bad for us.

But, quite frankly, we are serving our customers to take cost out of the system so we can compete on our own. I do not think we are there yet, and I think that that is why we are here today telling you that an immediate short-term extension is something that we need, and then I think the evaluation needs to be a part of a broader energy policy discussion that allows all forms of energy to exist.

And I think that the wind industry is rapidly bringing that cost to where we can compete with other forms of energy, especially fossil fuel. So I think there are still several years ahead of us yet.

Senator BINGAMAN. Senator Cornyn?

Senator CORNYN. Thank you, Mr. Chairman.

I find myself agreeing with the vast majority of what every witness said, as strange as that may sound, because there are, I think, different elements in all of this, recognizing that, number one, we are going to have to have major tax reform in the country, which is going to dramatically change the tax code—at least that is my hope—for a flatter, broader-based tax that stimulates economic growth.

And I would also like to see the government get a little bit out of the business of picking winners and losers in the marketplace, what some people have called crony capitalism, noting the connection sometimes between government largess and political support, which I think causes diminished confidence in the Federal Government.

But I also believe that there probably is a role for government to play in new technologies, encouraging new technologies and development. The problem is, to paraphrase President Reagan, the closest thing to eternal life here on earth is, in this case, I would say, a tax credit or a tax subsidy. And the problem is, how does Congress, as opposed to the marketplace, determine when an industry cannot compete or when it can compete and it just needs a little more time?

I would like to start with Mr. Zindler here in a moment.

But, Dr. Zycher, you have a chart on page 12 of your testimony that I think is instructive in terms of the tax subsidies and support per megawatt hour for electricity. And I wonder if you would just summarize that for us, because I think some people not as familiar with the details of this may find some of the disparities shocking.

Dr. ZYCHER. These are data taken directly from the Energy Information Administration estimate of Federal production subsidies and support per megawatt hour for the year 2010, and the data—I think I adjusted them for inflation. I think they reported in the EIA publication in either 2005 or 2009 dollars. I cannot remember. So I just used a very simple inflation adjustment.

But the basic message is that subsidies for wind power, again, on average, per megawatt hour are one or two orders of magnitude higher than they are for conventional generation technologies and, for solar power, in particular thermal solar technologies, three or four times or three or four orders of magnitude higher.

These are average subsidies. If you look at Professor Gil Metcalf's work on marginal subsidies, you come up with basically the same answer.

Senator CORNYN. That is on page 13 of your testimony.

Dr. ZYCHER. Yes. That is correct. Yes. I had forgotten I even had this in here.

Senator CORNYN. Let me just ask, because time is short here, if I am reading this correctly, on page 12, it says that electricity production subsidies of support per megawatt hour for natural gas and petroleum liquids, it is $.63 per megawatt hour, but for solar it is $968.

Dr. ZYCHER. Yes, that is correct.

Senator CORNYN. And then there are ranges, with wind at 52, geothermal at 12, and the like. So there is a lot of variation in terms of how the U.S. Government treats different sources of energy in the tax code, correct?

Dr. ZYCHER. Yes, that is correct.

Senator CORNYN. Mr. Zindler, you understand our challenge, and I wonder if you have any comments on the approach that you would recommend that we should take when it comes to these tax provisions that exist. And, as Mr. Ragan makes a point, companies have started a business, built a business expecting those to continue, but the reality being that, at some point, they cannot, and that it makes no sense to ask the taxpayers to subsidize some of these industries that are able to compete on their own in the marketplace or else cannot compete at all and we ought to just pull the plug and move on.

Mr. ZINDLER. Well, in my role, it is not my job to sort of recommend policy, but I think my own two cents on all of this is that there are value judgments that need to be made by policymakers like yourself and others in terms of what the priorities are, and then clear and defined and long-term policies need to be set and stuck to.

And anything short of that, the kind of end-of-the-year tax extender scramble that we have seen on several occasions, the inconsistency, that is probably the worst thing you can do for the industry in terms of its long-term growth.

Now, whether or not you decide that it is something that you want to flourish is really your determination.

Senator CORNYN. Well, Mr. Purcell, I know you said Leeco Steel has a distribution facility in Fort Worth, and we are grateful for that and for the jobs your business creates. I wonder if you have any comments, briefly, on the questions or the issues that I raised in terms of how—I agree with Mr. Zindler that it takes a value judgment, but I wonder if you have any thoughts on what should inform that value judgment that Congress is ultimately going to have to make on whether there is a good case to be made to continue some of the tax treatments, let us say, for wind and solar and others or at what point we should decide that the marketplace should make that determination.

Mr. PURCELL. Yes, sir. I think that, obviously, I am a huge believer in free markets, but I think there is a little bit more behind that. You have to take into consideration the fact that—and I am a little bit out of my bailiwick here, but, certainly, if you go back historically, when industries like nuclear energy were just getting started, the subsidies were much higher than they are for today's current wind subsidies at, I think, the $52 that was stated just a minute ago. And we certainly can get you some facts behind that.

But I think that, if you take into consideration that, in my opinion, it is a national energy and national security issue to have many other forms of electricity generation other than just what we are using today, that it would be certainly very destructive to end the policy of these tax credits for wind and others.

But, certainly, as I sit here today, I am a big believer that, with a little bit more time, this will be a competitive energy source and just, again, a huge jobs creator, and it is something that we certainly need.

So, yes, I do believe it is something that will be competitive, and I think we need to continue.

Senator CORNYN. Mr. Chairman, can I ask Mr. Ragan to comment?

Senator BINGAMAN. Sure.

Senator CORNYN. And just one other factor that your comments made me think of, Mr. Purcell, is that the other problem is, when Congress creates these various tax incentives and policies, we do not do a very good job of anticipating or reacting to innovation—and, of course, the production of shale gas and the cheap gas now which has made even nuclear power and others as a source for electricity generation less competitive, certainly.

But, Mr. Ragan, I wonder if you have any comments.

Mr. RAGAN. Sure. Senator, I think I will echo Mr. Purcell's—a few of Mr. Purcell's thoughts. Certainly, a broad array of energy production and energy sources is probably, from a policy standpoint, a good thing for our country.

In addition to that, I think that a big question for us, and certainly for our business decisions in the markets we go after, in wind's case, is, are we cutting the cost of wind? Has the cost of wind come down? Is it becoming more competitive, and do we have an opportunity to continue driving those costs to become competitive in a free market situation?

I think the answer is yes, from our perspective, and at the right time, any policy—and I suggested it before—I think that over time, Congress and industry need to come together and figure out what the right time is, but I think there is value there and wind will become a good contributor to this country.

Senator BINGAMAN. Senator Thune?

Senator THUNE. Thank you, Mr. Chairman and Senator Cornyn, for holding this subcommittee hearing and to all of you for being willing to share your perspectives.

I am interested in—I have supported renewable energy incentives, and I believe there is a growing realization on both sides of the aisle that Congress has to do a better job of figuring out a way of phasing out those incentives as industries grow and mature. And I would agree with what the chairman of the full committee, Senator Baucus, stated in an interview last week regarding the wind credit.

He said, "The industry needs a little boost, but that boost can't last forever. The more the industry can figure out a way to proceed by cutting back, phasing out, the better it would probably be."

Senator Baucus, I think, is, by and large, correct, and I hope that we can work together with the industry in a bipartisan way to find

a way to support renewable energy in a way that is fiscally responsible.

So I guess my question is, to get back to what Senator Cornyn was honing in on there for a moment—and I would open this up to anybody who cares to answer it—it is the question of when to recognize when you hit that threshold of whether or not an industry is sustainable or viable without the benefit of whatever that incentive is.

As you look across these energy industries, are there any benchmarks that you can use that would determine that or help determine that?

Dr. ZYCHER. Well, indeed, there are. If a technology is on the threshold of becoming economic, there is no particular reason why the private capital market will not support it in the interim, and there is no reason for Congress to squander taxpayer dollars in pursuit of that last increment of competitiveness.

If a technology is never going to be competitive, then, again, there is no particular reason for Congress to squander taxpayer dollars in pursuit of the impossible.

So the argument that many have made that some technologies are close to being competitive, all they need is a little boost, is precisely wrong. If they are really close to being competitive and in need of only a small boost, there is no particular reason why they cannot go to the capital market for working capital to get them over the hump. And, if they are not close to being competitive, again, they should not get taxpayer support.

Senator THUNE. Anybody else? Any specific benchmarks, anything?

Mr. ZINDLER. Well, I guess, first, I would just respond to that, that the main thing we do in life is count dollars invested in clean energy. We have counted about $1 trillion invested in this sector and about a quarter of a trillion invested last year alone.

So there are clearly those in the capital markets who are believers that this technology is right there knocking on the door of true cost competitiveness with its fossil generation rivals. And, in fact, our look at levelized cost of energy analyses suggests that, in some parts of the world, this technology and others, solar in particular, are already there, but that really market conditions do need to shift a little bit in the U.S. for wind to become more competitive.

And as I mentioned, the $2.30 natural gas price that we have now is probably not sustainable, and, when it rises, wind will become more competitive, again, in part because the industry has been, in fact, driving down costs through technology improvements and also through scale.

The industry has really grown tremendously in the last several years.

Senator THUNE. If I might—this would be, I guess, for Mr. Purcell or Mr. Ragan. But as participants in the wind energy industry, how important—you have talked about certainty, and I do not disagree for a minute. Certainty is really important.

We have a company called Molded Fiberglas in Aberdeen, SD that makes wind blades and employs hundreds of people, sitting there wondering what happens next in terms of in the incentives in this industry and what that is going to mean for investment.

But for participants in this, would a 2- to 3-year extension of the wind credit, even if the rate was phasing down, make a big difference in decision-making relative to a 1-year extension that is often done retroactively?

If you had the certainty of a 2- or 3-year extension, even though that might be phasing down, is that better than this sort of year-to-year thing that we do today?

Mr. RAGAN. Again, I will speak from TPI's perspective, which is a blade manufacturer, like the company in your State, Senator.

There is a long process, I have mentioned, to go from power purchase agreement to get orders, for the developers to place orders with our company for blades. We do not make VCRs or TVs; we cannot just turn our manufacturing lines back on the way other industries can.

So, from our perspective, a longer-term PTC is very valuable for TPI, much more so than would be the on-again off-again and 1-year extensions.

Mr. PURCELL. I guess I would echo those comments, not knowing what that ramp-down is that you are suggesting. But, certainly, a longer-term policy is, of course, best, and that is what we have had over the last several years, which has allowed my company and others that we serve to add investments in capital spent up and down, especially in areas like yours that you represent.

So I cannot tell you specifically, not knowing what that ramp-down would be, but, in general, yes, a longer-term view would certainly help.

I think it is important to note, echoing Mr. Zindler's comments, with regard to the technology and the advancements we have made, also having the local supply chain here, I would suggest that, if we do lose this, a lot of that just goes away and the investments that have been made over the last several years with the certain policy that you are talking about cannot be recapitalized if they are allowed to fail.

So I think that that is important to note, that part of the cost out of this industry is because the supply chain is here local now in the U.S. as opposed to Europe or Asia.

Senator THUNE. If I might just suggest, Mr. Chairman—and I have had this conversation with members of the wind industry in the past, and I know everybody says we want to wait for tax reform, this is going to get folded into tax reform, and I understand the logic behind that and I hope, frankly, that we get to tax reform and that we address all these things in a broader way.

But I think anybody who can come forward with a specific proposal that would have that sort of a wind-down in it is going to be well-placed relative to those discussions about tax reform. And so far, we have not seen any proposal that would do that. I know that there are many of us who would be very interested in working with people who would be able to advance that kind of an idea. So I just would put that out there.

And, again, thank you all for your testimony today.

Senator BINGAMAN. Senator Carper?

Senator CARPER. Thanks, Mr. Chairman.

Gentlemen, welcome. It is good to see you all. Thank you for joining us today and for your testimony and for your willingness to respond to our questions.

I have a couple of questions, one for Mr. Ragan, one for Mr. Purcell, and I will let the other two slide for now. But here is my question. I want to focus a little bit, if we could, on offshore wind. And we do not do much onshore wind in Delaware, some, but not a whole lot.

We have the potential for doing, I think, quite a bit of offshore wind. My colleagues have heard me tell the story—we tell the story of Goldilocks and the Three Bears, the story about the porridge that was too hot, the porridge was too cold, the porridge was just right.

As it turned out, in some places off the East Coast, the wind does not blow enough, in some places it blows really too much, some places it blows just right. There is a place about 12 miles due east of Rehoboth Beach, DE where the wind blows just right much of the year, and there is some real strong interest in harnessing that wind and turning it into electricity.

Mr. Ragan and Mr. Purcell, your testimonies focused on the importance of onshore wind production and the production tax credit to your businesses. However, we have started building offshore wind farms off our coast in this country. Could your businesses and other onshore wind manufacturers also benefit from those kinds of undertakings? And do you support the offshore wind industry's efforts to develop in this country? Please.

Mr. PURCELL. The answer is absolutely "yes." We have the steelmaking capabilities in this country to support the types of equipment that need to go on the seabed floor and, also, above ground—excuse me—above the water.

I think it is absolutely an important part of the wind solution, and it is something that we do support. And I think that there is room for that certainly along the East Coast, where we are going to need a lot of electricity generation for many years to come.

So the answer, simply, is "yes." We are supportive of the offshore business and, yes, we can be an integral part of that supply chain as well.

Senator CARPER. Good. Thanks.

Mr. Ragan?

Mr. RAGAN. Senator, the answer is "yes." In fact, TPI opened a small development factory in Fall River, MA not too long ago, first to build tooling and prototype blades for our facilities around the country. But more importantly, we see the opportunity and the potential growth in offshore, and that factory is also set in place and could be expandable when the offshore market takes off.

But we would be able to build blades there, employ more people, and basically barge blades right off the river in Fall River.

Senator CARPER. Thank you. Late last year, I held, along with some of our colleagues, a roundtable, a discussion with major offshore wind stakeholders, including several manufacturers. And during the discussions that we had there, there seemed to be overwhelming agreement that for offshore wind to be successful in this country, we needed a longer-term extension of the investment tax

credit for offshore wind, along with an extension of the production tax credit for onshore wind.

And, if you support the development, and it sounds like you do, Mr. Purcell and Mr. Ragan, if you support the development of offshore wind, do you support a longer-term extension of the investment tax credit for offshore wind?

Mr. Ragan or Mr. Purcell?

Mr. RAGAN. Yes, Senator. The answer is "yes."

Senator CARPER. Mr. Purcell?

Mr. PURCELL. Yes. The answer is "yes." I think offshore is certainly coming very quickly behind onshore. But I think the immediate need would be the production tax credit, but we are also in favor of the ITC, as well.

Senator CARPER. As it turns out, they are not going to build any offshore wind farms, as far as I know, without the investment tax credit. It just is not going to happen.

Senator Snowe and I have suggested that, rather than just saying, "Well, we are going to extend the investment tax credit for another year or two," what we do is change it up a little bit, and the first several thousand megawatts of capacity or production that are developed off of our shores would be eligible for the investment tax credit.

I think we had 3,000 megawatts in our bill, but you could go up, you could go down, make it dialable to meet whatever revenue constraints we might have. So that is what we have suggested as a difference.

The other question I have, and this would be for Mr. Zindler, if you would, sir, as of today, can you just give us some idea of how much offshore wind production we actually have underway in this country—in existence today offshore—and how much offshore wind there might be globally, just roughly, please?

Mr. ZINDLER. Well, there are zero megawatts of——

Senator CARPER. Would you say that again?

Mr. ZINDLER. There are no megawatts of offshore capacity operating, to the best of my knowledge. There may be a pilot project or two, as far as I know. I do not know the exact figure. I think it is a few gigawatts of capacity in Europe at this point. I can check for you and get back to you on that.

But Europe certainly has moved quickly. China has begun to do some offshore development as well. So other countries have certainly stepped up on this stuff.

I would make one comment, though, which is that it is hard to jumpstart an offshore wind industry. It takes substantial additional investment. A lot of the infrastructure that now is in place in Western Europe does not exist here yet in terms of the barges to put these things in and then manufacturing facilities.

So the first one is going to be the hardest, no question about that.

Senator CARPER. Great. Thank you very much.

Could I ask just a quick follow-up, if you do not mind?

Give us some idea what other countries, particularly those that are—what did you say, 4 gigawatts they are producing? What are some of the incentives for the offshore wind industry in that part of the world; any idea?

Mr. ZINDLER. Well, there are feed-in tariffs, first of all, which guarantee that the price—that the power is sold at a fixed rate. But the other——

Senator CARPER. Give us an example of a feed-in tariff, if you would.

Mr. ZINDLER. So, if the power price is typically $50 per megawatt hour, if you are generating from a renewable source, you might sell it for $100. It is sort of an artificially inflated price that tries to take into account some of the externalities that are associated with coal generating and the polluting aspects of that.

Those are not in any way accurate numbers——

Senator CARPER. I understand.

Mr. ZINDLER [continuing]. But just to give you a sense. The other support that we have seen in Europe is, some of the development banks have been supportive of financing these projects, and that early is going to be a major issue for offshore. The amount of dollars that are needed—it is roughly 2, even 2½ times the cost of onshore wind. In fact, you have more like 2½, and even to 3.

So the price check can be very, very high, and so you really have to raise a tremendous sum, and that is where sort of these quasi-public banks can come into play in the European sphere to help finance these.

Senator CARPER. And is the rationale in Europe for actually doing a fair amount of offshore wind, is it that the wind is a more reliable source of generating capacity than maybe onshore?

Mr. ZINDLER. I will not characterize exactly what the rationale is, but it is true that there are higher capacity factors that you get from an offshore project than you do from an onshore wind project. Typically, you can get up over 40 percent capacity factor, whereas you are usually in the 30s for an onshore project.

Senator CARPER. Good. Thanks. Thank you all very much.

Senator BINGAMAN. They have started a vote on the Senate floor, so I think we will have to adjourn the hearing. Thank you all very much for being here. I think it has been useful testimony. I appreciate it.

[Whereupon, at 3:50 p.m., the subcommittee was adjourned.]

APPENDIX

Additional Material Submitted for the Record

Statement of Chairman Jeff Bingaman
Senate Finance Subcommittee on Energy, Natural Resources & Infrastructure
March 27, 2012
"Renewable Energy Tax Incentives: How have the recent and pending expirations of key incentives affected the renewable energy industry in the United States?"

We have convened this hearing to understand how recent and pending expirations of energy tax incentives affects deployment of renewable energy facilities, energy efficiency measures, and advanced biofuels.

Last December this committee met to consider the effects of short-term extensions and frequent expirations on the renewable energy industry. Almost all of the witnesses argued that intermittent incentives severely stunt the promise of clean energy in the United States, and illustrated how the constant threat of expiration prevents the build-out of a robust manufacturing sector and supply chain - the very pieces that create the majority of jobs in these industries.

We undoubtedly will get some testimony on the extent of support that is being provided. In an Issue Brief released recently, the Congressional Budget Office observes, "tax preferences for energy were first established in 1916, and until 2005 they were primarily intended to stimulate domestic production of oil and natural gas." CBO also notes that it wasn't until 2006 that an increasing share of energy-related tax expenditures began to shift to renewables and energy efficiency. I'm sure we'll get testimony on this very point.

Clean energy and energy diversity have not always been perceived as a partisan issue. In fact, the legislation that most directly put the U.S. on a path towards clean energy and efficiency, the 2005 energy bill, was conceived, written, and passed by a Republican-led Senate and Republican-led House, and it was signed into law by a Republican president.

Much of the discussion today will center on the credit for wind, which expires this year, and I think we need to understand the effect not extending that. There are other important incentives (and the markets they encourage) for advanced biofuels, energy efficient homes, buildings and appliances, combined heat and power, fuel cells, advanced vehicles, and these are all the subject of our hearing today.

Let me go ahead and defer to Senator Cornyn for any commitments he has and then I will go ahead and introduce the witnesses.

Testimony of John Purcell, Leeco Steel
Senate Committee on Finance Subcommittee on Energy, Natural Resources, and Infrastructure
Hearing on Renewable Energy Tax Incentives
March 27, 2012

Thank you, Chairman Bingaman, Ranking Member Cornyn, and Subcommittee Members. My name is John Purcell and I serve as Vice President of Wind Energy for Leeco Steel. I appreciate the opportunity to speak briefly today about the impact on Leeco Steel and the U.S. wind energy sector due to the impending expiration of the Renewable Energy Production Tax Credit. We at Leeco Steel feel it is imperative that the PTC is extended in its full form as presented in S. 2201, the American Energy and Job Promotion Act, which was recently introduced by Senators Grassley and Mark Udall.

Leeco Steel is a wholly owned subsidiary of O'Neal Steel, the largest privately held metals distribution company in the United States, which is headquartered in Birmingham, AL. Headquartered in Lisle, IL, a western suburb of Chicago, Leeco Steel is a carbon, high-strength low-alloy steel plate distributor and processor serving the United States, Mexico and South America from seven locations throughout these regions. We have distribution facilities in Portage, IN, Oshkosh, WI, Pittsburgh, PA, Chattanooga, TN, and Fort Worth, TX.

Leeco Steel first began delivering steel plates and fabricated plate products into the wind industry in 2004. Revenue from the wind industry now accounts for nearly 40% of our company's total revenue. The wind business for Leeco has become a keystone of our overall business and a driver for development of our company. Leeco Steel has provided hundreds of thousands of tons of steel plates to these 12 tower manufacturing facilities in 12 states across America, most of which have been built in the past eight years. The PTC has helped us to expand our company in the wind industry and into new markets, and has helped us weather the recent economic downturn. Since the early development of our wind business, we have hired over 70 people at Leeco Steel to help maintain the growth strategies that we have planned for our company.

In the past six years, when there has been certainty of a PTC, our wind business and the wind industry overall has been a major job creation success story. Of the 12 tower factories mentioned above, 10 of those factories did not exist before 2002. Taking an average of 250 employees per factory, that is 2,500 new good paying jobs that were created in a very short amount of time within our supply chain alone. This does not take into account the thousands of additional jobs that exist in the supply chain that supplies goods and services to each of these 12 factories.

Because of the PTC, the U.S. wind industry overall has seen tremendous growth and innovation. Wind energy now provides nearly 3% of America's electricity, with that

number surpassing 20% in the state of Iowa. Overall, wind energy has accounted for 35% of all new electric generating capacity in the last five years. The wind industry has generated investment upward of $20 billion annually, which is greater than the economic impact on U.S. GDP from the Colombia, Panama, and South Korea free trade agreements combined (Senate Finance Committee Statement, 10/11/11). Since the PTC was last allowed to expire, there was approximately only 25% domestic content in each wind turbine that was erected. Today, we have approximately 60% domestic content in each installed turbine.

With the uncertainty of an extension of the PTC, many of Leeco's expansion plans are at risk. There have been high level discussions to increase the amount of steel plate capacity for the wind business in the coming few years. However those discussions have now gone silent, as there needs to be business case certainty to move forward with such huge capital investments.

In similar fashion, over the years many plans to increase wind tower production in the U.S. have been scrapped due to the business case uncertainty caused by the on again/off again nature of the PTC. The wind industry as a whole is already seeing layoffs as a result of this uncertainty. Many plans to add to existing facilities, or invest in new facilities, are on indefinite hold or have been scrapped altogether. Industry-wide, 37,000 jobs will be lost if the PTC is not extended.

It is my opinion that the supply chain was built and billions of dollars invested in this industry due to companies' expectations of a long term PTC in place that would allow for stable growth in the wind industry sector for many years to come. Major factories have been established from coast to coast, and many North American headquarters have been established in cities such as Chicago, Portland, OR, and Denver. Without an extension of the PTC, all of these assets are at premium risk of being shuttered or downsized dramatically.

With an immediate extension of the PTC, the development and construction of these turbines can continue as planned. The tens of thousands of jobs that can be created with this extension will allow the wind industry to not only continue being a leader in job creation, but help secure our nations' energy future by lessoning the reliance on foreign sources of energy. The PTC is also crucial for regaining our nation's leadership in new technology and innovation that will keep our economy competitive. The wind industry is on the verge of becoming competitive without the PTC, but failing to extend the PTC immediately would prevent us from finishing the job.

Again, thank you for the opportunity to be here today to hopefully give a little insight into the world of manufacturing that has been created in this country to support an industry that is on the cusp on being fully competitive with all major sources of electricity generation.

Testimony of

TPI Composites, Inc.

Before the

Senate Finance Subcommittee on Energy, Natural Resources and Infrastructure

March 27, 2012

John P. Ragan
Vice President of Business Development and Government Affairs
TPI Composites, Inc.
Scottsdale, AZ

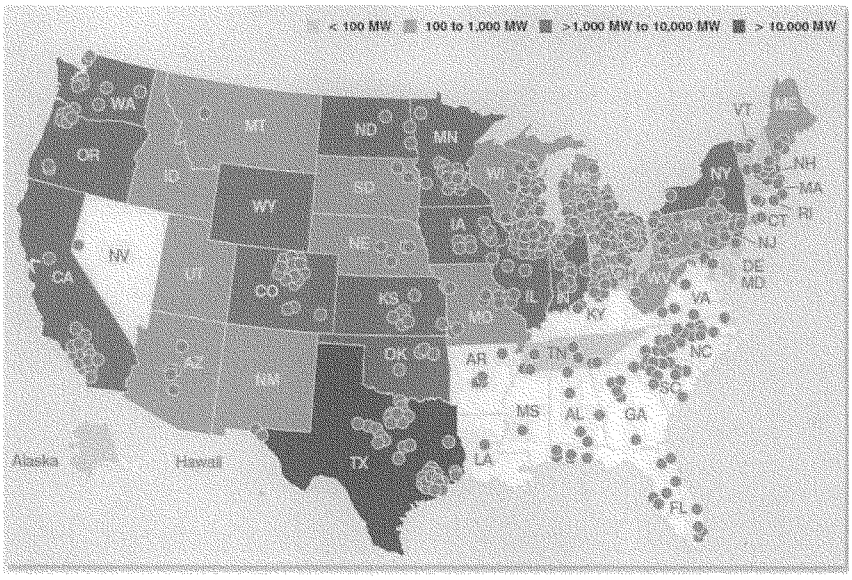
Good afternoon. Chairman Bingaman, Senator Cornyn, Members of the Committee, thank you for your leadership on this issue and for the opportunity to join you this afternoon to discuss the effect that the expiration of the Production Tax Credit (PTC) will have on wind energy companies like TPI Composites. I thank Senator Grassley for reintroducing his bill which will extend the PTC.

I appear before the committee as the Vice President of Business Development and Government Affairs of TPI Composites and as a corporate member of the American Wind Energy Association (AWEA). TPI is a manufacturer of blades for wind turbine makers including GE Energy and Mitsubishi Power Systems. With roughly 1,400 U.S. employees, TPI is headquartered in Scottsdale, Arizona and operates factories in Rhode Island, Massachusetts, Mexico, China, Turkey, and in Newton, Iowa, formerly the home of Maytag appliance manufacturing.

The wind energy industry is a U.S. manufacturing success story. U.S. wind experienced significant growth from 2004 to 2009, primarily due to a growing economy where energy consumption increased and state and federal policies promoted production of renewable energy. State renewable portfolio standards (RPS) and the federal PTC created reasonable stability for wind developers and suppliers to invest in wind farms and manufacturing plants. That growth led to the industry creating over 75,000 U.S. jobs and several thousand small to large U.S. companies participating in the chain. It also led to the wind industry becoming a significant provider of energy to consumers. Over the past five years, wind represented 35% of all new generating capacity installed. For five

consecutive years, wind has been second only to natural gas as a source of new electrical capacity. Through this time, investments in wind assets have topped $20 billion a year. According to a U.S. Department of Energy report published during the George W. Bush Administration, wind power could provide 20% of U.S. electricity needs by the year 2030. It is estimated that meeting this goal from wind would create 500,000 U.S. jobs and reduce the current electric sector natural gas consumption by nearly 50%.

TPI Composites recognized the market opportunity years ago and opened its first dedicated wind blade plant in 2002. Since that time, we've added dedicated U.S. plants in Newton, Iowa and a blade development center in Fall River, Massachusetts. An important factor in our company's growth has been stable and pro market growth policies on the federal and state level. During most of the 2000s, the federal PTC allowed companies like ours to invest and grow supply chain plants around the country as demonstrated in the chart below. The result is over 470 factories across 43 states in the U.S. providing wind components.

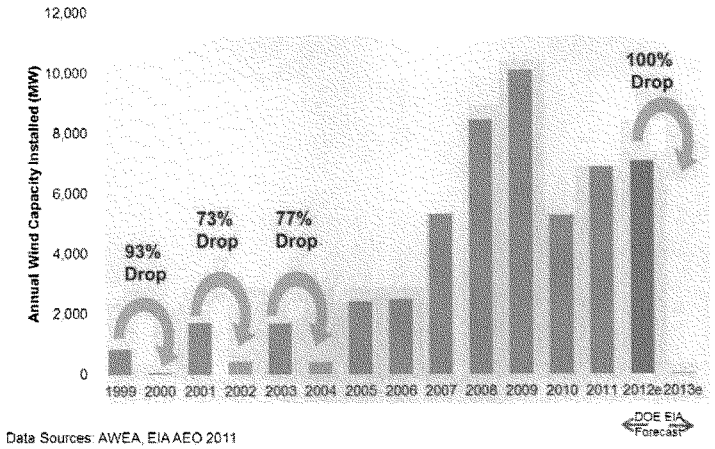


The resurrection of Newton, Iowa is a terrific American story. Newton is a city of roughly 16,000 residents, located 35 miles east of Des Moines. For many years, Maytag manufactured washers and dryers and maintained its corporate headquarters in Newton, employing 3,500 at its peak. After being acquired by Whirlpool in 2006, plans were made to consolidate manufacturing into existing facilities in Ohio and Mexico. The remaining 1,900 employees in Newton lost their jobs, the last on October 25, 2007. Because of the growth in the wind industry, much of it stimulated by the federal PTC, TPI built a plant in Newton in 2008 and today employs almost 800 people in the Jasper County region. TPI was not the only company who recognized the opportunity. Soon after TPI's arrival in Newton, Trinity Towers opened its facility on the abandoned Maytag campus, and hired over 125 employees to provide towers to many of the same

customers and wind farms to which TPI supplies blades. Second only to Texas for installed megawatts of wind, the state of Iowa is now getting 20% of its electricity from wind energy and employs thousands of citizens across the state. Newton and Iowa are shining examples of how to create a U.S. wind energy hub – none of which could have occurred without the PTC.

The opportunity to fulfill the wind energy industry potential is too important and too large for the U.S. not to forge ahead. Our work is not yet done. To achieve this desired economic and energy growth, I urge the U.S. Congress to pass a short-term extension of the PTC immediately followed by a long term debate on wind policy as part of structural tax policy reform.

Wind energy has been a source of important economic growth over the past seven years. But, the outlook for 2013 is bleak due to the pending expiration of the PTC. This tax credit has expired three times since 1999 leading, in each case, to dramatic declines (70 to 90 percent) in new wind power development.



Although the PTC technically expires at the end of 2012, practically it has already expired as the delay in extending the renewable energy credits is reducing investment in wind energy projects scheduled to come on line in 2013. Wind power plants and the component supply chain require months, if not years, of planning. Wind investors and suppliers like TPI want to know what tax policies will apply before they commit to projects for the next calendar year. A recent study by Navigant Consulting concluded that 37,000 jobs are likely to be lost with the effective expiration of the tax credits along with more than $11 billion in clean energy investment.

The PTC is an effective tool that drives as much as $20 billion a year in private investment and is at the heart of one of America's fastest growing manufacturing sectors. The PTC is not a handout. It is a business tax credit, with funding based solely on project performance, not evaluation by government officials. With a stable, low tax rate,

American wind power has provided more than a third of all new electric generating capacity across the U.S. in recent years and has kept the industry on track toward supporting 500,000 American jobs by 2030.

The federal tax code, as it exists today, is not a broad-based proportionate system where every industry pays its own fair share. Rather, it has specific tax incentives for all forms of energy, most of which is set in policy to promote economic growth. Trying to eliminate the PTC would place the wind industry at a tremendous disadvantage compared to other energy industries.

While an immediate short-term PTC extension is needed to stabilize the wind market, I also urge this Committee and Congress to work on a long term extension of the PTC as it considers overall structural reform of the tax code. Our hope is that industry and Congress can work together to reevaluate the PTC in a manner that:

- Enables the wind industry to continue its rapid growth as we chart a course to providing 20% or more of our nation's electricity from wind by 2030;
- Generates higher volume and more stability in demand - the lifeline to any successful manufacturing operation; and
- Provides investors with the confidence needed to fund new regional manufacturing facilities, which will create more cost-effective U.S. plants, which will, in turn, create stable U.S. manufacturing jobs.

Broad support exists across the political spectrum for extending the PTC. It is critical that this Congress act quickly to find a way through the current impasse and enact an immediate extension of the PTC. This is the starting point for U.S. job creation, a healthier economy and a cleaner energy future.

John P. Ragan
Vice President of Business Development and Government Affairs
TPI Composites, Inc
8501 N. Scottsdale Rd, Suite 280
Scottsdale, AZ 85258

Testimony to the Senate Committee on Finance
Subcommittee on Energy, Natural Resources, and Infrastructure
Ethan Zindler
Bloomberg New Energy Finance
March 27, 2012

Good afternoon, Chairman Bingaman, Senator Cornyn, fellow committee members, ladies and gentlemen. Thank you for this invitation to share my thoughts on these important topics.

I come here today in my role as head of policy analysis at Bloomberg New Energy Finance, a market research firm focused on the clean energy sector. Our clients include major investment banks; wind, solar, and other clean energy equipment makers; venture capitalists and project developers; plus major energy companies including the oil majors. Our primary mission as a firm is to provide timely, accurate, and actionable data and insight on investment, technology, and policy trends in clean energy. My remarks today represent my views alone as a clean energy industry analyst. They do not represent the corporate positions of either Bloomberg LP or Bloomberg New Energy Finance. In addition, they do not represent specific investment advice and should not be construed as such.

The subject of today's hearing is the role of tax credits in the development of technologies related to power generation and efficiency, and those related to transport fuels. I would also argue that tax credits have played different roles in these two areas and should be addressed separately.

Before touching on the tax credit issue, however, I'd like to update the committee on clean energy investment trends globally. Last year, the industry set a record, attracting $260bn in new outside investment, up from $54bn in 2004. In the fourth quarter of last year, we counted the *one trillionth dollar* of new investment in clean energy.

If there's a single theme that can be discerned from this it's that where supportive, clearly defined policies are implemented, private capital follows. As a result, we've seen major clean energy manufacturing sectors grow in Germany, China, and elsewhere.

The same cannot be said of the United States, which despite featuring strong supports in some states has not enshrined long-term national targets or goals for clean power generation. Still, the US actually led the world in attracting new investment in 2011 with over $55bn in new funds deployed here, mostly private money. This marked the first time since 2008 that the US did not finish second to

China in new clean energy capital attracted. (Bloomberg New Energy Finance will detail this further in a forthcoming report with the Pew Center next month.)

There is little to suggest the US will maintain its leadership position this year or next, however. Last year's surge in private US investment was a direct reaction to policies that were due to expire in 2011 or 2012. These included the 1603 "Treasury grant" program, the 1703 loan guarantee program, and the Production Tax Credit (PTC) which benefits primarily the wind industry. These three programs had the effect of front-loading US investment into calendar year 2011. In 2012 and 2013, the echo effect of this front-loading will almost certainly be felt.

With that as context, let me turn to the PTC, which has long played a critical role in the development of the US wind industry since being established by Senator Grassley and others in 1992. The credit has expired three times in the last dozen years. On each occasion, the result has been a sharp drop in new installations.

We are now on course for another such fall next year. Bloomberg New Energy Finance forecasts approximately 9,500MW of new power-generating capacity will be installed in 2012 but just 500MW will be installed in 2013. That would see the industry go from registering one of its best years on record in terms of installations to its worst since 2004.

What is likely to make the upcoming PTC expiration more dramatic is that this time around the US now has substantially more manufacturing capacity on its own soil. When the PTC expired at the end of 2003, resulting in a sharp drop in installations in 2004, there was insufficient domestic manufacturing to meet wind turbine demand, meaning project developers were importing final goods, mostly manufactured in Denmark, Germany or Spain. When the PTC expired then, manufacturers in Europe mostly felt the pinch.

This time, the US has over 13GW of final turbine assembly capacity. Again, without the PTC, we expect just 0.5GW of demand for that equipment in the US in 2013.

The industry is substantially bigger now with considerably more Americans employed. At this moment, a number turbine manufacturing plants are hard at work preparing turbines for delivery in the second half of this year, so that projects can be completed by the end of 2012 to meet the PTC expiration deadline. But we anticipate that by the second half of this year, a substantial portion of capacity will go idle as there are virtually no large-scale wind turbine orders in place for equipment to be delivered in 2013.

All of that said, I would note that extending the PTC will not be a panacea for the US wind market, which will remain at over capacity in 2013 regardless of the tax credit. We forecast that if Congress were to extend this credit now, approximately 3.5GW of new capacity would get built in 2013. This falls far short of matching the over 13GW of domestic capacity.

The wind industry has made major strides in both improving the efficiency of industrial-scale equipment and reducing capital costs. The result is that wind developers can now sell their power at between $30 and $70 per megawatt-hour and earn respectable returns in the US. In some parts of the world, including some parts of the US, wind can already compete and beat out its fossil rivals on cost -- without the benefit of subsidies.

However, the industry today finds itself under pressure from low electricity prices due both to relatively weak economic conditions and to unusually cheap natural gas, which today is trading at its lowest level in two decades. The expiration of the PTC would add a third negative factor. It would make what is likely to be a challenging year all the more difficult.

When will wind be able to compete with fossil forms of generation without the benefit of the PTC? In some cases, as I noted, it already is. In others, it will when electricity prices rise, which is likely when economic growth picks up, natural gas prices rise, or some combination of both takes place. Today's exceptionally low natural gas prices are unlikely to be the long-term norm, according to the Energy Information Administration and others. When these prices rise to a more sustainable level, demand for wind will rebound. We anticipate this recovery to start in 2014 and pick up steam in 2015 and beyond.

I'd now like to turn my attention to tax credits for the biofuels industry, which I view very much as a distinct topic, both because these credits are used to support the transport fuel sector (rather than power generation) and because the biofuels industry enjoys substantially clearer long-term support from the federal government overall than does the wind, solar, geothermal or other renewable power generation technologies.

As I mentioned, the US has set no long-term targets for consumption of electricity generated from non-carbon emitting sources. However, such a mandate does exist for the consumption biofuels. The Renewable Fuels Standard (RFS) effectively guarantees a market of a certain size for biofuels producers. It also renders tax credits less necessary since when such credits are removed, the market can simply "price in" their value.

Already, we have seen this with the "blender's tax credit" for ethanol. That $0.45/gallon credit expired at the end of 2011 and its disappearance has not had a major impact on the conventional ethanol industry. Today, the $0.45 that last year the federal government provided is instead being covered by some combination of ethanol producers, blenders, and end consumers.

The US corn ethanol industry remains at over capacity with plants with approximately 15.6bn gallons of production built, but an RFS requiring 13.2 gallons this year. Still, the industry is poised to benefit from rising oil prices which could push the price of gasoline up over that for ethanol on an energy-equivalent basis. Should that happen, blenders will start to use ethanol above and beyond what is required by the RFS.

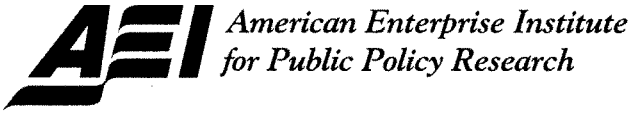
The lessons learned from the expiration of the blender's credit for corn ethanol may be worth heeding when considering the potential expiration of yet another sub-segment of tax credits -- those for "advanced" biofuels. To date, these credits have hardly been put to work since they reward production and little production has taken place. The question then is how much developers of advanced biofuels technologies might be hurt by their non-existence next year and afterward.

I would hypothesize that the answer is not all that much. First, thanks to the RFS, there will automatically be a ready market for advanced biofuels. Under the mandate, blenders must consume certain levels of advanced biofuels specifically. For their part, producers will dictate prices since there is so little advanced biofuel available today. Second, putting these credits to work could prove challenging for some producers, primarily because a number of them are small and not yet profitable.

The advanced biofuels sector is still very much at the early stage of development. As a result, a tax credit that focuses on production -- or any tax credit at all, for that matter -- is of limited use. Much more helpful to the industry are programs such as grants and loan guarantees which can help firms across the so-called technology valley of death and build their first demonstration- or commercial-scale project.

One bit of additional context: we anticipate 62m gallons of new advanced biofuels capacity will come online this year from companies such as Gevo, Poet, Ineos, and Kior. In 2013, we anticipate about 50m gallons of new capacity to be added from Abengoa, Coskata, and Fulcrum. With the credit set at $1.01/gallon, its cost in 2013 could total approximately $113m.

Thank you for your time. I look forward to your questions.



Statement before the Senate Finance Committee
Subcommittee on Energy, Natural Resources, and Infrastructure

Hearing on
Renewable Energy Tax Incentives:
How Has the Expiration of Key Incentives Affected the Renewable Energy Industry In the United States?

Renewable Energy Subsidies Should Be Abandoned

Dr. Benjamin Zycher
Visiting Scholar
American Enterprise Institute

March 27, 2012

The views expressed in this testimony are those of the author alone and do not necessarily represent those of the American Enterprise Institute.

Thank you, Mr. Chairman and distinguished members of this committee, for this opportunity to offer my perspective on the issues attendant upon the recent expiration of several tax incentives---subsidies---for renewable energy, energy efficiency, and biofuels. For the most part my comments will be oriented toward the issues raised by subsidies for renewable electricity, wind and solar power in particular, but are broadly applicable to the analysis of biofuels as well.

I begin with a summary of my testimony for the record. Section I discusses the inherent limitations of renewable electricity that public policies can overcome only at very substantial cost to the taxpayers and to the economy as a whole. Section II discusses the five central rationales that commonly are offered in support of subsidies for renewable power; these rationales are deeply flawed. Section III discusses recent developments in the market for natural gas---a direct competitor to renewable power technologies---and the attendant implications for the future competitiveness of renewable electricity. Section IV offers concluding observations on the economics and policy analytics of subsidies for renewable energy.

I will be very pleased to address any questions and observations that the Chairman and other members of this committee may have.

Summary

This testimony addresses the outlook for renewable energy in electricity generation as a substitute for such conventional fuels as coal and natural gas. The emphasis is on wind power, which in terms of projected generation capacity is by far the most important of the non-hydroelectric forms of renewable power. Some analysis of solar energy is presented also. The discussion examines as well the central arguments in favor of policies supporting the expanded use of renewables, and the implications of prospective supply and price developments in the market for natural gas.

Public policy support for renewable electricity has been substantial. This support has taken the form of direct and indirect subsidies, and requirements in a majority of the states that specific percentages of the market for electric power be reserved for electricity produced from renewable sources. Nonetheless, renewable power provides only a small proportion of electric power in the U.S., and official projections are for slow growth at most. This market resistance to investment in renewable generation capacity can be explained by the problems intrinsic to renewable power---that is, the inherent limitations on its competitiveness---that public policies can circumvent or neutralize only at very substantial expense. These problems uniformly yield high costs and low reliability for renewable power, and can be summarized as follows.

- The unconcentrated energy content of renewable energy sources.
- Location (or siting) limitations.
- Relatively low availability ("capacity factors") over time combined with the intermittent nature of wind flows and sunlight.

The low energy content of sunlight and wind flows relative to that of fossil or nuclear fuels forces renewable technology to compensate by relying upon massive substitute investment in land and/or materials. Second, unlike conventional generation technologies, renewable generation is sharply constrained by siting problems because favorable sunlight and wind conditions are limited geographically, yielding large additional costs for transmission. Finally, capacity factors---essentially, the proportion of the year during which renewable facilities actually can generate power---are substantially lower for wind and solar facilities than is the case for most conventional generation, and the intermittent nature of sunlight and wind flows exacerbates this problem. These conditions result in a need for conventional backup generation capacity so as to preserve the stability of the electric grid and prevent power shortages; this need increases associated costs substantially. Moreover, in particular for wind power, actual power generation tends to be concentrated in off-peak periods---winds tend to blow at night and in the winter---so that the electricity produced from wind facilities tends to be less valuable than that produced from conventional sources.

The five central rationales commonly offered in support of subsidies and mandates for renewables can be summarized as follows.

- The "infant industry" argument: Renewables cannot compete with conventional electric generation technologies on an equal basis because scale and learning efficiencies can be achieved only with an expanded market share.
- The "level playing field" argument: Subsidies enjoyed by conventional technologies introduce an artificial competitive disadvantage for renewable technologies.
- A second "level playing field" argument: The adverse environmental effects (e.g., air pollution)---"externalities"---of conventional electricity generation create an additional artificial cost advantage for those technologies.
- The resource depletion (or "sustainability") argument: Policy support for renewables is justified as a tool with which to slow the depletion of such conventional resources as natural gas and to hasten the development of technologies providing alternatives for future generations.
- The "green employment" argument: Policy support for renewables will yield expanded employment (and economic competitiveness).

These rationales are deeply problematic. The infant industry argument is inconsistent with the cost evidence for renewables and with the presence of an international capital market. The subsidies per kilowatt-hour enjoyed by renewables outweigh by far those bestowed upon conventional generation technologies, so that the first level playing field argument is unsupported by the evidence. With respect to the adverse environmental effects of conventional generation, the cost of conventional backup capacity made necessary by the unreliability of wind and solar generation is substantially greater than any artificial cost advantage enjoyed by conventional technologies as a result of negative external effects assumed not to have been corrected ("internalized") by current policies. The depletion or sustainability criticism of

conventional technologies is incorrect simply as a matter of basic economics, and is inconsistent with the historical evidence. Finally, the premise that expansion of renewable power will yield an increase in "green employment" confuses benefits for a particular group with costs imposed upon the economy as a whole, and fails to distinguish between employment growth in the aggregate and employment shifts among economic sectors. Moreover, the actual employment effect of expanded renewables subsidies is likely to be negative because of the inverse aggregate relationship between electricity costs and employment, and because of the adverse employment effects of the taxes needed to finance the subsidies. In short: The purported social benefits of policy support for renewables are illusory.

The market difficulties faced by renewables are likely to be exacerbated by ongoing supply and price developments in the market for natural gas, which will weaken further the competitive position of renewable power generation. At the same time, subsidies and mandates for renewables impose nontrivial costs upon the taxpayers and upon consumers in electricity markets. The upshot is the imposition of substantial net burdens upon the U.S. economy as a whole even as the policies bestow important benefits upon particular groups and industries, thus yielding enhanced incentives for innumerable interests to seek favors from government. As is the case in most contexts, the resource uses emerging from market competition, even as constrained and distorted by tax and regulatory policies, are the best guides for the achievement of resource allocation that is most productive. As federal policymakers address the ongoing issues and problems afflicting renewable electricity generation, the realities of this recent history provide a useful guide for policy reform. One such reform should be the abandonment of subsidies for renewable energy.

I. Inherent Limitations of Renewable Electricity

Renewable electricity---wind and solar power in particular---receives very large subsidies, both direct and indirect, from the federal and state governments. As discussed in section II, this policy support is far larger per kilowatt-hour, both on average and on the margin, than that enjoyed by such conventional electric generation technologies as coal, natural gas, nuclear fuels, or hydroelectric facilities. Moreover, a majority of states has mandated some form of guaranteed market shares for renewable electricity. This political support for renewable power is substantial, broad-based, bipartisan, and longstanding.

Nonetheless: Renewable electricity generally, and wind and solar power in particular, is very high cost and is likely to remain so for the foreseeable future because of three central factors discussed below. As a result, they have achieved only small market shares. Renewable electricity generation from all non-hydroelectric sources was only 3.6 percent of total U.S. generation in 2010. The Energy Information Administration estimated in 2007 that the proportion in 2030 would be that very same 3.6 percent. The EIA more recently has increased that projection to 11 percent.

But it is not clear what changes in important parameters have yielded that increase in the projected market share over the course of only a few years. No sound rationale, whether economic or technological, can explain this change in the official wisdom. Quite to the contrary: Both economic and technological factors suggest strongly that wind and solar power will remain uncompetitive, heavily dependent upon subsidies both direct and indirect, and small relative to the electricity market as a whole.

The implementation of energy policies in the U.S. for decades has pursued energy sources defined in various ways as alternative, unconventional, independent, renewable, and clean, in an effort to replace such conventional fuels as oil, coal, and natural gas. These longstanding efforts without exception have yielded poor outcomes, in a nutshell because they must swim against the tide of market forces. That is why the only reliable outcome has been one disappointment after another, and there are powerful reasons to predict that the same will prove true with respect to the current enthusiasm for renewable electricity.

Policy preferences for renewable electricity at both the federal and state levels are substantial, in the form of both direct and indirect financial subsidies, and other forms of support as well.[1] The relative magnitudes of the federal subsidies given various forms of electricity, as estimated by the Energy Information Administration, are instructive.[2] For 2010, nonhydroelectric renewable power generation, again, was 3.6 percent of all generation; but it received 53.5 percent of all federal financial support for the electric power sector. Wind power, providing 2.3 percent of generation, received 42 percent of such support. This combination of substantial policy support and meager market competitiveness suggests the presence of important impediments to the growth of renewable power. The technical literature reveals three central problems that have not received widespread attention in the popular discussion; they can be denoted as:

- The unconcentrated energy content of renewable energy sources.
- Location (or siting)---that is, geographic---limitations and resulting transmission costs.
- Relatively low availability ("capacity factors") over time combined with the intermittent nature of wind flows and sunlight.[3]

Unconcentrated Energy Content.[4] The energy content of wind flows and sunlight, which varies depending upon air speed and sunlight intensity, is far less concentrated than that of the energy contained in fossil or nuclear fuels. In order to compensate for this physical characteristic, large capital investments in land and/or

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[1] For a detailed list of such policies, see the database at http://www.dsireusa.org/.

[2] U.S. Energy Information Administration, *Direct Federal Financial Interventions and Subsidies In Energy In Fiscal Year 2010*, July 2011, at http://www.eia.gov/analysis/requests/subsidy/pdf/subsidy.pdf, Tables ES4 and ES5.

[3] The capacity factor for a generation facility (or technology) is its actual production over a given time period divided by its theoretical maximum production over that time period.

[4] The energy content of different fuels varies greatly. Per unit of fuel---tons of coal, millions of cubic feet of natural gas, wind speeds in miles per hour, an hour of sunlight---this variation can be thought of usefully as the degree of concentration of the energy content of a particular energy source.

materials must be made to make renewable generation even technically practical in terms of generating nontrivial amounts of electricity. A wind farm would require 500 wind turbines of 2 MW each to provide a theoretical generation capacity of 1000 MW. Since the wind turbines must be spaced apart to avoid wake effects (wind interference among the turbines), a 1000 MW wind farm even in principle would require on the order of 48,000-64,000 acres (or 75-100 square miles) of land. With an assumed capacity factor for a typical wind farm of, say, 35 percent[5], reliable wind capacity of 1000 MW would require an amount of land (perhaps at different locations) on the order of two to three times that rough estimate. In contrast, a 1000 MW gas-fired plant requires about 10-15 acres; conventional coal, natural gas, and nuclear plants have capacity factors of 85-90 percent.

The same general problem afflicts solar power. The energy content of sunlight, crudely, is about 150-400 watts per square meter, depending on location, of which about 20-30 percent is convertible to electricity, depending on the particular technology. Accordingly, even in theory a square meter of solar energy receiving capacity is enough to power roughly one 100-watt light bulb, putting aside such issues of sunlight intensity and the like. This problem of land requirements for solar thermal facilities is of sufficient importance that most analyses assume a maximum plant capacity of 50-100 MW, which, conservatively, would require approximately 1250 acres, or 2 square miles.

In short: Transformation of the unconcentrated energy content of wind and sunlight into a form useable for modern applications requires massive capital investment in the form of both land and wind turbines and solar receiving equipment. This means that the energy that can be extracted from renewable sources, relative to that from conventional forms, by its very nature is limited and expensive.

Siting Limitations and Transmission Costs. Conventional power generation plants can be sited, in principle, almost anywhere, and such fuels as coal and natural gas can be transported to the generation facilities. This means that investment planning decisions can optimize transmission investment costs along with the other numerous factors that constrain and shape generation investment choices, among them land costs, environmental factors, reliability issues, transmission line losses, and the like. Wind and solar sites, on the other hand, must be placed where the wind blows and the sun shines with sufficient intensity and duration. (Photovoltaic installations, suitable for small applications, face the transmission problem either not at all or to a far smaller degree than solar thermal plants, but still are constrained by the intensity of sunlight.) Because appropriate sites are limited, with the most useful (i.e., lowest cost) ones exploited first, the successive (or marginal) cost of exploiting such sites must rise, so that even if wind and solar technologies exhibit important scale economies in terms of capacity and/or generation costs, scale economies may not characterize a broader cost calculation including the cost of finding and using particular sites.

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[5] For standard assumptions on capacity factors for the various generation technologies, see Energy Information Administration, "2016 Levelized Cost of New Generation Resources from the *Annual Energy Outlook 2010*", at http://www.eia.doe.gov/oiaf/aeo/pdf/2016levelized_costs_aeo2010.pdf. The assumed capacity factor for onshore wind generation in that analysis is 34.4 percent.

In other words, scale economies are unlikely to be available at the industry level even if they are present at the project (or the turbine or parabolic dish) level. This reality is consistent with a time series of capacity factors for 1998-2009 published recently by the Energy Information Administration. The capacity factors for non-hydroelectric renewables declined almost monotonically from 57.0 percent to 33.8 percent over that period, suggesting that as renewables capacity has expanded it has been forced onto increasingly unfavorable sites.

Because conventional generation investments can optimize transmission costs and other reliability factors more easily than is the case for wind and solar capacity, it would be surprising if such costs were not higher for the latter. This general condition is exacerbated by the physical realities that wind conditions are strongest in open plains regions, while solar generation in general requires regions with strong sunlight and, for thermal solar plants, sizeable open areas. For the U.S., the best wind capacity sites are in a region stretching from the northern plains down through Texas, and the best thermal solar sites are in the southwest. The U.S. simply lacks significant east-west high-voltage interconnection transmission capacity to transport such power to the coasts. One national study of this problem notes that "wind development will require substantial additions to the nation's transmission infrastructure... due to the locational dependence of wind resources [and] the relatively low capacity factor of wind plants..."[6]

Some analyses of these transmission costs are available. One survey of 40 transmission studies for wind projects conducted during 2001-2008 finds a median transmission cost of $15 per megawatt-hour. The survey was limited to studies of transmission requirements for multiple new wind plants with a combined capacity greater than 300 MW. An analysis by the California Public Utilities Commission concludes that implementation of a 20 percent renewable electricity standard (or requirement) for the state by 2020 would impose a need for four new major transmission lines at a cost of about $4 billion, while a 33 percent standard would require seven new lines at a cost of $12 billion. For that 33 percent requirement, the assumptions in the CPUC study suggest transmission costs of about $6.39 per megawatt-hour, a figure that is implausibly low. A study done for the National Renewable Energy Laboratory examined the transmission requirements and attendant costs for four alternative wind capacity scenarios for the Eastern Interconnection (the continental U.S. east of the Rocky mountains, minus Texas, plus parts of southeastern Canada). This study reports a cost of wind "integration" of about $5 per megawatt-hour; but other data in the study suggest transmission costs of about $17 per megawatt-hour, a figure roughly comparable to the $15 median reported in the survey noted above.

A comprehensive comparison of various cost categories across generation types has been published by the Energy Information Administration. The data show that conventional generation---coal and natural gas combined cycle---has transmission costs

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[6] Andrew Mills, Ryan Wiser, and Kevin Porter, "The Cost of Transmission for Wind Energy: A Review of Transmission Planning Studies," Lawrence Berkeley National Laboratory, LBNL-1471E, February 2009, p. vii, at http://eetd.lbl.gov/EA/EMP/reports/lbnl-1471e.pdf.

of about $3.60 per megawatt-hour, less than half those of wind generation ($8.40) and about a third those of thermal solar generation ($10.40). These projections for transmission costs are consistent with the hypothesis that wind and solar power are highly constrained in terms of capacity factors and sites, and so impose higher transmission costs than is the case for conventional generation.

Low Availability and Intermittency. Electric energy in large amounts cannot be stored at low cost in batteries due to technological limitations; only indirect storage in the form of water in dams is economic. This reality means that the production and consumption of electricity in a given power network must be balanced constantly in order to prevent blackouts, and more generally to preserve system reliability. Because unexpected surges in demand and/or outages of generating equipment can occur, backup generation capacity must be maintained; such backup capacity is termed the "operating reserve" for the given network. This operating reserve is of two types; the first is the "spinning reserve," that is, generators already connected to the network, the output of which can be increased by raising the torque applied to the generating turbines. The typical system requirement is that spinning reserves be 50 percent or more of total operating reserves. The second component of operating reserves is the supplemental reserve, which comprises generation capacity that can be brought on line within five to ten minutes and/or electric power that can be obtained quickly from other networks or by withholding power being distributed to other networks. Additional reserve capacity often is provided by generators that require up to an hour to come on line; this backup capacity is not included in measures of the operating reserve for a system because of the length of time required for availability.

Electric supply systems respond to growing demands ("load") over the course of a day (or year) by increasing output from the lowest-cost generating units first, and then calling upon successively more-expensive units as electric loads grow toward the daily (or seasonal) peak. Because of the uncertainties caused by the unreliability of wind and sunlight, most electric generation capacity fueled by renewable energy sources cannot be assumed to be available upon demand; system planning and optimization cannot assume that such power will be available when it is expected to be most economic. Accordingly, it cannot be scheduled (or "dispatched"). Instead, it requires backup generation capacity to preserve system reliability.

And so the cost of that needed backup capacity becomes a crucial parameter usually not mentioned in public discussions of wind and solar power. One study, using figures from the California Independent System Operator, projects that an increase in California renewable generation capacity between 2009 and 2020 would be about 17.7 gigawatts (GW) for a 20 percent renewable requirement, and about 22.4 GW for the 33 percent requirement.[7] The projected needs for backup capacity (of varying types) are, respectively, 0.8 GW (or 4.5 percent) and 4.8 GW (or 21 percent).

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[7] See KEMA, Inc., "Research Evaluation of Wind Generation, Solar Generation, and Storage Impact on the California Grid," June 2010, p. 1, at http://www.ovcr.ucla.edu/uploads/file/CA%20Energy%20Commission_PIER%20Final%20Project%20Report_June%202010.pdf.

What would that backup power cost? U.S. wind and solar generation capacity in 2009 was about 34,000 MW. If we assume, conservatively, that this renewable capacity has required investment in backup capacity of about 3 percent (rather than 4.5 percent), that requirement would be about 1000 MW. Cost estimates published by the EIA suggest that this backup capacity has imposed fixed capital and operations and maintenance costs of about $1.7 billion, variable operating costs of approximately $2.00-$4.50 per megawatt-hour, and total costs per megawatt-hour of about $368.[8]

That rough estimate is likely to be biased downward. Because state renewables requirements require system operators to take renewable power when it is available, conventional backup generation must be cycled---that is, in effect turned on and off---in coordination with the availability of the renewable generation. In particular for coal-fired generation, but also for gas combined-cycle backup generation, this means that the conventional assets cannot be operated as efficiently as would be the case were they not cycled up and down in response to wind or solar generation conditions. A recent study of the attendant emissions effects for Colorado and Texas found that requirements for the use of wind power impose significant operating and capital costs because of cycling needs for backup generation---particularly coal plants---and actually exacerbate air pollution problems.[9]

The EIA estimates wind (onshore) and solar costs in 2016 at about $149 and $257-396 per megawatt-hour, respectively; if we add the rough estimate for backup costs, the total is about $517 for wind and $625-$764 for solar generation. The EIA estimates for gas- or coal-fired generation are about $80-$110 per megawatt-hour.[10] Accordingly, the projected cost of renewable power in 2016 including the cost of backup capacity is at least five times higher than that for conventional electricity.

At the same time, outages of wind capacity due to weak wind conditions are much more likely to be correlated geographically than outages of conventional plants, for the obvious reason that weak winds in part of a given region are likely to be observed in tandem with weak winds in other parts of that region. Because appropriate regions for thermal solar sites and photovoltaic systems are concentrated geographically, the same correlation problem is likely to affect solar electric generation as well.

The higher cost of electricity generated with renewable energy sources is only one side of the competitiveness question; the other is the value of that generation, as not all electricity is created equal. In particular, power produced at periods of peak demand is more valuable than off-peak generation, whether during a given daily cycle or across annual seasons. In this context, wind generation in particular is problematic because in

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[8] EIA, *Electricity Market Module*, release date April 2010, p. 91 (Table 8.2), at http://www.eia.gov/oiaf/aeo/assumption/pdf/electricity.pdf#page=3.

[9] See Bentek Energy, *How Less Became More: Wind, Power and Unintended Consequences In the Colorado Energy Market*, April 16, 2010, pp. 25-33, at http://www.wind-watch.org/documents/wp-content/uploads/BENTEK-How-Less-Became-More.pdf.

[10] See EIA, *op. cit.*, fn. 5.

general there is an inverse relationship between the daily hours of peak demand and wind velocities, and between peak summertime demands and peak wintertime wind velocities: Winds tend to blow at night and in the winter.

II. The Central Rationales for Renewables Subsidies: A Critique

The central arguments in support of subsidies for renewable power are numerous and varied, but generally fall into the following categories:

- Renewable energy as an "infant industry";
- Leveling the playing field: offsets for the subsidies enjoyed by conventional generation;
- The adverse environmental effects of conventional generation;
- Resource depletion or "sustainability"; and
- Renewable electricity as a source of expanded "green" employment.

The Infant Industry Argument. This argument begins with the assumption that new technologies often cannot compete with established ones because the available market at the beginning is too small for important scale economies to be exploited, and because the downward shifts in costs that might result from a learning process cannot be achieved without substantial expansion in market share. Accordingly, policy support for expansion of the newcomers' share of the market is justified as a tool with which to allow the achievement of both scale and learning efficiencies.

One obvious problem with this argument is that the market for electric power already has several competing technologies, each of which began with a small market share virtually by definition. More generally, many industries employing competing technologies are characterized by the presence of scale economies and/or learning efficiencies; but market forces operating through domestic and international capital markets provide investment capital in anticipation of future cost savings and higher economic returns. Accordingly, the infant industry argument is a *non sequitur*: The market can foresee the potential for scale and learning efficiencies, and invest accordingly. There is no efficiency rationale for subsidies or other policy support.

In any event, the narrower issue is whether important learning and/or scale efficiencies remain available to be exploited for cost reductions for wind or solar generation. The pattern of average costs over time, controlling for the size of projects, should yield inferences about the remaining importance of learning efficiencies; if the infant industry argument is correct, we should observe in the data over the last decade or two declining costs for renewable electricity. For wind generation, the Department of Energy reports data on average project cost per MW over time, beginning in the early 1980s.[11]

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[11] See Department of Energy, "2009 Wind Technologies Market Report," August 2010, at Figure 27, at http://www1.eere.energy.gov/windandhydro/pdfs/2009_wind_technologies_market_report.pdf.

These data show a rough pattern of declining average costs from the 1980s through about 2001, and then rising average costs through 2009: from about $4800 per MW in 1984 to about $1300 per MW in 2001, and rising to about $2100 in 2009, all in constant year 2009 dollars. Since these data are weighted by capacity, the rising average costs per wind MW after 2000-2001 suggest that further learning efficiencies no longer are available to be exploited, unless, perhaps, future technological advances are made.[12]

Other DoE data are available on average costs by project size for wind projects installed in the 2007-2009 period.[13] The short time period reduces the likely impact of learning efficiencies, yielding important information about the availability of scale economies. The data show that scale economies are important only for small wind projects (about $2700 per MW for projects smaller than 5 MW), and that average costs either constant or slightly increasing (about $1800-$2000 per MW) characterize projects larger than about 20 MW or thereabouts.

Reliable time-series data on costs for photovoltaic and thermal solar systems are more difficult to find in the literature; perhaps the only consistent series is provided by the EIA for 2000-2009.[14] These data show a decline in costs per MW for both photovoltaic and thermal systems early in the decade, suggesting the exploitation of learning efficiencies, and, perhaps, the use of more suitable sites. The data show also an increase in costs per MW after 2002; this suggests that no further learning efficiencies are available to be exploited and/or that the problem of rising site costs is significant.[15] On the other hand, a different data analysis for photovoltaics only, published by the DoE, shows a decline in the capacity-weighted average installed cost between 1998 and 2008, from $10.80 per watt (2008 dollars) to $7.50 per watt.[16] In short: The data are mixed in the case of solar generation systems. The "infant industry" assumption of significant learning and/or scale economies as a barrier to adoption of renewable technologies at best is far from obviously correct; the bilk of the available data suggest that it is incorrect.

Leveling the Playing Field. The second central argument made in favor of policy support for renewables is essentially a level-playing-field premise: Because conventional generation benefits from important tax preferences and other policy support, renewables cannot compete without similar treatment. A recent EIA analysis presents data from

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[12] Note that an assumption of future technological advances does not imply enhanced future competitiveness, in that technological advances are likely affect conventional and renewable technologies alike.

[13] *Ibid.*

[14] Energy Information Administration, *Electricity Market Module* discussions within the "Assumptions" chapters, various years, at http://www.eia.gov/oiaf/archive.html.

[15] For photovoltaic systems, capacity costs fell from $5386 per MW in 2000 to $4744 in 2002, and then increased steadily to $6239 in 2009. For thermal systems the figures were $3679 in 2000, $3194 in 2002, and $5237 in 2009.

[16] Department of Energy, "Solar Technologies Market Report," January 2010, at Figure 3.9, at http://www1.eere.energy.gov/solar/pdfs/46025.pdf.

which federal subsidies and support per kilowatt-hour produced by different technologies can be compared.[17] These data are presented in Table 1.[18]

Table 1
FY2010 Electricity Production Subsidies and Support per megawatt-hour
(year 2010 dollars)

Fuel/Technology	Dollars per megawatt-hour
Natural Gas, Petroleum Liquids	0.63
Coal (pulverized)	0.64
Hydroelectric	0.84
Biomass	2.00
Nuclear	3.10
Geothermal	12.50
Wind	52.48
Solar	968.00

These data show that federal solar and wind subsidies in fiscal year 2010 were far higher---by two or three orders of magnitude---than those enjoyed by fossil fuels, nuclear, or hydroelectric generation. Accordingly, it is clear that solar and wind technologies are not at a competitive disadvantage because of average subsidies enjoyed by conventional generation; quite the reverse is true.

A more direct calculation of marginal subsidies and support has been reported by Metcalf, yielding estimates of effective marginal tax rates on investments in alternative electric generation technologies. Computation of such effective marginal tax rates incorporates the many subsidies and preferences that affect choices among those alternatives, and so offers a direct test of the degree to which federal policies favor given technologies over others.[19] Table 2 summarizes his findings, which are for 2007.

[17] See the EIA data at http://docs.wind-watch.org/US-subsidy-2010.pdf.

[18] Other things held constant, subsidies that affect the marginal (or incremental) cost of generation or the per-unit prices received by particular technologies are likely to affect market prices, even under standard rate-of-return regulation, and so might create a competitive disadvantage for other technologies not receiving equivalent treatment. An example is the per-unit production tax credit for renewable power. Other credits might improve profitability without affecting marginal costs or prices directly; investment tax credits for renewables are a good example. The latter would attract additional investment into the industry over time, thus perhaps affecting market prices, but that price effect would be felt by all producers regardless of which actually received the subsidy. At the same time, even such subsidies as the latter would serve to reduce or eliminate whatever competitive disadvantages confront renewables as a result of policies in support of conventional generation.

[19] See Gilbert E. Metcalf, "Investment in Energy Infrastructure and the Tax Code," in Jeffrey R. Brown, ed., *Tax Policy and the Economy, Volume 24*, Chicago: University of Chicago Press Journals, 2010, pp. 1-33. See also Gilbert E. Metcalf, "Federal Tax Policy Towards Energy," NBER Working Paper No. 12568, October 2006, at http://www.nber.org/papers/w12568.pdf; and Gilbert E. Metcalf, "Taxing Energy In the United States: Which Fuels Does the Tax Code Favor?", Manhattan Institute Center for Energy Policy and the Environment, Report No. 4, January 2009, at http://www.manhattan-institute.org/html/eper_04.htm.

Table 2
Metcalf Findings on Effective Marginal Tax Rates For Electric Generation Investment
(percent)

Technology	Current Law	No Tax Credits	Economic Depreciation
Coal (pulverized)	38.9	38.9	39.3
Gas	34.4	34.4	39.3
Nuclear	-99.5	32.4	-49.4
Solar Thermal	-244.7	12.8	-26.5
Wind	-163.8	12.8	-13.7

Source: Metcalf (2010), *op. cit.*, fn. 19.
Note: Current law is as of 2007.

The three columns present the Metcalf calculations of effective marginal tax rates under current law (as of 2007), under a regime without production and investment tax credits, and with economic depreciation assumed in place of accelerated depreciation, respectively.[20] Under current law, solar thermal and wind generation investments receive large net percentage marginal subsidies (negative effective marginal tax rates) far larger than those enjoyed by nuclear investments; and coal and gas investments face effective tax rates greater than zero. If the tax credits are assumed away, solar thermal and wind investments face effective tax rates roughly one-third those of the other technologies. If economic depreciation replaces accelerated depreciation, nuclear investment enjoys a negative effective marginal tax rate (tax subsidy) larger (in absolute value) than those for solar and wind investments; but coal and gas investments face effective marginal tax rates of over 39 percent.

The Metcalf calculations of effective marginal tax rates under current law suggest strongly that the "offsetting subsidy" rationale for public support for solar and wind investments is weak: Coal and gas investments face positive effective marginal tax rates, and new nuclear investment no longer is a serious competitive threat.[21] Moreover, the effective subsidies enjoyed by solar and wind generation are far greater than those needed to level the playing field with respect to nuclear generation.[22]

[20] Metcalf uses an exponential depreciation rate rather than straight-line depreciation as an approximation of economic depreciation over the lives of given investments.

[21] The last nuclear generation reactor to begin operation is the Watts Bar-1 plant in Tennessee, which began commercial operation on May 27, 1996. See EIA at http://www.eia.gov/cneaf/nuclear/page/operation/statoperation.html. However, the Tennessee Valley Authority has announced plans to complete Watts Bar-2.

[22] The playing field is biased in favor of renewables for two additional reasons, the first of which is the implicit subsidy for backup generation capacity and transmission costs: Such costs are a direct effect of investment in renewable capacity, but are spread across electricity consumption from all sources. The Federal Energy Regulatory Commission, in a recent case involving the Midwest Independent Transmission Operator, ruled that the transmission costs attributable to wind generation may be allocated to consumers regardless of the amount of wind power actually consumed by any given ratepayer. This ruling essentially

Adverse External Effects of Conventional Generation. A negative "externality" is an adverse effect of economic activity the full costs of which are not borne by the parties engaging directly in the activity yielding the adverse effect. A simple example is the emission of effluents into the air as a byproduct of such industrial processes as power generation. There is no dispute that power generation with fossil fuels imposes adverse environmental effects in the form of sulfur dioxide, nitrogen oxides, mercury, particulates, and other effluents. Accordingly, the EPA and the states have established detailed programs for defining emission standards and for implementing attendant investment and enforcement programs.

If the negative externalities yielded by conventional generation are not internalized fully by current environmental policies---that is, if buyers and producers are not confronted with the full costs of the environmental costs that they impose on others---then the costs of conventional generation as perceived by the market would be (artificially) lower than the true social costs. At the same time, the unreliable nature of wind and solar generation imposes a requirement for costly backup capacity, as discussed above.[23] And so the question to be addressed is as follows: Given the magnitude of those externalities as estimated in the technical literature, are the additional (or marginal) costs of backup capacity imposed by renewable generation sufficient to offset any artificial cost advantage enjoyed by conventional generation?

A number of analyses of the externality costs of U.S. electricity generation were conducted during the 1980s and 1990s. These studies differ somewhat in terms of methodology and focus, but offer a range of estimates useful in terms of the question addressed here. In summary: The estimated externality costs for coal range from 0.1 cents per kilowatt-hour to 26.5 cents per kilowatt-hour. For gas generation, the range is 0.1-10.2 cents per kilowatt-hour. For oil, nuclear, and hydro generation, the respective ranges are 0.4-16.5 cents per kilowatt-hour, 0-4.9 cents per kilowatt-hour, and 0-2.1 cents per kilowatt-hour.

The highest estimated figure for coal generation is 26.5 cents per kilowatt-hour, or $265 per megawatt-hour. From the discussion above, a conservative estimate of the cost of backup capacity for existing wind and solar generation is about $368 per megawatt-hour, or roughly 37 cents per kilowatt-hour. Accordingly, if all conventional generation were coal-fired, existing wind and solar capacity imposes a backup cost "externality"

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spreads such costs across the entire grid; accordingly, the transmission costs associated with wind generation are not reduced but instead are hidden somewhat from calculations of the marginal cost of wind power. See the FERC Conditional Order, Docket No. ER10-1791-000, December 16, 2010, at http://www.ferc.gov/whats-new/comm-meet/2010/121610/E-1.pdf. Second, public subsidies for renewable power, whether in the form of direct outlays or indirect tax preferences, impose costs upon the private sector larger than the subsidies themselves, because of the excess burden (or "deadweight losses") imposed by the tax system. Essentially, the private sector becomes smaller by more than a dollar when it is forced to send a dollar to the federal government. For a nontechnical discussion, see Martin A. Feldstein, "The Effect of Taxes on Efficiency and Growth," *Tax Notes*, May 8, 2006, pp. 679-684.

[23] See the discussion *supra.*, pp. 8-10.

about 39 percent higher than the environmental externality costs of conventional generation under the implausible assumption that none of the conventional externalities have been internalized under current environmental policy.

But in fact coal generation is a bit less than 45 percent of total U.S. generation; gas generation is about 23 percent, nuclear generation is about 20 percent, hydroelectric generation is about 7 percent, and renewables and other miscellaneous technologies make up the rest. If we use those figures and the highest estimates by fuel type noted above to compute a weighted-average externality cost for nonrenewable generation, the externality cost per conventional kilowatt-hour is about 15.5 cents, or $155 per megawatt-hour. If we use instead the midpoints of the externality ranges listed above, the weighted average externality cost is 7.8 cents per kilowatt-hour, or $78 per megawatt-hour. Relative to the backup cost "externality" ($368 per megawatt-hour) imposed by wind and solar investments alone, those figures are sufficiently low to cast substantial doubt upon the externality argument for renewables subsidies: Current environmental regulation must internalize some substantial part of conventional externalities, and federal and state subsidies, both explicit and implicit, and requirements for minimum market shares for renewables also have the effect of offsetting any artificial cost advantage enjoyed by conventional generation as a result of uninternalized externalities.

Note that in terms of economic efficiency, subsidies for renewables intended to offset the (assumed) uninternalized external costs of conventional generation are a "second-best" policy at best. Such subsidies would reduce the (inefficient) competitive advantage of conventional generation yielded by the presence of some social costs unreflected in prices; but they would not improve the efficiency of costs or prices for conventional generation. And by biasing the perceived costs and prices of renewable generation downward, the subsidies would result in a total electricity market that would be too large. In short: The externality argument in favor of policy support for renewable electricity generation is exceedingly weak, far more so than commonly assumed.

The Resource Depletion or "Sustainability" Argument. "Renewable" energy has no uniform definition; but the (assumed) finite physical quantity of conventional energy sources is the essential characteristic differentiating the two in most discussions. In a word, conventional energy sources are depletable. In contrast, sunlight and wind flows replenish themselves, a central component of "sustainability," perhaps a broader concept, which has been defined by the Environmental Protection Agency as "the satisfaction of basic economic, social, and security needs now and in the future without undermining the natural resource base and environmental quality on which life depends."[24]

As an aside, the energy content of sunlight and wind is finite, regardless of self replenishment. They contain only so much convertible energy, and they are not always available. Moreover, the same is true for the other resources---materials, land, etc.---upon which the conversion of such renewable energy into electricity depends. In any event, the basic "sustainability" concept seems to be that without policy intervention, market forces will result in the depletion (or exhaustion) of a finite resource.

[24] See the EPA discussion (February 2001) at http://epa.gov/sustainability/basicinfo.htm.

Accordingly, subsidies and other support for renewable power generation are justified as tools with which to slow such depletion and to hasten the development of technologies that would provide alternatives for future generations.

That argument is deeply problematic. Putting aside the issue of whether government as an institution has incentives to adopt a time horizon longer than that relevant for the private sector, the profit motive provides incentives for the market to consider the long-run effects of current decisions. The market rate of interest is a price that links the interests of generations present and future. If a resource is being depleted, then its expected future price will rise, other things held constant. If that rate of price increase is greater than the market interest rate, then owners of the resource have incentives to reduce production today---by doing so they can sell the resource in the future and in effect earn a rate of return higher than the market rate of interest---thus raising prices today and reducing expected future prices. In equilibrium---again, other factors held constant---expected prices should rise at the market rate of interest.[25] Under market institutions, it is the market rate of interest that ties the interests of the current and future generations, by making it profitable currently to conserve some considerable volume of exhaustible resources for future consumption.[26] Because of the market rate of interest, market forces will never allow the depletion of a given resource.

Accordingly, the market has powerful incentives to conserve, that is, to shift the consumption of some resources into future periods. That is why, for example, not all crude oil was used up decades ago even though the market price of crude oil always was greater than zero, which is to say that using it would have yielded value. In short, the "sustainability" argument for policy support for renewable electricity depends crucially upon an assumption that the market conserves too little and that government has incentives to improve the allocation of exhaustible resources over time. That is a dual premise for which the underlying rationale is weak and with respect to which little persuasive evidence has been presented.

"Green Jobs": Renewable Power As A Source of Expanded Employment. A common argument in support of expanded renewable power posits that policies in support of that goal will yield important benefits in the form of complementary employment growth in renewables sectors, and stronger demand in the labor market in the aggregate. Both of those premises are almost certainly incorrect.

The employment in renewables sectors created by renewables policies actually would be an economic cost rather than a benefit for the economy as a whole. Suppose that policy support for renewables (or for any other sector) had the effect of increasing the demand for high-quality steel. That clearly would be a benefit for steel producers, or

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[25] In reality the long run prices of most exhaustible natural resources have declined (after adjusting for inflation), in large part because of technological advances in discovery, production, and use.

[26] Strictly, speaking, it is not the price of the resource that should rise at the market rate of interest; instead the total economic return to holding the resource for future use should equal the market rate of interest. That economic return includes expected price changes and capital gains, expected cost savings, and the like.

more broadly, for owners of inputs in steel production, including steel workers. But for the economy as a whole, the need for additional high-quality steel in an expanding renewable power sector would be an economic cost, as that steel (or the resources used to produce it) would not be available for use in other sectors. Similarly, the creation of "green jobs" as a side effect of renewables policies is a benefit for the workers hired (or for those whose wages rise with increased market competition for their services). But for the economy as whole, that use of scarce labor is a cost because those workers no longer would be available for productive activity elsewhere.[27]

There is the further matter that an expansion of the renewable electricity sector must mean a decline in some other sector(s), with an attendant reduction in resource use there; after all resources in the aggregate are finite. If there exists substantial unemployment, and if labor demand in renewables is not highly specialized, a short-run increase in total employment might result. But in the long run---not necessarily a long period of time---such industrial policies cannot "create" employment; they can only shift it among economic sectors. In short, an expanding renewables sector must be accompanied by a decline in other sectors, whether relative or absolute, and creation of "green jobs" must be accompanied by a destruction of jobs elsewhere. Even if an expanding renewables sector is more labor-intensive (per unit of output) than the sectors that would decline as a result, it remains the case that the employment expansion would be a cost for the economy as a whole, and the aggregate result would be an economy smaller than otherwise would be the case.[28] There is no particular reason to believe that the employment gained as a result of the (hypothetically) greater labor intensiveness of renewables systematically would be greater than the employment lost because of the decline of other sectors combined with the adverse employment effect of the smaller economy in the aggregate. There is in addition the adverse employment effect of the explicit or implicit taxes that must be imposed to finance the expansion of renewable power.

Because renewable electricity generation is more costly than conventional generation, policies driving a shift toward heavier reliance upon the former would increase aggregate electricity costs, and thus reduce electricity use below levels that would prevail otherwise. The 2007 EIA projection of total U.S. electricity consumption in 2030 was about 5.17 million gWh.[29] The latest EIA projection for 2030 is about 4.31 million gWh, a decline of about 16.6 percent.[30] The change presumably reflects some combination of assumptions about structural economic shifts, increased conservation,

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[27] Considerable employment would be created if policies encouraged ditch-digging with shovels (or, in Milton Friedman's famous example, spoons) rather than heavy equipment. Such employment obviously would be laughable, that is, an obvious economic burden. There is no analytic difference between this example and the "green jobs" rationale for renewables subsidies.

[28] Many advocates of renewables subsidies assert that solar and wind power is more labor intensive than conventional generation. The assumption of greater labor intensity for renewable power production is dubious: The operation of solar or wind facilities does not employ large amounts of labor, and it is far from clear that construction of solar or wind facilities is more labor intensive than construction of conventional generation facilities.

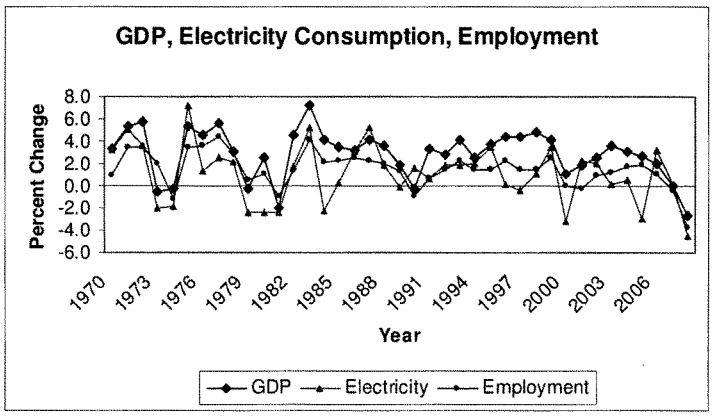
[29] See EIA at http://www.eia.doe.gov/oiaf/archive/aeo07/aeoref_tab.html, at Table 2.

[30] See EIA at http://www.eia.gov/forecasts/aeo/tables_ref.cfm, at Table 8.

substitution of renewables for some conventional generation, and a price increase from about 8.8 cents per kilowatt-hour to 9.0 cents (in 2009 dollars).

It would be surprising if that reduction in total U.S. electricity consumption failed to have some employment effect. Figure 1 displays data on percent changes in real GDP, electricity consumption, and employment for the period 1970 through 2009.[31]

Figure 1



It is obvious from the aggregate trends that electricity use and labor employment are complements rather than substitutes; the simple correlation between the percent changes for the two is 0.61, meaning, crudely, that a percent change in one tends to be observed with a 0.61 percent change in the other, in the same direction. The simple GDP/electricity and GDP/employment correlations are 0.67 and 0.85, respectively.

The correlations by themselves are not evidence of causation, the determination (or refutation) of which requires application (and statistical testing) of a conceptual model. But the data displayed in Figure 1 make it reasonable to hypothesize that the higher costs and reduced electricity consumption attendant upon expansion of renewable generation would reduce employment; and they certainly provide grounds to question the common assertion that policies in support of expanded renewable electricity generation would yield increases in aggregate employment as a side effect, putting aside whether such increases would be a net economic benefit for the economy as a whole.

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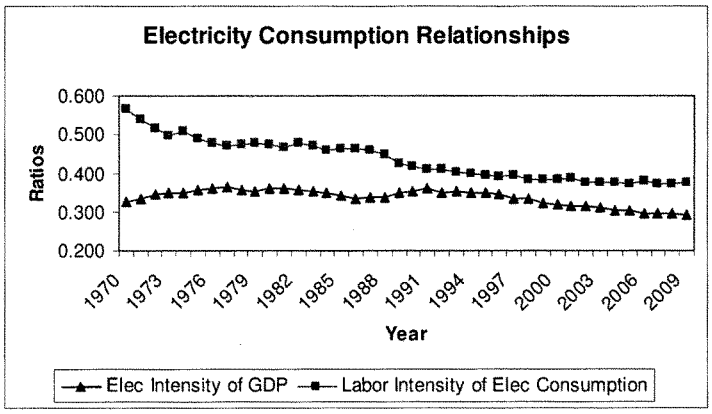
[31] Sources: For real GDP, see Bureau of Economic Analysis at http://www.bea.gov/national/nipaweb/SelectTable.asp?Popular=Y, and author computations; for civilian employment, see Bureau of Labor Statistics at http://www.bls.gov/cps/cpsaat1.pdf; and for electricity consumption, see EIA at http://www.eia.doe.gov/emeu/aer/pdf/pages/sec8_5.pdf.

It certainly is possible that the historical relationship between employment and electricity consumption will change. Technological advances are certain to occur; but the prospective nature and effects of those shifts are difficult to predict.[32] The U.S. economy may evolve over time in ways yielding important changes in the relative sizes of industries and sectors; but, again, the direction of the attendant shifts in employment and electricity use is ambiguous.

But there exists no evidence with which to predict that a reduction in electricity consumption would yield an increase in employment. Like all geographic entities, the U.S. has certain long-term characteristics---climate, available resources, geographic location, trading partners, *ad infinitum*---that determine in substantial part the long-run comparative advantages of the economy in terms of economic activities and specialization. Figure 2 presents the historical paths of the electricity intensity of U.S. GDP (kilowatt-hour per dollar of output) and of the labor intensity of U.S. electricity consumption (employment per kilowatt-hour).[33]

Figure 2



During 1970-2009, the electricity intensity of GDP has increased and declined over various years, but for the whole period has declined slightly at a compound annual rate of about 0.3 percent. The labor intensity of U.S. electricity consumption---in a sense, the employment "supported" by each increment of electricity consumption---has declined

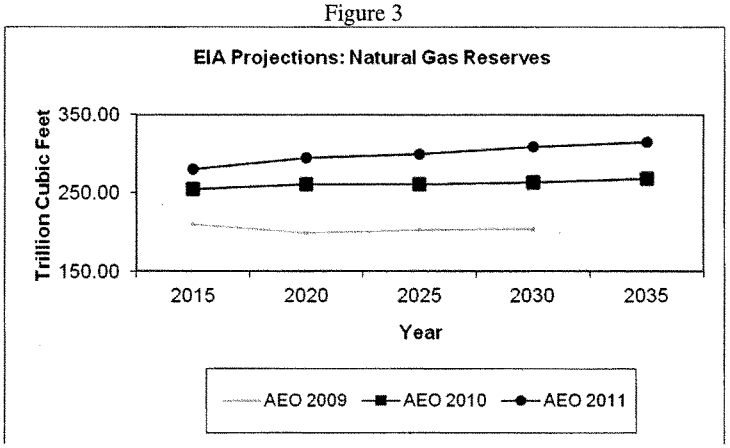
[32] Note that greater energy "efficiency" in any given activity can yield an increase in actual energy consumption, if the elasticity of energy demand with respect to the marginal cost of energy use is greater than one. If, for example, air conditioning were to become sufficiently "efficient" in terms of energy consumption per degree of cooling, it is possible that air conditioners would be run so much that total energy consumption in space cooling would increase. A tax, on the other hand, whether explicit or implicit, increases the price of energy use, and so unambiguously reduces energy consumption.
[33] Sources: See fn. 31.

more-or-less monotonically over the entire period, at an annual compound rate of about 1.05 percent.[34] This may be the result largely of changes in the composition of GDP (toward services), and perhaps the substantial increase in U.S. labor productivity in manufacturing. But these data do not suggest that a reduction in electricity consumption would yield an increase in aggregate employment; instead, they suggest the reverse. In short, while the employment/electricity relationship may have declined over time, there is no evidence that it is unimportant in an absolute sense, and it is far from inverse.

III. Implications of Recent Developments in the Market for Natural Gas

Recent technological advances in the production of natural gas from shale formations and from coal beds have increased estimated natural gas reserves sharply.[35] Figure 3 illustrates the resulting sharp increase over the last two years in projected gas reserves. Between the 2010 and 2011 EIA estimates, projected natural gas reserves through 2025 have increased about 15 percent. The 2011 projection is about 17 percent higher for 2030 and for 2035.[36]

Figure 3



[34] These data in Figure 2 were scaled upward by a factor of 10 for ease in presentation.
[35] For a brief discussion, see EIA, "What Is Shale Gas and Why Is It Important?," at http://www.eia.gov/energy_in_brief/about_shale_gas.cfm.
[36] See EIA at http://www.eia.gov/oiaf/archive/aeo/aeoref_tab.html, at Tables 13 and 14; and EIA at http://www/eia.gov/forecasts/aeo/tables_ref.cfm, at Tables 13 and 14.

As a result, the EIA has reduced its projections of future prices for natural gas delivered for electric generation. Between the two sets of projections (2010 and 2011), prices fall by about 15-23 percent over the period 2015-2035.[37]

Drawing the obvious conclusion, the 2011 EIA projection of combined cycle gas capacity for 2035 is about 6 percent higher than that made a year earlier. *But the projections of non-hydroelectric renewable capacity in 2030-2035 fall by about 16-21 percent over the course of only one year.*[38] These EIA projections of capacity investment in substantial part reflect the fact that gas and renewable generation technologies are substitutes, and the projected decline in delivered gas prices exacerbates the inherent competitive disadvantages borne by renewable technologies.

IV. Concluding Observations

As a crude generalization, the experience in Europe in the context of renewable electricity can be summarized as high costs combined with low reliability.[39] That is the U.S. experience as well, an outcome unavoidable given the basic economic realities afflicting wind and solar power electric generating technologies. Accordingly, renewable power generation has achieved only a small market share in the U.S., and official projections are for slow growth at best, notwithstanding large subsidies and other policy support.

This market resistance to investment in renewable generation capacity can be explained by the problems intrinsic to renewable power---that is, the inherent limitations on its competitiveness---that public policies can circumvent or neutralize only at very substantial cost. Those problems can be summarized as:

- unconcentrated energy content;
- siting constraints and resulting high costs for transmission; and
- the costs created by low capacity factors, the intermittent nature of wind flows and sunlight, and the resulting need for backup capacity.

Moreover, the five central analytic arguments that dominate the political/policy support for renewables are highly problematic: The "infant industry argument is inconsistent with the cost evidence on renewables. The subsidies enjoyed by renewables

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[37] *Ibid.*

[38] For the capacity projections in the 2010 *Annual Energy Outlook*, see http://www.eia.gov/oiaf/archive/aeo10/aeoref_tab.html, at Table 9. For the capacity projections in the 2011 *Annual Energy Outlook* (early edition), see http://www.eia.gov/forecasts/aeo/tables_ref.cfm, at Table 9.

[39] See Kenneth P. Green, "The Myth of Green Energy Jobs: The European Experience," American Enterprise Institute, Energy and Environment Outlook No. 1, February 2011, at http://www.aei.org/docLib/EEO-2011-02-No-2-g.pdf. See also Kenneth P. Green, "On Green Energy: A Dutch (Re)Treat," *The American*, April 10, 2011, at http://www.american.com/archive/2011/april/on-green-energy-a-dutch-re-treat. For an analysis of capacity factors for UK wind generation even lower than expected, see *Analysis of UK Wind Power Generation: November 2008 to December 2010*, John Muir Trust, March 2011, at http://www.jmt.org/assets/pdf/wind-report.pdf.

outweigh by far those bestowed upon conventional generation technologies. The costs of backup capacity made necessary by renewable power---an "externality" that renewable power imposes upon the electric system writ large---are greater than any negative externalities created by conventional generation and assumed not to have been corrected by current policies. And the "sustainability" and "green employment" rationales are exceedingly weak.

These realities suggest that the purported social benefits of policy support for renewables are illusory. Moreover, ongoing supply and price developments in the market for natural gas are likely to weaken further the competitive position of renewable power generation. At the same time, the subsidies and mandates that have been implemented in support of renewable electricity impose nontrivial costs upon the taxpayers and upon consumers in electricity markets. The upshot is the imposition of substantial net costs upon the U.S. economy as a whole even as the policies bestow important benefits upon particular groups and industries, thus yielding enhanced incentives for innumerable interests to seek favors from government. As has proven to be the case in most contexts, the outcomes of market competition, even as constrained and distorted by tax and regulatory policies, are the best guides for the achievement of resource allocation that is most productive. As federal policymakers address the ongoing issues and problems afflicting renewable electricity generation, the realities of this recent history provide a useful guide for policy reform.

COMMUNICATIONS

STATEMENT FOR THE RECORD

OF

THE AMERICAN INSTITUTE OF ARCHITECTS

FOR THE HEARING ON

"RENEWABLE ENERGY TAX INCENTIVES: HOW HAVE THE RECENT AND PENDING EXPIRATIONS OF KEY INCENTIVES AFFECTED THE RENEWABLE ENERGY INDUSTRY IN THE UNITED STATES?"

BEFORE

THE U.S. SENATE
COMMITTEE ON FINANCE
SUBCOMMITTEE ON ENERGY, NATURAL RESOURCES, AND INFRASTRUCTURE

MARCH 27, 2012

The American Institute of Architects (AIA) appreciates the opportunity to submit this statement for the record and commends the Subcommittee's work on the critical issue of renewable energy tax incentives.

Given the critical economic, security, and environmental considerations surrounding the energy sector, the issue of energy tax policy is an important consideration as extensions are considered. Although there are numerous tax policies that impact energy policy and the built environment, our statement focuses on an energy efficiency and conservation tax provision, the Energy Efficient Commercial Building Deduction, which is contained in section 179D of the Internal Revenue Code. Although not an expiring provision this year (it is set to expire in 2013), the AIA highlights the 179D deduction as an example of one provision in the energy tax family that has had a demonstrable effect on energy efficiency investment, domestic manufacturing, and design and construction industry jobs.

The 179D deduction has leveraged billions of dollars in private capital, resulted in the energy-efficient construction or renovation of thousands of buildings, and created or preserved hundreds of thousands of jobs in the process. Although it is not a per se renewable energy tax incentive, 179D is a good indicator of the positive impact extensions of renewable energy incentives can have on the economy.

In recognition of the benefits of the section 179D deduction, there have been reform proposals offered in recent months aimed at further enhancing the important tax benefit. The AIA supports reform of the 179D deduction that makes it simpler and more accessible. As these discussions progress, the AIA also strongly urges Congress to consider enhancements to 179D that would provide an effective and efficient way to encourage investments in energy efficiency, stimulating construction activity and jobs during this fragile time in the nation's economy.

The AIA represents over 75,000 architects and emerging professionals nationwide and around the world. As a leader in the design and construction industry, the AIA supports incentivizing energy efficiency in a myriad of ways, but particularly through provisions like 179D, that have proven to be quite successful in the field.

The AIA strongly supported this provision when it was enacted as part of the Energy Policy Act of 2005. The AIA also helped form a partnership with other concerned stakeholders and through this partnership, developed implementation recommendations for building owners to obtain this tax deduction. In 2008, the AIA helped pass legislation to extend the life of the deduction so that it covers property placed in service by December 31, 2013. That same year, at the AIA's urging, the IRS issued guidance on how the deduction could be allocated to the designer.

The AIA was pleased with the initial clarification that this IRS guidance provided, and many agencies on the federal, state and local levels followed suit by issuing policies on the allocation of this deduction.

Background on Section 179D, the Energy Efficient Commercial Building Deduction

The Energy Efficient Commercial Building Deduction was created by the Energy Policy Act of 2005 (Pub. L. No. 109-58), in recognition of the fact that a substantial portion of U.S. energy consumption is attributable to commercial buildings and to provide a tax incentive to help offset the costs associated with enhancing their energy efficiency. Section 179D provides a deduction for certain energy-efficient commercial building property expenditures.

Eligible expenditures are for property which is: (1) installed on or in any building that is within the scope of Standard 90.1-2001 of the American Society of Heating, Refrigerating, and Air Conditioning Engineers and the Illuminating Engineering Society of North America ("ASHRAE/IESNA"); (2) installed as part of the (i) interior lighting systems, (ii) heating, cooling, ventilation, and hot water systems, or (iii) building envelope; and (3) certified as being installed as part of a plan designed to reduce total annual energy and power costs by 50 percent or more. The deduction is effective for property placed in service prior to January 1, 2014.

The maximum deduction is $1.80 per square foot. In the case that a building does not meet the 50 percent energy savings requirement, a partial deduction of $0.60 per square foot is allowed for each separate building system that comprises energy-efficient property and that is certified as meeting required savings targets. To encourage the public sector to utilize these same energy efficient enhancements, the 179D deduction also provides a federal, state, or local government owner of a commercial building an election to allocate the tax deduction to the primary person responsible for designing the energy efficient enhancements installed in the building.

Building owners who take advantage of 179D not only enjoy a deduction for qualifying levels of efficiency but also enjoy significantly lower energy costs down the road, the benefits of leading edge design and construction which enhances the building's long term market value, and the benefits of a cleaner environment overall. Owners have utilized the deduction for both new construction projects and retrofits of existing buildings.

Although a public entity cannot take advantage of the tax proceeds from the 179D deduction allocation, it will also receive other benefits in the form of energy savings and market value, often totaling more than the deduction proceeds received by the designer.

The average 179D project (typically $0.60/ sq. ft. for lighting upgrades) saves an agency an average of 20 percent on their energy expenses. However, even in cases where there are minimal upgrades that qualify for 179D, agencies have saved relatively large amounts.

For example, when a middle school set out to retrofit its lighting system, an architect worked to find 12 percent energy savings just on that single lighting system. The system then qualified for the 179D partial lighting deduction. In return, the school saved $15,000 on its energy bill in that year alone. It saved even more the next year, and will continue to save each year. Over 10 years, that totals to over $150,000, for a single school. School districts that take advantage of 179D for five, 10, or 20 schools can save millions of dollars over 10 years, at no additional cost to them, because they can utilize the 179D deduction to finance the additional energy savings.

This example illustrates the impact of just 12 percent energy savings in a single school. There are hundreds of other examples of the deduction providing even greater benefits to school districts, army bases, civic structures, and other publicly owned buildings across the nation.

Proposals to Improve the 179D Deduction

There have been reform proposals offered in recent months aimed at further enhancing this important tax benefit. AIA supports commonsense efforts that make 179D more usable, effective and simpler. As these discussions progress, the AIA, in particular, strongly urges Congress to consider three key improvements to 179D: (1) ensuring the ability of pass-through entities to capture the full value of an allocated deduction in the case of a public owner of a building; (2) enhancing the value of the 179D deduction; and (3) allowing non-profit owners of buildings, similar to public owners of buildings, to allocate the deduction.

Allocating the Section 179D Deduction to a Pass-Thru Entity
The section 179D deduction provides a federal, state, or local government owner of a commercial building an election to allocate the tax deduction to the primary person responsible for designing the energy efficient enhancements. In December 2010, the IRS released a memo that effectively prevents design firms organized as partnerships or S corporations from fully realizing the benefit of a section 179D allocated deduction.

This problem is not merely theoretical – almost 80 percent of architectural firms have fewer than 10 employees and a significant number of these small businesses are organized as partnerships and S corporations. Moreover, it is often these small and mid-size firms that work on state and local government projects such as schools.

By way of background, an allocated section 179D deduction is a tax deduction that does not reflect an economic cost to the recipient taxpayer, because similar to a tax credit, the deduction provides an incentive. The technical tax rules nonetheless treat an allocated deduction as reflecting an economic cost to the taxpayer and accordingly reduce partnership and S corporation taxable income *and* the partners'/shareholders' basis in the partnership/S corporation (*i.e.*, "outside basis") by the amount of the allocated deduction. The reduced outside basis may force partners and S corporation shareholders to recognize taxable gain on the distribution of economic earnings that were excluded from tax by the allocated section 179D deduction at the partnership and S corporation level. The IRS memo states that, in the absence of explicit statutory authority allowing for basis adjustments to preserve the benefit of the deduction at the partner or shareholder level, the technical tax rules govern. The result will be that, in the case of many partnerships and S corporations, the benefit of the section 179D deduction will be lost or significantly diminished. This will harm not only these firms, but also the school districts and other public entities who own the buildings.

In order for partnerships and S corporations to obtain the intended benefits, it is necessary for partners and S corporation shareholders to obtain a basis in their partnerships and S corporations that is not reduced by an allocated 179D deduction. This issue could be addressed by a simple modification to expressly require Treasury to issue regulations that properly determine partnership or S corporation outside basis in the case where the 179D deduction is allocated.

Such a clarification would provide certainty and address a widespread concern among many small businesses that design energy efficient buildings.

Enhancing the Section 179D Deduction
The impact of the section 179D deduction has become muted over time. The maximum deduction of $1.80 per square foot has not been increased since the deduction was put in place in 2005 and, as a result, has not kept pace with inflation. Moreover, as the economy and financial markets continue their fragile recovery, the amount of capital available for building design, construction, and renovation continues to be limited. A recent AIA survey of architecture firms shows that nearly two-thirds report that a lack of financing has slowed or stopped construction projects that would create jobs. Owners are also less likely to invest the upfront capital costs associated with energy efficient systems, which often are somewhat more expensive to design, build, and install than their less efficient counterparts.

In 2010, a coalition of more than 80 organizations and companies called on Congress to increase the 179D deduction from the current maximum allowable amount of $1.80 per square foot to $3.00 per square foot. In the case of individual subsystems, the maximum allowable deduction should be increased from $0.60 per square foot to $1.00 per square foot. Bipartisan legislation was introduced in both chambers in the 111th Congress to enhance the deduction in this way.

Enhancing the 179D deduction would provide an important source of additional capital to stimulate building design, construction, and renovation, driving the creation of well-paying jobs. Studies have shown that every $1 million invested in design and construction yields 28.5 full-time jobs. Moreover, an enhanced section 179D deduction would further incentivize energy efficiency, improve the nation's commercial building stock, and increase energy independence.

Allocating the Section 179D Deduction in the Case of a Non-Profit Owner of a Building
The 179D deduction allocation provision, which allows a federal, state, or local government owner of a building to allocate the deduction to the designer, has been used to great effect by design professionals to encourage their public sector clients to meet the energy targets of the deduction and then have the client assign them the tax deduction. The result has been more energy efficient public buildings, lower energy costs for the building owners, and tax relief for design professionals.

In many cases, non-profit entities, such as hospitals, universities, private schools, charities, and foundations, conduct functions similar to state and local governments. Currently, non-profit entities own thousands of properties across the country. Although retrofits to these properties could result in significant energy savings, the non-profit entities do not pay taxes and, consequently, cannot benefit from the section 179D deduction.

The section 179D allocation provision should be expanded to provide non-profit owners of buildings, similarly to public owners of buildings, with the ability to elect to allocate the deduction to the primary designer of the building. Such a provision would assist non-profits in financing energy efficiency upgrades and would reduce their energy costs in the longer-term.

Conclusion

The AIA appreciates the opportunity to submit this statement for the record. As Congress considers energy tax policy issues, it is important to recognize the impact the 179D deduction has had in leveraging private capital and increasing energy-efficient construction and renovation. Modest improvements to the section 179D deduction would increase the effectiveness and efficiency of this important tax policy. The AIA and its members are ready to serve as a resource to Congress, the Committee, and the Subcommittee on these and other issues.

April 4, 2012

VIA EXPRESS MAIL

Senate Committee on Finance
Attn: Editorial and Document Section
Rm. SD-219
Dirksen Senate Office Building
Washington, DC 20510-6200

Re: Statement of Biomass Fuel Company, LLC with respect to the Public Hearing Before the Subcommittee on Energy, Natural Resources and Infrastructure of the Senate Committee on Finance on March 27, 2012 regarding Present Law and Analysis of Energy-Related Tax Expenditures

Ladies and Gentlemen:

This statement is delivered on behalf of Biomass Fuel Company, LLC, whose address is 15860 East Rio Verde Drive, Scottsdale, Arizona 85262 and Morton H. Fleischer, Chairman of the Board and Chief Executive Officer of Biomass Fuel Company, LLC ("Biomass") who has the same address.

Biomass is a start-up company involved in developing a new, proprietary technology which will convert cellulosic biomass into a renewable crude oil that can be refined into transportation fuels, diesel and gasoline. Biomass will be using renewable cellulosic feedstock. Our comments will be directed toward the financing of production facilities for the alternative fuels sector, all of which is in the early development stage. Biomass plans on building these biofuel production facilities in the State of Arkansas.

I am a financial entrepreneur and have financed or operated a wide range of businesses for over 50 years. My resume is an exhibit to this letter.

For the purposes of this statement, we have separated the development of new technology for alternative fuels into two separate stages for both technological and financial risk analysis. Stage I is the development of new technology through the actual operation of a prototype production facility or pilot unit (the "Pilot Unit"). Stage II is the design, development and construction of a full-scale production facility. Our proposal is based upon a public-private

partnership where risk is appropriately shared which can result in the most efficient and productive process to develop new technologies and profitable companies.

Stage I

The Stage I development and construction of the Pilot Unit creates an operating model or prototype unit which can actually produce biofuels, generally in small quantities. We believe that Stage I should be financed by engineers, venture capitalists and similar type investors who can because of their scientific and investment experience can provide a critical, independent review of the feasibility of the proposed technology and project.

We do not think the United States Government should be involved in assisting Stage I activities in any manner, including grants, loan guaranties or similar incentives. Engineers and entrepreneurs should be able to convince venture capitalists and other investors that their proposed technology is viable. These investors should bear the initial risk of review and investment since the technology and finance used in Stage I development is a highly specialized skill set best suited for the private sector.

Stage II

Stage II is the development, construction and operation of a commercially-viable facility to produce alternative fuels. This involves increased production capacity (also known as "scalability" in the industry) from a few gallons per day to thousands of gallons per day. Scalability is not a linear problem whereby engineers increase the size of the Pilot Unit to full-scale production facility by a multiplying factor of 10 or 100 to its components. Increasing the size of the Pilot Unit to the full-scale production facility can result in numerous, unanticipated problems which are not linear in nature. Scalability is the principal Stage II risk and there is no financial system mechanism in the private sector capital market that we know of which can help alternative fuel start up companies through this financial "Valley of Death" so that a full scale commercial facility can be constructed and operated.

We believe the United States Government has been and should continue to provide incentives to attract the necessary capital for the scale up of the activities required under Stage II. These incentives should be available to all qualified companies and individuals without the requirement for any subjective, special administrative action.

We suggest that the following provisions (which were previously used by the United States Government) be included in the Internal Revenue Code for qualifying alternative fuel facilities:

Depreciation

Accelerated depreciation for building and equipment. There should be a fifty percent (50%) write-off for the first year of operations (as was previously available under Section 168(l) of the Internal Revenue Code) with the remainder written off over the remaining five years would be beneficial.

Tax Credit

A tax credit of 30% of the project cost (was previously available under Section 48C of the Internal Revenue Code), which would include land, buildings and equipment. We think this tax credit should be limited to a $100 million, even if the cost of the production facility is in excess of $100 million, with a maximum credit of $30 million for a full-scale production facility and only be used for a sponsor's first facility. If the first facility is successful, additional capital for future projects will be available from the private sector.

New Markets Tax Credit

Simplify the 39% new markets tax credit for alternative energy facilities and have this available when the full scale production facility is located in a government-approved location in need of jobs.

Our goal is to recommend an effective private/public partnership for the development of new technology and production facilities to create alternate energy fuels, which show much promise, but are still in the early development stages. We believe this proposal does so.

Summary

STAGE I. The private sector would provide the intellectual capital and bear the financial risk of creating the technology and development of the Pilot Unit.

STAGE II. The United States would reenact and provide the tax incentives as previously discussed. These incentives will mitigate some of the scalability risk and encourage the private sector to invest the capital necessary to build the production facility. (A partnership structure can be used where the investors own the production facility and receive the tax incentives which can be used to offset income from the production facility or other sources.)

Our proposal efficiently allocates the resources of the United States acting using an equitable partnership with the private sector and offer benefits to the widest possible group of entrepreneurs and investors. This creates the possibility for the greatest number of successful projects without direct government capital investment, extensive administration and expense. Risks would be shared as appropriate.

We believe our proposal is simple, utilizes pre-existing tax incentives and has limitations on its use which will help avoid abuse. It will be easily accepted and understood by entrepreneurs and investors which will substantially assist in the development of this new and vital source of energy.

Following your review of this statement, I would be happy to meet with your staff in person or by phone.

Sincerely,

Morton H. Fleischer
Chairman of the Board and
Chief Executive Officer of Biomass Fuel
Company, LLC

kmm

Exhibit To

Statement of Biomass Fuel Company, LLC with respect to the
Public Hearing Before the Subcommittee on Energy, Natural Resources
and Infrastructure of the Senate Committee on Finance on March 27, 2012
Regarding Present Law and Analysis of Energy-Related Tax Expenditures

BIOGRAPHY OF MORTON H. FLEISCHER

Morton H. Fleischer, 75, is a financial entrepreneur who has financed or operated a wide range of businesses during his 50-year business career. These business include retailing, land development, cattle ranching, advising companies and individuals with respect to corporate mergers and acquisitions, mining, providing capital for SBA loans for small businesses and owning and operating a Hispanic radio station, life insurance company and a coal mining company.

For the last 30 years he has been involved in the financing of single-tenant real estate in the following three separate companies:

- Mr. Fleischer was a Founder, Chairman of the Board of Directors, Chief Executive Officer and President of Franchise Finance Corporation of America (FFCA), a New York Stock Exchange (NYSE)-listed company and its predecessor companies which initially operated through a series of limited partnerships which were initially offered in the 1980s. FFCA, a real estate investment trust, was formed by a merger of these partnerships and was listed on the NYSE from 1994 through 2001 and sold to GE Capital Corporation in 2001.

- Mr. Fleischer was also a Founder and Chairman of the Board of Directors of Spirit Finance Corporation from 2003 through 2007, a real estate investment trust, which was also listed on the NYSE. In 2007 Spirit Finance Corporation was acquired by an international consortium of private equity investors.

- Mr. Fleischer currently is Chairman of the Board of Directors of STORE Capital Corporation, a private real estate investment trust, which was formed in 2011. STORE Capital Corporation continues Mr. Fleischer's participation in the financing of single-tenant real estate.

Mr. Fleischer has been instrumental in creating and expanding various charities and cultural projects, including The Fleischer Foundation, The Fleischer Museum and the Southwest Chapter of the Juvenile Diabetes Association and the Phoenix board of the Alexis de Tocqueville Society. He received his Bachelor of Arts degree in 1958 from Washington University, St. Louis, Missouri. He was awarded its Distinguished Business Alumni Award in 1993.

HEARING STATEMENT

United States Senate Committee on Finance Subcommittee on Energy, Natural Resources and Infrastructure

"Renewable Energy Tax Incentives: How have the recent and pending expirations of key incentives affected the renewable energy industry in the United States?"

March 27, 2012

Executive Summary

- The Biotechnology Industry Organization (BIO) represents more than 1,100 innovative biotechnology companies and institutions in all 50 states, leading companies in the production of conventional and advanced biofuels, renewable chemicals and other sustainable energy and manufacturing solutions.

- Advanced biofuels, renewable chemicals, and biobased products have tremendous potential to address the nation's economic, energy and national security challenges and are ready for commercial deployment, but simply cannot secure needed capital for first-of-a-kind biorefinery construction without government support.

- Congress should include the following important tax provisions in any energy tax extenders package to help renewable chemical and advanced biofuels developers access critical capital to move their projects forward:

    - Extend the cellulosic biofuels production tax credit and accelerated depreciation for cellulosic biofuel property for the longest feasible duration and extend eligibility to algae-based biofuels;
    - Preserve current incentives for alternative alcohol fuels; and
    - Fund and clarify eligibility of renewable chemicals and biobased products for Sec. 48C Advanced Manufacturing Credit.

- Supportive, stable federal policy is essential to ensuring that advanced and cellulosic biofuels developers can move forward on these first-of-a-kind commercial projects.

- Congress should consider enacting additional incentives to further help renewable chemical and advanced biofuels producers to access capital.

Biotechnology Industry Organization
James C. Greenwood, President and CEO
1201 Maryland Avenue, SW, Suite 900
Washington, DC 20024
202-962-9200

HEARING STATEMENT

United States Senate Committee on Finance Subcommittee on Energy, Natural Resources and Infrastructure

"Renewable Energy Tax Incentives: How have the recent and pending expirations of key incentives affected the renewable energy industry in the United States?"

March 27, 2012

Introduction

Thank you for the opportunity to provide a written statement to the U.S. Senate Committee on Finance Subcommittee on Energy, Natural Resources and Infrastructure ("the Subcommittee") on its March 27, 2012, hearing titled "Renewable Energy Tax Incentives: How have the recent and pending expirations of key incentives affected the renewable energy industry in the United States?"

The Biotechnology Industry Organization ("BIO") is the world's largest biotechnology organization, with more than 1,100 members worldwide, including state and regional biotech associations, service providers to the industry and academic centers. BIO's Industrial and Environmental Section represents over 85 leading companies in the production of conventional and advanced biofuels, renewable chemicals and other sustainable solutions to energy and climate change. BIO member companies apply industrial biotechnologies to help resolve important challenges in synthesizing new products, whole cell systems and other biologic processes to improve the range of manufacturing and chemical processes. BIO members include the leaders in developing new crop technologies for food, feed, fiber, and fuel.

BIO commends the Subcommittee for holding today's hearing, and for recognizing the vital role tax policy plays in driving investment in alternative energy. Sustained supportive tax policy is particularly important to emerging technologies that have not yet achieved commercial scale, and should be targeted at those technologies with the greatest potential to create the jobs, economic growth, energy security and environmental benefits we seek as a nation. Emerging technologies in advanced biofuels, renewable chemicals, and biobased products have tremendous potential to address the nation's challenges and are ready for commercial deployment, but simply cannot secure needed capital for first-of-a-kind biorefinery construction without government support. We urge you to extend provisions supporting scale-up of these important technologies.

Background

Advanced biofuels, renewable chemicals and biobased products have great potential to significantly increase this nation's energy and national security, while creating thousands of

solid, well-paying U.S. jobs (see **Appendix A** chart on "U.S. Jobs Associated with the Production of Advanced Biofuels and Renewable Chemicals"). In fact, today, the domestic biofuels industry is already creating jobs, helping to reduce our dependence on foreign oil and providing downward pressure on gas prices at the pump. It is now contributing more than 400,000 jobs and $53 billion in new activity to the nation's economy. A recent report found that additional job creation from advanced biofuels production under the federal Renewable Fuel Standard (RFS) could reach 807,000 by 2022.[1] Advanced biofuels production under the RFS could further reduce U.S. petroleum imports by nearly $70 billion by 2022.

The domestic renewable chemicals and sustainable biobased products industries are also helping reduce U.S. dependence on foreign sources of energy, while creating significant numbers of jobs. One recent report estimates that the global sustainable chemical industry will grow to $1 trillion, which provides an important opportunity for U.S. job and export growth. Currently, the industry is estimated to be only seven percent of its future projected size. U.S. companies traditionally make-up about 19 percent of the traditional global chemical industry. If U.S. companies capture the same percentage of the sustainable chemical industry as it grows to $1 trillion, BIO anticipates 237,000 direct U.S. jobs and a trade surplus within the chemical sector. See attached **Appendix B** BIO white paper. Also, please see http://www.bio.org/sites/default/files/20100310_biobased_chemicals.pdf for a report on "Biobased Chemicals and Products: A New Driver of U.S. Economic Development and Green Jobs." The report provides further explanation and context showing that, through the development of the U.S. renewable chemicals and biobased products industries, the U.S. has the opportunity to recover and reclaim significant U.S. manufacturing jobs that have been lost to other nations in recent decades.

As the 2010 Quadrennial Defense Review notes, the Navy, other branches of the military, and the nation as a whole, face a significant national security threat from U.S. dependence on foreign sources of energy. This threat can be significantly reduced with an ample supply of U.S. advanced biofuels. Innovative advanced biofuels companies have made great strides in developing new technologies to produce next generation biofuels from a variety of feedstocks, and are poised to produce billions of gallons of advanced biofuels if project financing can be secured in a timely fashion (See for example (1) the following link to an article on "Current Status of Cellulosic Biofuel Production in the United States": http://www.liebertonline.com/doi/abs/10.1089/ind.2011.7.365, and (2) **Appendix C** chart of current and planned advanced biofuel projects). Supportive, stable federal policy—including tax incentives for biofuels and biobased products—is essential to ensuring that advanced biofuels developers can move forward on these first-of-a-kind commercial projects, which are a critical component of plans to meet the nation's energy independence and security needs. Many federal incentives vital to U.S. advanced biofuels development and commercialization are set to expire in the near-term.

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[1] *U.S. Economic Impact of Advanced Biofuels Production: Perspectives to 2030*, bio-era, Feb. 2009, available at: http://www.ascension-publishing.com/BIZ/BIO-econ-impact.pdf

To accelerate large scale commercialization of advanced biofuels, renewable chemicals and biobased products, below please find an overview of provisions we believe are necessary to drive continued investment in the broadest possible set of emerging technologies.

Tax Extensions Necessary To Drive Investment in Advanced Biofuels, Renewable Chemicals and Biobased Products

The following existing tax incentives must be extended, with recommended clarifications, so that renewable chemical and advanced biofuels producers can access critical capital to move their projects forward and help the U.S. meet its energy independence, national security, and job creation needs.

- ***Extend the Cellulosic Biofuel Production Tax Credit and Accelerated Depreciation for Cellulosic Biofuel Property*:** BIO's member companies are working hard to commercialize cellulosic technologies and these companies are dependent on private investors to help fuel the innovation that will enable this commercialization effort. The cellulosic biofuels production tax credit and the accelerated depreciation for cellulosic biofuel property have the potential to unlock vital project financing. But because commercial biorefinery projects take an average of two or more years to complete, the December 31, 2012, expiration date prevents project developers from leveraging the value of these credits. Thus, even though the incentives are nominally effective through 2012, the credits have already effectively expired with regard to current facility development. **Extend the cellulosic biofuels production tax credit (PTC) and accelerated depreciation for cellulosic biofuel property for the maximum feasible duration.**

- ***Algal Biofuels Tax Parity*:** The Internal Revenue Code effectively impedes the commercialization of algae-based biofuels by providing a production tax credit and favorable depreciation to cellulosic biofuels developers, but not for algae-based fuel facilities. Algae-based fuels provide public benefits similar to those provided by cellulosic biofuels in terms of job creation, energy security, and environmental profile. As long as the law discriminates against the algal fuels developers, it will continue to be extremely challenging for algae-based fuel start-up companies to attract the capital required to build the first commercial scale facilities. **Algae-based biofuels should be made eligible for the cellulosic biofuels PTC and accelerated depreciation.**

- ***Preserve Current Incentives for Non-Ethanol Alcohol Fuels*:** Under current law, the Internal Revenue Code provides income tax credits, or excise tax credits in lieu of income tax credits, for a number of alcohol fuels, including advanced non-ethanol alcohol fuels. It is important that these tax incentives for non-ethanol alcohol fuels be considered on their own merits. The tax credits for non-ethanol alcohol fuel are available only to biofuels that are poised to come onto the market but that need temporary policy support to help ensure their commercial viability in the short-term. Like the cellulosic biofuel production tax credit and accelerated depreciation rules, **the non-ethanol alcohol fuels credits should be extended as long as possible.** Moreover, because production levels of

these alternatives will be small in the next few years, the cost of extending the provision for a term of years is expected to be modest.

- ***Fund and Clarify Eligibility of Renewable Chemicals and Biobased Products for Sec. 48C Advanced Manufacturing Credit*:** S. 1764, the *Make It in America Tax Credit Act of 2011,* provides much needed additional funding to the Advanced Energy Manufacturing Tax Credit (Section 48C) and explicitly clarifies the eligibility of renewable chemicals and biobased product projects. Incentivizing investment in biorefineries provides potential to create new markets for American products and jobs. Renewable chemicals and biobased products impact everyday products such as car parts to cleaning products, soaps, insulation materials, plastics, foams, fibers, fabrics, and are impacting our economy. BIO supports **incorporating S. 1764 into any energy tax extenders package**.

The following incentives should also be enacted to further help renewable chemical and advanced biofuels producers access critical capital to move their projects forward.

- ***Provide an Investment Tax Credit (ITC) for Advanced Biofuel Biorefineries*:** Capital costs for construction of advanced biofuel biorefineries are a substantial barrier to commercialization. **Congress should provide an Investment Tax Credit option (available in lieu of production tax credits) for emerging advanced biofuel project developers** to help accelerate construction of advanced biofuel biorefineries and speed deployment of emerging advanced biofuel technologies.

- **Provide a Tax Credit for Production of Qualifying Renewable Chemicals:** Renewable chemicals and biobased plastics represent an important technology platform for reducing reliance on petroleum, creating green U.S. jobs, increasing energy security, and reducing greenhouse gas emissions. By providing a federal income tax credit for domestically produced renewable chemicals, Congress can create domestic jobs and other economic activity, and can help secure America's leadership in the important arena of green chemistry. Like current law renewable electricity production credits, the credits would be general business credits available for a limited period per facility. To truly achieve energy security, the U.S. must develop biorefineries that produce alternatives to all of the products made from each barrel of oil. Industrial biotechnology enables the production of renewable chemicals and biobased products from biomass, and the total displacement of fossil fuel products can be accelerated with a production tax credit.

The provisions above are essential ingredients in any effort to accelerate the commercialization of advanced biofuels, renewable chemicals and biobased products. We ask that you include these provisions in any energy tax extenders package.

Thank you.

APPENDIX A

U.S. Jobs Associated With the Production of Advanced Biofuels and Renewable Chemicals

Source of Jobs	Associated U.S. Jobs
DOE/USDA	**5505** currently **see attached chart of public private biofuel projects compiled by BIO
Biomass Crop Assistance Program	**700,000** potential U.S. jobs **USDA BCAP Fact Sheet, May 2011. http://www.fsa.usda.gov/Internet/FSA_File/bcap_update_may2011.pdf
Potential Advanced Biofuels jobs in agriculture, engineering, construction and research by 2030	**800,000** **"U.S. Economic Impact of Advanced Biofuels Production: Perspectives to 2030" (bio-era, 2009)
Sustainable Chemistry Sector	**237,000** direct U.S. jobs once the global sustainable chemistry industry grows to its widely projected $1 trillion size

APPENDIX B

Renewable Specialty Chemical Working Group White Paper

March 11, 2010

Sustainable chemistry produces green chemicals from renewable raw materials using environmentally friendly processes that not only conserve energy and water but also have a low carbon footprint. The primary technology-driver for sustainable chemistry is biotechnology and the main input is plant-derived raw materials. Importantly, sustainable chemistry allows U. S. companies to replace raw materials derived from foreign oil with agricultural materials produced domestically.

Why does sustainable chemistry make sense for America? We live in a competitive world. U.S. companies can create rewarding high-paying jobs for Americans, if government supports new industries in which the U.S. can maintain a leadership position. Sustainable chemistry is a sector where U.S. companies are positioned to lead because it combines three areas of U.S. strength: biotechnology, agriculture and chemicals. First, the U.S. has been and continues to be a world leader in biotechnology- its companies and research institutions excel in the core capabilities required by this industry: protein engineering, metabolic engineering and synthetic biology. Second, the American farmer has an unparalleled ability to produce the raw material needed by this industry. Finally, the U.S. has the world's largest national chemical industry. Ten cents of every U.S. export dollar is derived from chemical sales. The value of America's share of the global chemical market is $690 billion (19% of the $3.7 trillion dollar global market). The chemical industry directly employs 860,000 people in the U.S., and indirectly supports the employment of another 4,795,500 people.

Why switch from "traditional chemistry" to "sustainable chemistry"? Although the U.S. chemical industry remains successful, several forces have reshaped the global chemical industry over the past decade. Among these is growth of the industry in the Middle East and Asia. Consider, for example, Dow Chemical's decision to exit the commodity chemical business in 2007. According to Dow's CEO, Andrew Liveris: "Petrochemicals will be looked at from the point of view of low-cost feed stocks; given the likelihood that energy and feedstock costs will remain high by historical standards, there is every reason to believe that productive assets will continue to gravitate to regions that offer advantaged feed stocks, namely, the Mideast and Asia." Over the past decade, U.S. direct employment in the chemical sector has decreased from 992,000 to 860,000 employees. Regarding exports, the U.S. enjoyed a trade surplus of $13.4 billion in 1998, but by 2008 the sector suffered a trade deficit of -$2.7 billion. We believe that the U.S. can reverse these trends by capitalizing on its core strengths in biotechnology, agriculture and chemical manufacturing. While the traditional U. S. chemical industry is shrinking, several independent groups have estimated that the global sustainable chemistry industry will grow to $1 trillion dollars. This creates a significant opportunity for job growth and export growth because the current global sustainable chemistry industry is only about 7% of its projected future size. If U.S. companies can capture 19% of this new $1 trillion market, (by analogy to the traditional chemical industry) we project that the U.S. will create about 237,000 direct U.S. jobs in the sustainable chemistry sector, while shifting the balance of trade in the chemical sector to a trade surplus.

The traditional chemical industry is made up of two broad sectors: commodity chemicals and specialty chemicals. Each plays critical but different roles. Commodity chemicals are manufactured in large quantities, sell for a low price and provide the base volume for the industry. However, they are cyclic and have wide swings in prices and margins across the commodity cycle. Specialty chemicals in contrast have smaller volumes and higher margins. Their role is to provide higher margins that are consistent across the commodity cycle.

Like the traditional chemical industry, the sustainable chemistry industry of the future will have two product sectors: commodity biochemicals (also known as bioproducts) and specialty biochemicals. Both will play critical yet different roles in the integrated biorefinery. Commodity biochemicals like biofuels will

provide a base of large volume, low margin business. However, both commodity biochemicals and biofuels are subject to the volatility of commodity cycles. Specialty biochemicals will provide a base of consistent, non-cyclic higher margin products that can be depended upon across the commodity cycle and offer a stable cash-flow during biofuels and commodity chemical troughs.

What is required to accelerate the development of a strong specialty biochemical sector? Three factors are currently limiting the growth of specialty biochemical sector. The first is a lack of research funding to support early stage development of new specialty biochemical technology platforms and products. For many years, the US DOE has provided significant research support for both biofuels and commodity biochemicals which has greatly accelerated the development of these products. Over the past 15 years, the DOE and USDA have provided significant financial support for the development of cellulosic and third generation biofuels. Their support greatly accelerated the development of these new fuel alternatives. Commencing in 2004, the DOE and USDA expanded their support of biofuels to include support for the development of 12 commodity biochemicals which have had a significant impact on their advancement.

Authorizing consistent annual research funding specifically for specialty biochemicals will encourage them to expand their focus to specialty biochemicals which will greatly accelerate and expand the pipeline of new products

While biofuels and commodity biochemicals have benefited from extensive research grant support, there has been very little research support for specialty biochemicals. Thus, universities, research institutions and industry have focused on developing new biofuels and commodity chemicals. Authorizing consistent annual research funding specifically for specialty biochemicals will encourage them to expand their focus to specialty biochemicals which will greatly accelerate and expand the pipeline of new products.

Access to loan guarantees and grants will help address the lack of capital to fund the transition from pilot-scale production to full-scale manufacturing

The second factor limiting the growth of the specialty biochemical sector is the cost of investing in manufacturing capacity. It is often said that there is a "valley of death" that must be crossed in order to make the transition to full-scale manufacturing. Access to loan guarantees and grants will help address the lack of capital to fund the transition from pilot-scale production to full-scale manufacturing.

A production credit for qualifying specialty biochemicals products during the first five years will provide the incentive to accelerate market growth

The third is the initial product costs due to a lack of economy of scale during the initial years of launching a product. Initially, when a specialty biochemical is first commercialized, sales volumes are low and due to the lack of economy of scale, costs are high. After several years as the product is successfully adopted by the market, volumes increase, costs drop and the product becomes profitable. A production credit for qualifying specialty biochemicals products will provide the incentive to accelerate market growth.

APPENDIX C

Company	Location	Technology	Date	Jobs	Other participants
Abengoa Bioenergy	Hugoton, Kans.	Agricultural residues fermented to ethanol	9/2007	94 permanent, 250 construction	
Agrivida	Medford, Mass.	New crop traits that eliminate pre-treatment of cellulosic feedstock	11/2009		
Algenol*	Ft. Myers, Fla.	Algal production of ethanol		120	Dow Chemical
Alpena Biorefinery	Alpena, Mich.	Hardwood byproducts fermented to ethanol	12/2011	10 permanent	Valero Energy Corp.; American Process Inc.
Amyris	Emeryville, Calif.	Sweet sorghum fermented to diesel and related chemicals	11/2009	350	Ceres Inc., NREL
Bluefire Ethanol	Fulton, Miss.	Forest waste, MSW	12/2009	50 permanent, 250 construction	
Clear Fuels Technology	Commerce City, Colo.	Syngas from biomass, integrated with FT diesel from natural gas	12/2011		
Coskata	Boligee, Ala.	Syngas from MSW fermented to ethanol	1/2011	700 direct and indirect	
DuPont Danisco Cellulosic Ethanol	Vonore, Tenn.	Corn stover, switchgrass fermented to ethanol	12/2009	40	
Enerkem, Inc.	Pontotoc, Miss.	Syngas from wood residue catalysed to ethanol	12/2013	70 permanent	
Gevo	Englewood, Colo.	Yeast fermentation to isobutanol	11/2009		
INEOS Bio, New Planet Energy	Vero Beach, Fla.	Syngas from agriculture waste and MSW, fermentation to ethanol.	3/2010, 9/2010, 1/2011	50 permanent, 175 construction	
Lignol	Ferndale, Wash.	Fermentation of ethanol from woody biomass	9/2010	39 permanent, 200 construction	
Logos	Visalia, Calif.	Enzymatic hydrolysis of corn stover and switchgrass		43 permanent	Ceres, Novozymes
Mascoma	Kinross, Mich.	Fermentation of forestry waste to ethanol	2/2009	50 permanent and 150 construction	Oak Ridge National Laboratory
Myriant	Lake Providence, La.	Fermentation of sorghum to succinic acid	3/2010	50 permanent, 250 construction	
POET Project Liberty	Emmetsburg, Iowa	Fermentation of corn stover to ethanol	9/2008	40 permanent and 200 construction	Novozymes
Sapphire Energy	Columbus, N.M.	Algal production of green crude oil		750 direct and indirect	Sandia National Lab, and New Mexico State University
Solazyme	Riverside, Pa.	Heterotrophic algal lipid production from sugar.		388 direct and 256 indirect	Abengoa Bioenergy, BlueFire Ethanol, UOP LLC
UOP Renewables	Oahu, Hawaii	MSW and algae to gasoline, diesel and jet fuels via pyrolysis	2/2010	40 direct	Ceres, Targeted, HR BioPetroleum
ZeaChem	Boardman, Ore.	Hybrid poplar fermented to acetic acid		100 operations, 338 construction + 442 indirect jobs	Valero Energy Corporation, GreenWood Resources

*Shaded projects indicate ARRA-funded projects

National Biodiesel Board
605 Clark Ave.
PO Box 104898
Jefferson City, MO 65110-4898
(800) 841-5849 *phone*
(573) 635-7913 *fax*

National Biodiesel Board
1331 Pennsylvania Ave., NW
Suite 512
Washington, DC 20004
(202) 737-8801 *phone*

www.biodiesel.org

Statement for the Record
U.S. Senate Committee on Finance
Subcommittee on Energy, Natural Resources, and Infrastructure
Hearing on Expired and Expiring Renewable Energy Provisions
Anne Steckel, Vice President of Federal Affairs
National Biodiesel Board
March 27, 2012

Chairman Bingaman and Ranking Member Cornyn, we appreciate the opportunity to submit written testimony on behalf of the National Biodiesel Board (NBB) regarding the economic impact of the recent expiration of the biodiesel tax incentive.

As producers of America's only commercial-scale Advanced Biofuel that is sold and produced nationwide, the U.S. biodiesel industry looks forward to working constructively with this committee to ensure that our nation's energy goals are met.

NBB applauds your efforts to review renewable energy tax incentives. History has shown that well-crafted and efficient tax incentives can be powerful policy mechanisms to achieve the nation's energy objectives and leverage private sector investment to promote the deployment and utilization of new energy resources. This is certainly the case with the tax incentives for biodiesel, renewable diesel and bio-jet fuel. As with every other major U.S energy resource, effective tax policy has helped create domestic biodiesel manufacturing jobs as well as significant economic and energy policy benefits.

Before the biodiesel tax incentive expired on December 31, the U.S. biodiesel industry had a record year of production in 2011, producing nearly 1.1 billion gallons of fuel and creating well-paying jobs in nearly every state in the country. This success is in part attributable to the strong federal policies in place encouraging domestic renewable energy production. While we understand the pressures facing Congress, we believe the economy is too weak today to withdraw support from a growing American industry that is a rare bright spot in our struggling economy.

The recent expiration of the $1 per gallon biodiesel tax incentive poses a serious threat to the industry's continued growth, economic impact and job creation. While the biodiesel industry has made significant strides in recent years in building the infrastructure and value chain that supports our growing production levels, we need policy stability and support to continue this remarkable success story, and we encourage Congress to provide a seamless retroactive extension of the biodiesel, renewable diesel, and bio-jet tax credit. Quickly and seamlessly reinstating the expired biodiesel tax incentive would provide needed certainty and protect against future supply disruptions and the loss of thousands of much-needed jobs.

Background: Biodiesel is a renewable, low-carbon diesel replacement fuel made from an increasingly diverse mix of feedstocks including agricultural oils, recycled cooking oil, and animal fats. It is the only domestically produced, commercial-scale Advanced Biofuel – as defined by the Environmental

Protection Agency (EPA) – that is readily available and accepted nationwide. It meets a strict ASTM fuel specification and can be used in existing diesel engines.

In its short history, the biodiesel tax incentive has helped the industry to make significant progress toward the desired goal of stimulating U.S. biodiesel production – increasing the domestic manufacturing of a clean-burning, renewable fuel while generating jobs, reducing America's reliance on foreign oil and improving the environment.

Biodiesel Public Policy Benefits: The biodiesel tax incentive has helped achieve the worthwhile policy goal of creating jobs while increasing the production and use of biodiesel in the U.S. In 2004, prior to enactment of the tax incentive, the U.S. produced 25 million gallons of biodiesel. In 2011, with the tax credit reinstated and with a strong RFS program, the industry produced nearly 1.1 billion gallons supporting more than 39,000 jobs across the country while generating at least $628 million in federal, state and local tax revenues, according to a recent economic study [i]. There are compelling public policy benefits associated with the enhanced production and use of biodiesel in the U.S.

If the Congress extends the industry's tax incentives, America's biodiesel producers are poised to continue that momentum in 2012.

Unfortunately, the recent expiration of the biodiesel tax incentive threatens to impede the industry's continued growth. U.S. biodiesel remains a young and vulnerable industry. In fact, we know from recent history what happens without the biodiesel tax incentive. When the credit expired in 2010, the result was predictable: U.S. biodiesel production plummeted by 42 percent, resulting in the loss of nearly 8,900 jobs and a drop in household income of $485 million.

After Congress reinstated the tax incentive, the industry regained its footing and began ramping up production, with record-breaking success.

With the ongoing economic downturn, now is not the time to force another industry slump. Under projected expansion by 2015, biodiesel is expected to support more than 74,000 jobs, $4 billion in income, and add approximately $7.3 billion to the nation's GDP, according to the economic study.

That growth will be severely jeopardized if Congress does not extend the biodiesel tax incentive, which also applies to bio-jet and renewable diesel production.

Industry Overview: Biodiesel is a renewable, low-carbon diesel replacement fuel. The EPA has determined, based on the performance requirements established by the *Energy Independence and Security Act* (EISA) (P.L. 110-140), that domestically produced biodiesel is an Advanced Biofuel under the RFS2 program. To date, it is the only commercial-scale fuel sold and produced across the United States to achieve this designation.

Biodiesel is made from waste greases like recycled cooking oil and animal fats and secondary-use agricultural oils and is refined to meet a specific commercial fuel definition and specification. The fuel meets the D6751 fuel specification set forth by ASTM International, the official U.S. fuel-certification organization. Biodiesel is one of the most- and best-tested alternative fuels in the country and the only alternative fuel to meet all of the testing requirements of the 1990 amendments to the Clean Air Act. There are approximately 195 domestic and foreign biodiesel plants registered with the EPA, representing a combined production capacity in excess of 2.7 billion gallons.

Biodiesel is primarily marketed as a five percent (B5) blending component with conventional diesel fuel, but can be used in concentrations up to twenty percent (B20). It is distributed utilizing the existing fuel distribution infrastructure with blending occurring both at fuel terminals and "below the rack" by fuel jobbers.

Status and Background on the Biodiesel Tax Incentive: The biodiesel tax incentive was enacted in 2004 as part of the American Jobs Creation Act (P.L. 108-357) and took effect in 2005. The incentive was subsequently extended through December 31, 2008 as part of the Energy Policy Act of 2005 (P.L. 109-190). H.R. 1424, the Emergency Economic Stabilization Act of 2008 (P.L. 110-343), again extended the incentive for one year through December 31, 2009, at which time the credit expired and was not renewed for almost a year until a one-year extension was included in the "Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act Of 2010" (P.L. 111-312).

The biodiesel tax credit once expired again on December 31, 2011, and is currently lapsed.

The biodiesel tax incentive is designed to encourage the production and use of biodiesel by making the fuel price-competitive with conventional diesel fuel. In general, current law allows taxpayers to claim the biodiesel tax incentive as either a $1.00 per gallon general business income tax credit or as a $1.00 per gallon blenders excise tax credit. To qualify for the biodiesel tax incentive, the fuel must by statute meet both the ASTM D6751 fuel specification and the Environmental Protection Agency's (EPA) registration requirements under Section 211 of the Clean Air Act.

The Internal Revenue Code provides a general business income tax credit to encourage the production and use of biodiesel, renewable diesel and bio-jet fuel. The credit is the sum of three credits – the biodiesel mixture credit, the biodiesel credit and the small agri-biodiesel producer credit. The biodiesel mixture credit provides a $1.00 per gallon credit for each gallon of biodiesel that is blended with conventional diesel fuel. The biodiesel credit provides $1.00 per gallon credit for each gallon of pure B100 biodiesel that is used as a fuel. The small agri-biodiesel producer credit is a 10 cents per gallon credit for plants with a production capacity of less than 60 million gallons per year. The credit can be claimed on the first 15 million gallons of production.

The Biodiesel Industry is Creating Jobs and Making a Positive Contribution to the Economy: In 2011, NBB estimates that the U.S. biodiesel industry supported more than 39,000 jobs in all sectors of the economy. This will add more than $3.8 billion to the nation's Gross Domestic Product (GDP).

Biodiesel Reduces our Dependence on Foreign Oil: Biodiesel can play a major role in expanding domestic refining capacity and reducing our reliance on foreign oil. The 3.6 billion gallons of biodiesel produced in the U.S. since 2005 have displaced an equivalent amount of diesel fuel with a clean-burning, efficient fuel that according to the EPA reduces lifecycle greenhouse gas emissions by as much as 86 percent compared to petroleum diesel fuel and creates 5.5 units of energy for every unit of energy that is required to produce the fuel.

Biodiesel is Good for the Environment: Biodiesel is an environmentally safe fuel and is the most viable renewable transportation fuel when measuring its carbon footprint, life cycle and energy balance. Since 2005, biodiesel has reduced lifecycle greenhouse gas emissions by 48.3 billion pounds, the equivalent of removing 4.25 million passenger vehicles from America's roadways.

Biodiesel Reduces Diesel Emissions: Tailpipe emissions from traditional diesel – primarily from trucking fleets, school buses and other vehicles – present a significant health and air quality concern. In an update to its National-Scale Air Toxics Assessment earlier this year, EPA cited diesel exhaust as one of the nation's most dangerous pollutants, saying it is "among the substances that may pose the greatest risk to the U.S. population." Thousands of trucks and buses hit the road every day burning traditional diesel fuel. Substituting higher amounts of biodiesel for traditional diesel fuel is the simplest, most effective way to immediately improve tailpipe emissions. Furthermore, heavy exposure to diesel exhaust has been linked to lung cancer death in miners[ii].

Biodiesel is America's first advanced biofuel and when compared to gasoline, diesel and ethanol, it is at a fundamentally different stage of development and should be treated as a new fuel in the marketplace. Conventional energy resources have received tax and non-tax federal support for decades; the ethanol industry been the beneficiary of tax incentives for 30 years. In contrast, the biodiesel industry has been in commercial-scale production for only six years and has received federal tax incentives only since 2005.

The gasoline marketplace is approximately 140 billion gallons, the diesel pool is approximately 60 billion gallons and the ethanol marketplace is producing some 14 billion gallons. By comparison, biodiesel is on pace to produce about 1 billion gallons this year. Biodiesel is an up-and-coming industry and is in a far more fragile stage of development.

Conclusion: The biodiesel tax incentive has helped achieve the desired goal of increasing the domestic production and use of biodiesel, and in turn has helped the U.S. realize the energy security, economic and environmental benefits associated with displacing petroleum with domestically produced renewable fuels. These benefits, however, will be jeopardized if Congress does not act in a timely manner to address the immediate issue facing the industry and extend the biodiesel tax incentive.

About NBB: NBB is the national trade association representing the biodiesel industry as the coordinating body for research and development in the U.S. It was founded in 1992, and since that time, NBB has developed into a comprehensive industry association which coordinates and interacts with a broad range of cooperators including industry, government and academia. NBB's membership is made up of biodiesel producers; state, national and international feedstock organizations and feedstock processor organizations; fuel marketers and distributors; and technology providers.

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Chairman Bingaman and Ranking Member Cornyn, I again appreciate having the opportunity to submit this statement for the record to provide you with NBB's view on this issue of significant importance to the U.S. biodiesel industry. We look forward to serving as a resource for the Committee on issues related to biofuels tax policy as the Committee proceeds.

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[i] Cardno ENTRIX June 8, 2011, Economic Impact of Removing the Biodiesel Tax Credit for 2010 and Implementation of RFS2 Targets through 2015.

[ii] In a study of non-metal miners in the United States, federal government scientists reported that heavy exposure to diesel exhaust increased risk of death from lung cancer.[ii] The study was carried out by researchers from the National Cancer Institute (NCI), part of the National Institutes of Health, and the National Institute for Occupational Safety and Health (NIOSH), part of the Centers for Disease Control and Prevention, both parts of HHS. The results were distributed in two papers on March 2, 2012, from the Journal of the National Cancer Institute and posted to the JNCI website on March 5, 2012. The research, all part of the Diesel Exhaust in Miners Study, was designed to evaluate cancer risk from diesel exhaust, particularly as it may relate to lung cancer, among 12,315 workers at eight non-metal mining facilities. The facilities were located in Missouri (1 limestone mine), New Mexico (3 potash mines), Ohio (1 salt mine), and Wyoming (3 trona mines, which process an ore used in soda ash).

National Hydropower Association
25 Massachusetts Ave. NW, Ste. 450, Washington, D.C. 20001 • Tel 202-682-1700 • Fax 202-682-9478 • www.hydro.org

March 27, 2012

The Honorable Jeff Bingaman
Chair
Subcommittee on Energy, Natural Resources, and Infrastructure
Committee on Finance
219 Dirksen Senate Office Building
Washington, DC 20510

The Honorable John Cornyn
Ranking Member
Subcommittee on Energy, Natural Resources, and Infrastructure
Committee on Finance
219 Dirksen Senate Office Building
Washington, DC 20510

Re: Statement for the Record of the National Hydropower Association on the March 27, 2012 Hearing on Renewable Energy Tax Incentives: How have the recent and pending expirations of key incentives affected the renewable energy industry in the United States?

Dear Chairman Bingaman and Ranking Member Cornyn:

The National Hydropower Association[1] (NHA) appreciates this opportunity to comment on the need for continued federal tax policy support of renewable energy technologies – particularly hydropower and marine and hydrokinetic (MHK) – and the negative impacts developers are experiencing, and will be further exacerbated, due to lack of certainty with regard to the future availability of the credit.

NHA reiterates its strong support for federal policy that provides a predictable market signal in support of renewable energy project deployment, which in turn leverages significant private investment, stimulates job creation, and provides local economic benefits across the country.

We continue to urge Congress to approve, without delay, long-term extension of renewable energy incentives, such as the production tax credit (PTC) and other policies, which provide the hydropower industry the certainty needed to compete for investment, complete project construction and begin operation over the next several years.[2]

As demonstrated by the recent introduction of PTC extension bills in both the Senate and the House, support for renewable energy incentives crosses party lines and regions of the country.

The American Energy and Job Promotion Act, S. 2201, sponsored by Senator Chuck Grassley (R-IA), has seven co-sponsors, both Democrats and Republicans, representing constituencies from Oregon to Colorado, from Nevada to Massachusetts. In the House, the American Renewable Energy Production

[1] NHA is the non-profit national association dedicated exclusively to advancing the interests of the U.S. hydropower industry, including conventional, pumped storage and marine and hydrokinetic technologies. NHA's 180 members includes public utilities, investor owned utilities, independent power producers, project developers, equipment manufacturers, environmental and engineering consultants and attorneys.

[2] Other incentives for the hydropower industry include the investment tax credit, Section 1603 grants in lieu of tax credits, clean renewable energy bonds (CREBs), as well as the renewable energy equipment manufacturer ITC.

Tax Credit Extension Act of 2011, H.R. 3307, sponsored by Representatives Dave Reichert (R-WA) and Earl Blumenauer (D-OR), has 85 cosponsors – again with supporters from both sides of the aisle and representing 30 states across the country.[3]

Extension of the renewable energy incentives has broad bipartisan support in Congress, assists the industries seeking to increase the nation's renewable energy production, and provides the necessary certainty to finance projects – particularly large, capital-intensive hydropower projects that must navigate long licensing processes.

Of the renewable technologies, hydropower has one of the longest development timeframes due, in part, to the extensive multi-year federal and state licensing process.[4] In addition, these projects incur significant up-front costs.

Without the long-term certainty and predictability provided by consistent federal support policies, developers will be unable to attract the financing needed to support this considerable investment and utilities will be driven by default to other resources with shorter development timelines, such as wind and natural gas, resulting in a less diverse electricity generation mix.

As demonstrated below, failure to extend the tax incentives will effectively bring these projects to a halt and undermine the progress the hydropower industry has made in recent years.

The Impact of Tax Incentives on Hydropower Industry-wide Growth

Throughout the 1990s and 2000s, the hydropower industry experienced a period of minimal growth. This changed dramatically with the inclusion of hydropower technologies under the production tax credit (PTC) and clean renewable energy bonds program (CREBs) in 2005, and other incentives, such as the investment tax credit (ITC) and Section 1603 program, in 2009.

From the enactment of the Energy Policy Act of 2005 through December 2011, FERC has certified 85 hydropower projects in 22 states for the PTC.[5] These projects, involving capacity additions and technology or efficiency improvements at existing hydropower facilities, have resulted in an average

[3] The 30 states include: Alabama, Alaska, Arkansas, California, Connecticut, Colorado, Hawaii, Illinois, Iowa, Maryland, Massachusetts, Michigan, Minnesota, Nevada, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Dakota, Texas, Virginia, Washington, Wisconsin, and Vermont.

[4] The integrated licensing process (ILP), the default federal process for hydropower development takes 5-5.5 years. While FERC is the lead agency, the process can also involve federal hydropower project owners, such as the Bureau of Reclamation and the Army Corps of Engineers, federal resource agencies, state resource agencies, tribes, and interested stakeholders and the public. This complex, comprehensive process is intensive, multi-layered and can take up to 26 steps as outlined at: http://ferc.gov/industries/hydropower/gen-info/licensing/ilp/flowchart.pdf.

[5] The 22 states in which hydropower projects have received PTC certification are: Arkansas, California, Georgia, Idaho, Indiana, Kansas, Maine, Maryland, Massachusetts, Michigan, Montana, New Hampshire, New York, North Carolina, Oregon, Pennsylvania, South Carolina, Vermont, Virginia, Washington, West Virginia and Wisconsin.

increase in generation of close to 11 percent for a total generation increase of 971,798 megawatt hours. This is enough energy to power 84,533 homes.[6]

Hydropower Project-specific Examples of the Need for Extension

One NHA member company that has a portfolio of 450 MW of proposed projects (all new facilities on existing dams) reports that the PTC and the ITC have brought much more capital investment into the hydropower market than in the past. Their projects are projected to receive FERC licenses between 2013 and 2015. Once the license is issued, they will then proceed to construction financing. The incentives help make the hydropower projects economically competitive to other renewable energy facilities.

For this company, election of the PTC or the ITC provides important value. However, for their portfolio, an ITC extension provides the greatest value. The company reports that an extension of the ITC would allow them to move forward on 83 percent of the MWs in their portfolio. With no ITC extension, they estimate only 23 percent will be built.

If the PTC is extended, but no parity given (hydropower currently receives only one-half PTC credit), they estimate 26 percent of their projects will move forward. If PTC is extended with parity given, the number increases to 45-50 percent. They also said that the 30 percent ITC is a value of about 26 percent of total project costs, while the PTC provides a value of only 7.5 percent (15 percent with parity).

Another member company has a proposed portfolio that includes a total of 10 projects totaling 250 MW that either have FERC licenses and/or are pending FERC issuance of a license. The company reports 2 of these will get built on the basis of qualification for the Section 1603 cash grant; however, it is unlikely that most of the other projects will get built unless the placed-in-service dates for the incentives are extended.

The multi-year licensing timeline, followed by an additional 1-2 years to get Corp of Engineers or Bureau of Reclamation sign-off and approval (the projects will be situated on existing federal infrastructure) is representative of the additional risks that new hydro projects on existing non-powered dams face from a financing perspective.

Additionally, while the projects are granted up to a 50-year license and have 80-100-year lifetimes, they must be financed and the debt amortized over a 20-year period, if developed by a private company. Once the projects are online they become the least costly source of energy over the life of the project. This is because once the debt and the initial costs are amortized; the projects will continue generating for another 30-60+ years and with much lower O&M costs.

Lastly, another NHA member company is currently developing 33 projects in 15 states, with 12 projects presently in the FERC hydropower licensing process. Nearly all of the projects are located at existing Army Corps of Engineers' dams. The company holds preliminary permits for the development of 400 MW of new hydropower capacity, equivalent to the energy production from approximately 1400 MW of solar power or 930 MW of wind power. The current projects will provide enough annual power for approximately 200,000 homes and annually avoid 2.7 billion pounds of carbon emission. The company expects to create 140 jobs per project during development.

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[6] See http://www.eia.gov/tools/faqs/faq.cfm?id=97&t=3 for EIA data on average residential annual electricity consumption for 2010 (updated December 2011).

They also report that they have received preliminary FERC permits for 11 new sites totaling 140 MW. The company states that they will not begin to develop these sites until the PTC is extended and are now only moving forward on licensing 1 of the 12 previously mentioned projects until there is resolution to the PTC issue.

They report that the PTC is valuable and will help ensure new development because it closes the gap between the price of a new hydro plant at an existing dam and the price to build new gas fired plants, which is the de facto baseline for utilities in PPA negotiations.

The company states that a PTC extension (at the full credit rate) would undoubtedly unlock new hydro growth and they would move forward very aggressively on virtually all of their proposed projects. Extension of the current PTC for hydropower (at half credit) also helps, though not as much as a full credit extension.

Conclusion

Hydropower is the country's largest renewable electricity provider, generating approximately 8 percent of total electricity in the United States in 2011.[7] This represents almost two-thirds of U.S. renewable electricity generation.

NHA believes tremendous opportunities exist to further increase deployment of hydropower resources to realize our national clean energy, job creation, and environmental goals.

However, the looming expiration of incentives is already leading to a decline in the commitment to new projects and construction. As the company examples cited above illustrate, the full scope of this potential will only be realized if there is continued stable policy support for project deployment, such as extension of the placed-in-service dates of existing renewable energy incentives.

Again, NHA would like to thank you for the opportunity to comment on the need for continued federal tax policy support of renewable energy technologies - particularly hydropower and marine and hydrokinetic (MHK) - and we look forward to serving as a resource for the Committee.

Sincerely,

Linda Church Ciocci
Executive Director

[7] http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_1

Renewable Energy Tax Incentives: How have the recent and pending expirations of key incentives affected the renewable energy industry in the United States?

United States Senate Committee on Finance
Subcommittee on Energy, Natural Resources, and Infrastructure
Tuesday, March 27, 2012

Statement for the Record
Of

Wesley T. Hansen
Manager, Applications Engineering
Nuvera Fuel Cells, Inc.
129 Concord Road
Billerica, MA 01821
Voice: +1.617.245.7590
Fax: +1.617.245.7514

Hydrogen Infrastructure Tax Credit

Action Now Will Add Jobs, Increase Clean Energy Capacity, and Reduce CO_2 Emissions

Fuel cells generate electricity electrochemically, with no combustion, and can provide overall energy efficiency increases of 150-200% over traditional internal combustion engines. Fuel cells yield energy efficiencies in all applications, including power generation, industrial equipment, and transportation.

The material handling market, which is one of the first markets to use commercial fuel cell systems, is also one of the markets that the Department of Energy (DOE) considers as a precursor to the transportation market.[1] Using fuel cells in forklifts now will accelerate the development of technology, manufacturing capacity, and supply base necessary to ensure the commercialization of automotive fuel cell systems by 2015. Additionally, this early market will yield valuable field experience with both the fuel cell and its supporting hydrogen infrastructure. Compared to charging standard batteries with the average U.S. electric grid electricity, these forklifts will offset over 47 million megawatt hours of electricity. In addition to offsetting U.S. grid congestion, it is estimated that these sales of fuel cell and hydrogen generation systems will produce over 22,000 jobs across the extended enterprise of fuel cell and hydrogen manufacturers and their supply chains by 2016.

To spur the use of fuel cells in forklifts and other applications, Congress provided an IRC Section 48 Investment Tax Credit for fuel cells in 2005 and subsequently extended the credit through 2016 in the Energy Improvement and Extension Act of 2008. During 2008, consideration was given to establishing a separate tax credit for hydrogen infrastructure and fuel that would support installation of infrastructure systems in warehouses and distribution centers to support material handling equipment (H.R.5746 and S.2129), as these would be a precursor to mass robust transportation fuel cell and hydrogen infrastructure systems.

Issue

Unfortunately, there are several issues with the language in current law, with the net result being that hydrogen stations installed for use by fuel cell forklifts would not be eligible for the tax credit. Importantly, as currently drafted, IRC Section 30C defines qualified alternative fuel vehicle (QAFV) refueling property to have the same meaning as under IRC Section 179A(d), which incorporates by reference a definition of a motor vehicle as "any vehicle which is manufactured primarily for use on public streets, roads, and highways (not including a vehicle

operating exclusively on a rail or rails) and which has at least 4 wheels." This definition of motor vehicle would not allow forklift installations to take advantage of the tax credit and must be resolved first and foremost. Without correcting this issue, near-term hydrogen installations, the vast majority of which are planned to be for fuel cell forklifts, would not be incentivized as intended, likely leading to delays in the commercialization of automotive fuel cell systems.

Impact

Because current law does not accommodate fueling infrastructure for the material handling market, the industry has been unable to take advantage of the credit. Because the infrastructure is a large investment for customers, this is negatively impacting customers who have been previously committed to moving towards hydrogen fuel cell powered equipment.

Resolution

Proposed Amendment to IRC Section 30C Alternative Fuel Vehicle Refueling Property Credit

The proposal would broaden the applicability of the tax credit to property used to refuel forklifts and other motor-propelled carrying and towing vehicles.

Tom Pallow
Third Way Progressives
22 Orchid Court
Bellingham WA, 98229-0000

How Obama and Democrats are Not Going Far Enough Regarding Tax Policy and American Job Growth

By Tom Pallow of Third Way Progressives: (202) 903-1133 or

This paper is not at all about what one would commonly imagine upon reading its title. It is not at all about Obama and Democrats not being "progressive" or "liberal" enough. It is about them not going far enough into the radical center, not adopting enough Endogenous Growth policies, or what we call qualityist policies. As of early 2012 Obama and Democrats are certainly not doing these things enough to turn the economy around or to inspire the electorate to vote for him and Democrats this fall.

We are in a unique position in US and world history. The most important change in our lifetimes has been the effective 12 fold increase in global trade that has accompanied the weakening and fall of communism, along with new technologies that make outsourcing across state and national borders as easy and fast as the movement of light. With the fall of communism, every multinational employer in the developed world no longer needed to worry that an investment in an underdeveloped nation might become nationalized by an emerging communist government. This suddenly very different reality opened up a new cheap labor market of 4 billion people. No major nation in the future is ever going to champion socialism or communism, so the old world order is never going to return. Therefore, all successful tax and spending regimes in the future will need to be structured around the realities of this highly competitive global economy. Not only will this new regime make our economy more competitive, but it will make it more egalitarian and more environmentally sustainable than it ever has been.

Regarding tax policy, a good first step in the right direction is the recent plan by Senators McCaskill and Collins to cut the employer payroll tax rate as a way of carving out, or exempting, US employers from any tax increase on the wealthy. Given that about 65% of US employers are taxed at the personal income tax rate, and given that these businesses are generally responsible for creating as much as 90% of America's new jobs, raising taxes on these job providers is never a good idea in a global economy and especially when the economy is weak. US employers are always a very small percentage of tax payers. For example, the McCaskill-Collins carve out would only cost about 13% of their tax increase on those

who make over $1 million that was proposed by them in December to pay for this year's employee payroll tax cut.

There are several reasons why a US employer exemption, or carve out, is very important policy. For one, it is very cheap while it accomplishes much. This is because, with a US employer carve out, the math always works for us. Very little of the earnings of the wealthy, as well as all others, actually comes from the profits of the active ownership of a business that employs in the US. The high mark for this number is about 20%. This comes as incomes reach about $350,000 a year or at about what demarcates the top 1% of US income earners. As incomes go higher and lower from this point this percentage drops quickly. Again, the McCaskill-Collins carve out for those earning over $1 million a year would only cost 13% of the total tax increase. If this new tax incentive to employ in the US were to motivate more of the wealthy to employ in the US so that this percentage were to increase, then great, more Americas would be employed and the increased demand for labor would increase real incomes and tax revenues.

Reason two, when raising income taxes on the wealthy without a US employer carve out, raising taxes on wealthy growing businesses has the effect of slowing the economy to some degree because capital is taken away quarterly from growing businesses who would otherwise use that capital to invest in new US jobs. This is especially true coming out of a recession when about 90% of all new jobs are typically created by businesses that are taxed as personal income, and most of these are within the top income tax brackets.

Thirdly, without a carve out, US employing businesses have an incentive to close up shop in the US and outsource to foreign countries in order to avoid the higher tax. This is especially true within the US when states that raise their income taxes will often see employer flight to US states that are not raising their income tax or do not have a state income tax. This is a big problem right now with our cash strapped states. The current problems in Illinois are just the most recent example, and their example will deter others states from raising their income tax. These states, along with Illinois, will continue their cash flow problems, but a state employer carve out with a state income tax increase would solve this problem. There is more concerning this problem below.

Reason four is one of the most important reasons. The greater the carve out is made, that is, the larger the difference in effective tax rates are made between the US employing wealthy and the non- US employing wealthy, the greater will become the tax incentive for the non-US employing wealthy, or others who want to become wealthy in the future, to find ways to stay wealthy or become wealthy by employing fellow Americans. This tax incentive will greatly increase economic growth and the demand for labor in the US. It is only increases in productivity along with increases in the demand for labor primarily in the private sector that has the effect of raising real wages for the poor and middle class.

Reason five is as important as reason four. Because American voters will soon realize that a US employer carve out tax strategy will not slow down the economy but actually increase private sector jobs, our federal and state governments will be able to raise income taxes far above where Americans would otherwise let them go. As this occurs, the above reason four will only become more pronounced, thus creating a virtuous cycle of increasing private sector job growth that will also be accompanied with increasing government revenues!

Reason six is as important as reasons four and five. These increased tax revenues will allow our governments to fully fund new industrial policy projects that will further grow the US private sector

while allowing us to fully fund current government programs. Fully funded governments, along with a robust private sector that is aided by new industrial policy projects will increase the demand for labor in the US so high as to increase real wages in the US for the first time since 1967 when the global economy really began with the end of the Kennedy GATT trade rounds that signaled the weakening and eventual fall of communism!

Reason seven, our federal deficit and debt problems, along with those of our states, that have the effect of creating economic uncertainty and trepidation that then slows the economy, will be no more!

In his American Jobs Act President Obama proposed an employer payroll tax reduction that holds the possibility of working much like the McCaskill-Collins US employer carve out. The problem is that Obama proposed that this tax cut only exist for one year when it needs to be permanent. We can only hope that if this part of the American Jobs Act were ever passed, a part of this tax cut would be made permanent, along with the Bush tax cuts expiring on the top two income tax brackets, thus creating an income tax increase with a permanent US employer carve out.

If President Obama does not aggressively sell such an idea by the general election season he will lose reelection. Under current proposals, it will not take long before the Republicans will be able to explain that all of Obama's proposed tax increases will only cover about 10% of our federal deficit. Obama's proposed expiration of tax rates on the top two brackets, his Buffet Rule which is essentially a capital gains tax increase on those earning over $1 million, his taxing carried interest at the ordinary income rate, his valuing itemized deductions at 28% for those earning over $250,000, and his elimination of oil tax preferences and corporate jet depreciation will altogether only raise about $150 billion a year while our deficit in 2011 was over $1.5 trillion. Therefore, the president will be asking to raise all of these taxes on a still slow and probably even slowing economy just to cover 10% of our deficit!

I know that Democrats like to point to polls that show that most Americans favor many of these tax increases. But very importantly, if you study the actual wording of the questions in these polls you will see that most of these polls make it appear as though these tax increases would create an equal trade off with spending cuts in order to cover our full deficit. These questions read as though these tax increases would cover 50% of the deficit with spending cuts covering the other 50%. However, given that they would only cover about 10% while likely slowing the economy, the Republicans will easily be able to argue that we have a spending problem not a revenue problem and that Democrats will destroy any economic growth we have. However, with US employer carve outs this problem will be eliminated. In fact, due to reason number four above, we will be able to argue for and enact even larger tax increases. So hopefully President Obama will push for a permanent employer payroll tax cut and sell it as a US employer carve out that would accompany a tax increase on the wealthy.

Better yet, the President and all others looking to create an employer carve out when increasing income taxes should look to institute an Employee Tax Credit along with an employer payroll tax cut. Regarding employer carve outs for income tax increases, while an employer payroll tax cut has some advantages over a US Employee Tax Credit, a US ETC has more advantages, but a combination of the two is optimum. An ETC is a credit against a final income tax bill that has a flour cap at a particular effective rate. For more on US ETCs see our website, ThirdWayProgressives.org.

An employer payroll tax cut does have the advantage that the tax cut is awarded immediately with the first employment of an individual, while with an ETC the tax cut is awarded latter, after a profit is made. The immediacy of the payroll tax cut makes the cost of capital for the employment of new hires lower

than it would be with an ETC. Further, it is important in the global economy to make employing fellow citizens as easy as possible and an employer payroll tax cut helps in this regard. However, Social Security and Medicare must be paid for, and employer payroll taxes cover about 18% of our total federal revenues, so only so much can be cut. For these and another very important reason our tax plan proposes an employer payroll tax cut for new hires while relying primarily on a US ETC to achieve most of the carve out.

The most important advantage of a US ETC is that it will allow our 31 states that do have income taxes to enact state employer carve outs, while with an employer payroll or withholdings tax cut this would not be possible. Given that the economic competition for employment between our states is even more intense than it is between us and other nations, employer carve outs are a must for our states! Employer payroll tax cuts as carve outs are impossible for our states because most of these tax rates are already very low in places, too low to create carve outs. More importantly, these payroll taxes, that usually come in the form of unemployment and disability insurance taxes, are generally structured as to create very valuable tax incentives, with those businesses and industries that have high rates of unemployment and injures paying higher tax rates and those without them paying lower to often extremely low tax rates.

It is very important that these tax incentives are maintained. Therefore, in order to create carve outs, state ETCs will need to be enacted. Further, given that most tax policing is done by the IRS and that states have much less resources in this regard, it would be very inefficient for each individual state to have to do all of its policing for its ETC. For this reason, and the fact that we can only cut federal payroll taxes so far, the federal government should enact a US ECT as part of an employer carve out strategy. Hopefully we are concerned as much about the welfare of our state governments as we are the federal government.

Another very positive feature of December 2011's McCaskill-Collins Bill is its "technology company," venture capital investment tax credit or possible carve out. However, this tax credit's shortcoming is that it is only for investments in technology companies that are expanding in the US, while it should be for investments in all companies that are expanding in the US. Also, many problems will arise be trying to define what a "technology company" is.

Our qualityist capital gains tax plan would raise to 25% today's top capital gains tax rate from 15%. However, it would carve out, and slightly lower from where the rates are today, capital gains tax rates on four basic investments that would all need to have a minimum of jobs created in the US. These for fundamental investments are: first issue bonds, stocks bought at IPO, venture capital investments, and the underwriting of any of the latter three investments. More on our capital gains tax plan can be found at ThirdWayProgressives.org. These four investments are the primary products of the financial market that allow it to raise capital for growing businesses in America. Generally in order to expand, small businesses raise venture capital, medium sized businesses launch IPOs, and large corporations float bonds. With our qualifications for increased employment in the US in order to achieve the lower tax rate, the financial markets will be generating jobs in the US like never before!

The virtues and math in our capital gains tax plan are nearly identical to that of a US employer carve out with an income tax increase. Generally, only about 5% to 12% of all gains in the financial markets come from the above four fundamental investments. However, these four investments are responsible for nearly all of the job growth that is facilitated by the financial markets. It is not that the other products in the financial markets are not important to the economy. It is just that a higher capital gains

tax on them would have little to no effect on American job growth. Except for first issue mortgage backed securities that could also receive a lower tax rate with little cost, virtually all of the rest of the financial products sold are preexisting stocks and bond, and options and derivatives. This other, typically 90% or more, of the financial markets, even with a much higher capital gains tax rate, would retain enough liquidity in their market as to not present any adverse effect on the businesses that rely upon them. However, the more investment we have in the four fundamental financial vehicles, the lower will be the cost of capital for American businesses that are expanding in the US. The greater the difference in tax rate between these four investments and all the other financial vehicles that are generally speculative paper trades, the more American economic growth will occur through financial markets via this tax incentive and the more tax revenues will be raised. Therefore, our capital gains tax regime will allow the federal government and our state governments to be able to raise capital gains tax rates far above were they are today while actually improving the economic efficiency of our financial markets!

Our overall qualityist tax plan also has a C Corporation tax plan that uses ETCs to incentivize job growth in the US along with further rewarding and incentivizing compensation above the US norm for US employees. Our overall plan also contains tax policies designed to create a more environmentally sustainable and safe economy. All of these plans can be found at ThirdWayProgressives.org.

But tax policy is not the only area where we need to adapt government policies to the realities of our highly competitive global economy. Qualityism resides in the world of the New Growth, or Endogenous Growth, Economics School, a school that is only a few decades old and not completely defined. Like most Endogenous Growthers, qualityism believes that economies are affected positively by three primary factors. Like the Keynesians, qualityists believe that it is important that governments take an active role in keeping consumer demand high. Yet like classical, neoclassical, or supply-side economists, qualityists believe that it is very important to keep the cost of capital low for the private sector by keeping taxes low on businesses and capital formation. The above qualityist tax policies and others that can be found at ThirdWayProgressives.org destroy the policy catch 22 that we have been in for the last 100 years regarding this unfortunate tradeoff between Keynesian and supply-side economics. Our new global economy is too competitive, complex, and demanding to put up with this catch 22 any longer! But qualityists also believe that there exists a third primary engine of economic prosperity that is at least as important as the other two. This engine is the emergence of new technologies and methods of production.

Like New Growth or Endogenous Growth economists, and like those on the right who call themselves Real Business Cycle theorists, qualityists see economic growth and the business cycle as being dominated by the arrival of new technologies, products, and methods of production that will be bought and invested in even if consumer demand is low or the cost of capital is high. When one examines historically how relatively small portions of the economy can be responsible for very large portions of the growth of an economy the reality for this perspective becomes extremely evident. Some studies have shown that as much as 60% to 90% of the economic growth in an expansion occurs in what begins that expansion as only 2% to 3% of GDP. For example, housing, healthcare, and cell phones were responsible for an extremely large percentage of economic growth in the US between 2002 and 2008. Between 1992 and 2000 it was personal computers and the internet that drove growth. Between 1982 and 1990 it was commercial real-estate and computers for businesses. In the 1970's it was gasoline and inflation. In the 1960's it was aerospace and war. In the 50's it was TVs and other consumer electronics. In the 40's it was war, in the 30's government, in the roaring 20's cars, trucks, and radios, and in the 10's cars and war. Before 1913 there took place shorter economic cycles that were most effected by railroad expansions.

Yet unlike Real Business Cycle theorists who believe that the best policy is for governments to simply not get involved and let this real cycle play out, Endogenous Growthers and qualityists believe that the government should, and has in the past but never optimally or efficiently done so, facilitate and add to new technological development. When one recognizes that the private sector alone has never been able to produce at close to peak potential scientific and technological outputs, and given our need for more environmentally sustainable technologies among others, it is easy to realize that the government should be doing much more in this area. It has been said by those who study the subject that the free market alone only generates about half of the R&D that the economy could efficiently produce.

A majority of the most impressive achievements of mankind were financed and designed with government funding, from the pyramids in Egypt, to the ships that were designed via Prince Henry the Navigator of Portugal and then financed by the royalty of Spain that discovered the New World, to the moon landing, satellites, and the internet. Moreover, war financing has generated much technological improvement, from arguable everything but the pyramids above, to many improvements in the combustible engine and most improvements in aerospace. Given our technological needs as a growing species with only one planet, we should not rely on the inefficiencies of war as the catalyst for needed technological improvements!

It is wealth and better technologies that allow societies to preserve their environments while acquiring what they need and desire, not economic constraints and poverty. The poorest and least politically and economically free nations of the world are all its least environmentally preserved. Therefore, it is the free market in accordance with predictable, transparent, and robust government R&D support, along with tax incentives both on the purchasing and profit end, which will preserve our environment. But it is also the free market with such government support that will best allow us to fulfill our economic needs, wants, and dreams that are not hampered in any major way by environmental concerns. The people of the world are made better off if a favorite play toy of many that the private sector alone would have taken 50 years to develop is there to enjoy 25 years earlier because a government helped in the development of that product and production. Further, when structured properly, workers are able to engage in jobs that produce higher rates and qualities of output while enjoying a larger share of this output.

For all of these reasons an important feature of qualityism is structuring the most fair and economically efficient way for the government to assist the private sector in increasing the economies overall scientific and technological output. As importantly, qualityism is structured so that the people of a nation who pay for their government's successful R&D support receive just compensation for these expenses while their workers are able to benefit from an increased demand for their employment. For this to be done in a way that is predictable, transparent, and not swayed by political influence is of utmost importance. Fortunately, such a method is also one that would be most economically efficient and without waist.

In the last several years our federal government under programs like the Energy Policy Act of 2005 and the assistance of General Motors has began to move in this proper direction. However, many of these programs have provided assistance at points of production that create waist and can be adversely altered by political influence. It is very important to remember that the point of production where government can assist the private sector with the least amount of waist and adverse political influence is during the basic and applied research and development stage.

President Obama's newly proposed National Network for Manufacturing Innovation at first glance looks to be the right step in the right direction, as has long been the Brookings Institute's Energy Discovery – Innovation Institutes. However, with only $500 million to $1 billion to be spent over four years with the new NNMI, this is a baby step when an Olympic long jump is needed. Nonetheless, if structured properly it will take relatively little time before it is found that this program more than pays for itself. I don't mean "pays for itself" using typical squishy Washington DC accounting, so the monies earned through the program could be ploughed back into it. However for now, at the very least and with this year's election, a real commitment to this program needs to be made!

What is suspected that the NNMI would do because it is reported to be molded after Germany's Fraunhofer Institute is to invite as many private business participants as possible to come together along with the government to brainstorm over what possible technological developments they would like to collaborate in developing that they would all find benefit in using once developed. Those ideas that attract the most private sector R&D investment commitments would then also receive government R&D funds and other basic science support. With the right government incentives the intellectual property developed would then be produced and used in the US.

At present there is a debate within the administration as to whether the NNMI should be structured with incentives for businesses to manufacture in the US those products that arise using the NNMI government funds. Unless China and India offer to pay, and I don't mean lend, the NNMI funding, the answer to this question should be yes. More specifically what should happen is that as federal, state, and local funds begin to rise on a particular project, so too must correspondingly rise the percentage of payroll that a business has in each jurisdiction relative to its global payroll in order for it to have a right to the intellectual property developed. Failure to do so would mandate very high royalties and fees in order to use the intellectual property. Further, the best way to calculate payroll increases would be to measure them through the amount Employee Tax Credits earned. Given that our ETCs as part of our personal income and corporate tax plans allow for ever greater ETC rewards that can be given to businesses that compensate their employees at ever greater amounts above the norm, the NNMI would then maintain, create, and attract higher paying jobs in the US. Germany's Fraunhofer Institute provides 70% of its funding via its own internal profits, with only 30% of its funding coming from German governments. With the right incentives and tax structure the NNMI would more than pay for itself!

Such institutes in the US will need to expand far beyond what is being proposed above. A very extensive NNMI along with robust state involvement and connected institutes through business incubators and our universities will be a must. One of the missions of our universities should now be to be their own business incubators with manufacturing institutes. Large patent pools and networks should be formed within and among them. Students, private groups, and perhaps even non-affiliated individuals would give up exclusive intellectual property rights in exchange for a predetermined percentage of royalties. The exclusivity of each patent pools would be determined by the university and each program coordinator. Private investors, existing businesses, and those within the business incubators would then be able to license any such patents with similar payroll, ETC, and/or royalty commitments as would exist above with the NNMI. Further, universities should stop using not always relevant math courses as "weeder" courses into many science and engineering degrees. Albert Einstein, perhaps the greatest physicist of all time, was a well below average mathematician. It is safe to say that many of the futures greatest inventors and scientists may be the same.

All of this will be part of a transformation of our universities that is typical for a time period that has experienced an even more profound economic transformation, our rapid movement into the global

economy. After the Civil War and around the turn of the last century the mission of America's universities was greatly broadened. Prior to the Civil War American college students could typically only receive degrees in one of five subjects: law, medicine, theology, philosophy, or science. But as our economy was rapidly transformed from agricultural to industrial during this period, within our colleges and universities the subjects of philosophy and science splintered and became specialized eventually into what we know them to be today. During this period higher education became much more relevant to the needs of society. A similar revolution is now upon us, and reluctant schools will only suffer.

Given this reform to higher education along with the NNMI it would not take long until the economies scientific and technological output would be taken to a more desired level. Along with various environmental tax incentives and programs, the possibility of maintaining a pristine and safe environment for the US and the rest of the world would greatly increase. On the purchasing end, the federal, state, and even local governments could enact an Environmental Fair Tax. For states and local governments this would simply mean that they would structure their sales taxes such that products with a great environmental rating would receive a very low to no sales tax, while products with low environmental ratings would make up for this cost by having much higher sales tax rates. This tax would be revenue neutral. A federal Environmental Fair Tax would piggy back on the state and local sales tax system, lowering sales taxes even further for products with great environmental ratings while raising sales taxes even further on those with poor ratings.

Our other environmental tax proposal would reword tax credits for the production of products using best practices. Just like with an Environmental Fair Tax on the federal level, the EPA could designate, and then Congress and the president could OK, best, standard, and poor practices, and then award a lower income tax rate via this designation. Also just like with an EFT, these practices could be judged for what is generated for the production of a product, when a product is in use, and when a product is discarded. Another very positive proposal for the environment is to have the federal government announce that the first some odd amount of the production of a certain best practice could be produced tax free. All of these tax incentives would slowly but inevitably create a cleaner environment as new best practices are invented and old best practices becomes standard practices and so on. With these tax policies understood as being permanent, given potential technologies being even close to equal, engineers will always default to employing the more environmentally friendly technology. Furthermore, given that the overall output of environmentally friendly technologies will increase under qualityism, if the free market with these tax incentives alone is not enough for a given sector to move away from certain less environmentally friendly products and procedures, it will then be easier for governments to mandate the use of cleaner technologies without adversely affecting the economy.

But what qualityism would best achieve over time is a more egalitarian society! Our tax plan would raise far more government revenues than any other currently proposed tax plan. Much of these new revenues could be used to improve education. Greater educational opportunities are liberating for both individuals and the overall economy. Until the last few years, greater educational outputs have been virtually the only policy initiatives of Endogenous Growth Economists. A more highly educated work force will entice capital and job growth, along with raising productivity and incomes. Meanwhile the tax incentives in qualityism also increase the demand for labor in the jurisdiction of the government that employs them. In the end, given that government can never be larger than the private sector that creates it and keeps it alive, it is only the demand for labor in the private sector and increases in productivity that can overtime raise real incomes for workers. These tax incentives, along with the NNMI and our proposed incentives for their associates to employ domestically, would ensure that the demand

for labor in the domestic private sector is at its optimum, along with ensuring that desired scientific and technological outputs are at their optimum.

With a greatly increased demand for labor and better technologies that will increase productivity, clean the environment, and deliver better products, workers will be able to demand more of better products, and/or more time off and vacations if they so chose. A great demand for labor will put workers in greater control. Moreover, free market entrepreneurs will have more opportunities than ever before to rise and become wealthy, while everyone will have a more prosperous life even if they chose to do less, all while creating a more environmentally sustainable economy. The economy will be of a higher quality, and this will give all individuals more of an opportunity to do what they dream. Such is the essence of anything that is liberating.

Qualityism liberates us from the failed philosophies of both Keynesianism and neoclassical economics. Keynesians, especially in a competitive global economy, adversely constrain and shun the private sector while far too often they spend through the government in ways where economic efficiency is inadequately measured. Meanwhile, neoclassical economists or supply-siders fail to live in the real industrial economy where, without government or union intervention, consumer demand by the masses is never able to keep pace with the rest of the economy, leading to an ever slower and less prosperous economy. Unfortunately today in our global economy, the only redeeming value of either economic philosophy, and therefore most of the beliefs either political party, is that their advocates block the other party from completely running, and therefore completely destroying, our economy!

Unfortunately for Democrats in our global economy, it would take Keynesians less time to destroy our economic prosperity than it would for supply-siders to do so. Certain destruction would come with supply-side policies, but a slower certain destruction. The American people sense this, and this is why since the global economy really began with the end of the Kennedy GATT trade round in 1967 Democrats have only had one two term president while the Republicans have had three. Further, every exit poll showed that that without Ross Perot running Bill Clinton never would have won in 1992, so the Republicans would have had a fourth two term president and the Democrats zero. In order to win in 1996 Clinton had to "triangulate" and become a "New Democrat." Without Watergate, the financial crash in the fall of 2008, and Ross Perot, it could have been a complete wipeout for Democrats since 1967. No president has ever been reelected with such a poor approval rating this close to an election as President Obama now has. Democrats can pretend this is not a problem and continue to lose, as the American people continue to lose. Or they can face reality and adopt Endogenous Growth, qualityist policies, thereby improving their lot and more importantly the lot of the American people.

Exactly 100 years ago, as the most developed economies of the world experienced an equally pronounced and profound economic transformation as our sudden movement into a global economy, the Democratic Party took up the mantel of the progressive income tax and other progressive legislation as a way of adapting to the sudden movement from a primarily agricultural economy to a primarily industrial economy. This economic transformation was primarily due to their recent development of electricity, mechanized farm equipment, and railroad expansion. In an agricultural economy, during a recession people can remain or move back to family farms and live off of them. In an industrial economy this is much less so. Plus, industrial economies have to deal with non-reinvested profits that disallow workers to be able to keep their consumer spending at pace with the rest of the economy, thereby helping to bring on recessions. Only progressive income and capital gains taxes can increase consumer spending by the poor and middle class because all other forms of taxation are regressive so they cannot increase moneys to the poor and middle class. These are the reasons why between 1910 and 1915

virtually all of the economically developed nations of the world enacted for the first time, with a few short exceptions in Britain and the US in order to pay for 19th century wars, progressive income taxes, along with other progressive legislation. All of these nations, and soon after most of the nations of the world, have had progressive income taxes ever since.

Today we still live in an industrial economy and hopefully with vigor want to remain in one. Therefore, we still must redistribute income in order to keep consumer demand up, and we must do it through progressive income taxes. However, given our now highly competitive and employment mobile global economy we must counter our progressive income and capital gains taxes in a much more sophisticated manor that does not damage domestic job growth but actually incentivizes it. Income and capital gains taxes make up about 55% of our federal revenues and the top 5% of income earners pay about 70% of these taxes. The top 5% or higher of income earners is where the money is, and this is where we must acquire it. However, and very importantly, our qualityist income and capital gains tax plans increase taxes only on the moneys in the economy that are LEAST responsible for domestic economic growth while incentivizing domestic economic growth!

No major nation of the world in going to champion communism or socialism and take this world back to the pre-global economy days. The lesson that has been learned by effectively all the world that came out of the grand struggle of communism and socialism against the free market is that a private economy with a profit margin is much more efficient and liberating then is a government controlled economy without a profit margin. Communism and socialism have been permanently discredited and there is no going back. The global, industrial, free market economy is here to stay, until sometime long after we are dead it transforms into something different. If the US were to now champion qualityism, it would not take long until the rest of the world had more democratic, free market, qualityist governments which would therefore have higher labor and environmental standards. This would in turn allow the US and the other economically developed nations of the world to have ever higher labor and environmental standards. Our governments much better fiscal position under qualityism, along with similar governments and fiscal positions in Europe and Japan, would also give these democratic nations much greater influence upon the world and upon all undemocratic nations both large and small.

Just like with what was done 100 years ago, the Democratic Party must lead the way in applying new policies to a new economic reality. Being the "conservative" party, or in other words the "slow to little change" party, we cannot rely on the Republicans to champion these new policies. The Democratic Party also led the way during its inception during the Second Great Awakening of the early 1800's by championing very important democratic reforms that made our democracy much more representative. The early part of each century, following a cycle of four roughly 25 year long generations, or a cycle of roughly every 100 years, has always experienced a profound and very substantial redefinition of what people considered to be politically and socially liberating. This occurred during the Progressive Era of the early 1900's, the Second Great Awakening of the early 1800's, the Great Awakening of the early 1700's, the Puritan Awakening of the early 1600's, and the Protestant Reformation of the early 1500's. This 100 year cycle in this manifestation appears to have begun with the great period of nation building in Europe in the late 1400's that was primarily a result of the invention of the canon and the printing press during that century. However, a paralleling sequenced 100 year cycle of new and profound societal changing ideas appears to have followed this same pattern as far back as into the ancient world. But most importantly for us, an Awakening of more modern magnitude is, and must, now be upon us. The sooner we accomplish what past generation have and rise to the challenge of history, the better off we and all future generations will be!

Statement of the Window & Door Manufacturers Association

before the

Subcommittee on Energy, Natural Resources and Infrastructure

Committee on Finance
United States Senate

on

"Renewable Energy Tax Incentives: How Have the Recent and Pending Expirations of Key Incentives Affected the Renewable Energy Industry in the United States?"

March 27, 2012

Chicago Office: 401 N. Michigan Ave., Suite 2200 | Chicago, IL 60611 | Phone: 312-321-6802 | Fax: 312-673-6922 | www.wdma.com
Washington Office: 2025 M St, NW, Suite 800 | Washington, DC 20036 | Phone: 202-367-1280 | Fax: 202-367-2280 | www.wdma.com

The Window and Door Manufacturers Association (WDMA) would like to thank Chairman Bingaman, Ranking Member Cornyn and the members of the Subcommittee for the opportunity to provide this statement regarding our nation's energy tax policy and the vital role it plays increasing energy efficiency and job creation.

Founded in 1927, WDMA is the premier trade association representing the leading manufacturers of residential and commercial window, door and skylight products for the domestic and export markets. WDMA members are focused on Total Product Performance™ products that are designed and built to performance-based standards. WDMA members are leading America's efforts to develop and utilize energy efficient windows, doors and skylights for both new and replacement construction.

We are particularly appreciative of the Subcommittee's interest in examining the goals and implementation of energy tax incentives. Our testimony will comment in general on the goals of energy efficiency in buildings and specifically on the importance of the 25C tax credit to attaining the dual objectives of saving energy and spurring investment in U.S. job creation.

Meeting Our Nation's Energy Goals Through Window, Door and Skylight Replacement

While much has been said and written about reducing our nation's reliance on foreign oil and investing in renewable energy technologies—both important goals—not as much attention has been paid to the dramatic impact that improving the energy efficiency of existing buildings could have on reducing energy consumption, and, as a result, reducing our dependence on foreign oil and other fossil fuels.

40 percent of all energy consumed in the U.S. is consumed by residential and commercial buildings, while U.S. buildings alone accounted for 8 percent of global energy consumption in 2008.[1] Significantly contributing to that energy consumption is the stock of nearly a billion single-pane windows still in use in residential buildings alone. As the California Energy Commission notes, the amount of energy lost each year through inefficient windows and doors is equivalent to the amount of oil the nation receives from the Alaska pipeline.[2]

Any national energy tax policy needs to make replacing these inefficient windows and doors a major component if we are to make a dent in the overall efficiency of our nation's residential and commercial building stock.

The 25C Residential Energy Efficient Tax Credit

Enacted as part of the Energy Policy Act of 2005, the original purpose of the Residential Energy Efficient Tax Credit (IRC 25C) was to save energy. However, in recent years, the 25C incentives have achieved two compelling national goals:

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[1] 2010 Building Energy Data Book, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy,
[2] "Today's Windows," California Energy Commission, Consumer Energy Center, www.consumerenergycenter.org

- Saving energy by making energy efficient home improvements more affordable for a wide spectrum of the American public; and
- Saving thousands of U.S. manufacturing and construction jobs.

We believe that a properly focused residential tax credit can efficiently and effectively spur private investment in energy saving measures. While niche populations utilize other tax credits, the 25C tax credit is broad-based. By all accounts, it was hugely popular with the American homeowner, particularly the middle class, in 2009 and 2010. Internal Revenue Service (IRS) preliminary data for 2009 shows that taxpayers with adjusted gross income of under $100,000 claimed two-thirds of the credit.[3]

Also known as the Nonbusiness Energy Property Credit, 25C provides a credit to homeowners who make qualified energy efficiency improvements, including windows, doors and skylights, to an existing residence. In 2009 and 2010, the credit was increased to 30 percent of the cost of improvements up to $1,500. For 2011, the 25C credit was reduced to 10 percent of the cost of improvements up to $200 for windows and skylights and $500 for exterior doors. The 25C tax credit expired at the end of 2011. Many of the products that qualified for the 25C tax credit, including windows, doors and skylights, are manufactured in America, unlike alternative energy sources that have benefited from other federal incentives.

As most are aware, the nation's housing industry is mired in a slump, which has had a profound impact on the window, door and skylight industry. Residential window sales for new construction dropped 65 percent from 34.1 million units in 2005 to just 11.9 million units in 2010.[4] This has resulted in over a one-third decline in employment in our industry since 2005.[5] Further, private residential investment remains near record low levels at only 2.5 percent of gross domestic product for the fourth quarter of 2011—in comparison to its historic average of approximately 5 percent.[6]

As a result, there has been a demonstrable shift in the last few years to the remodeling and retrofit market for the window, door and skylight industry, spurred in part by the 25C tax credit. The 25C tax credit in effect for 2009-2010 was tremendously successful in supporting the industry and its workers during the worst housing downturn since World War II. The tax credit can be directly tied in our industry to the preservation and creation of American jobs and keeping plants and production lines open.

This shift to the remodeling and retrofit market is evident in comparison to new home sales over the past five years. While total remodeling activity declined somewhat, it certainly weathered the economic downturn much better than new home construction, in large part due to the 25C energy tax incentives Congress enacted in 2009.

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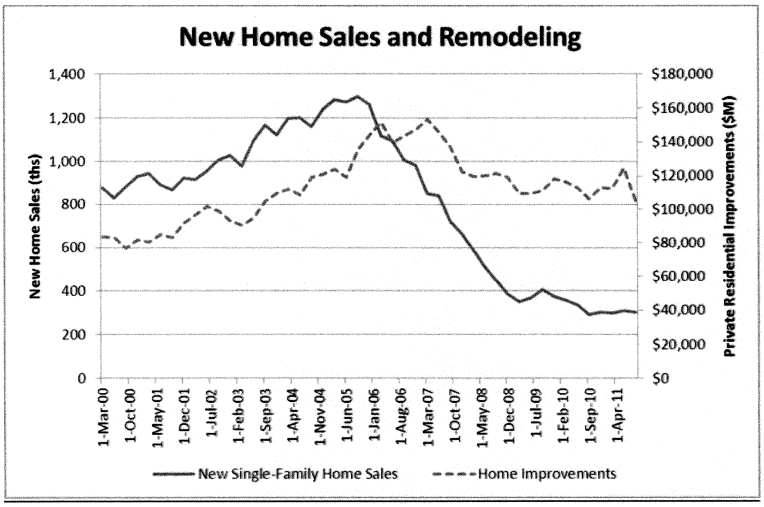
[3] Individual Tax Returns Preliminary Data, 2009, Statistics of Income Bulletin, Winter 2011. Michael Parrisi
[4] AAMA/WDMA U.S. Industry Statistical Review and Forecast, 2010
[5] U.S. Bureau of Labor Statistics data
[6] U.S. Bureau of Economic Analysis data

The following chart courtesy of the National Association of Home Builders (NAHB) plots new home sales (left axis) and total remodeling expenditures (right axis). The data indicates that remodeling expenditures fared better over the 2008 through 2011 period than new home sales. The tax credit program provided a floor on remodeling activity, which has declined only 32 percent since its peak compared to 76 percent for new home sales.



Economic Impact of the Residential Energy Efficient Tax Credit

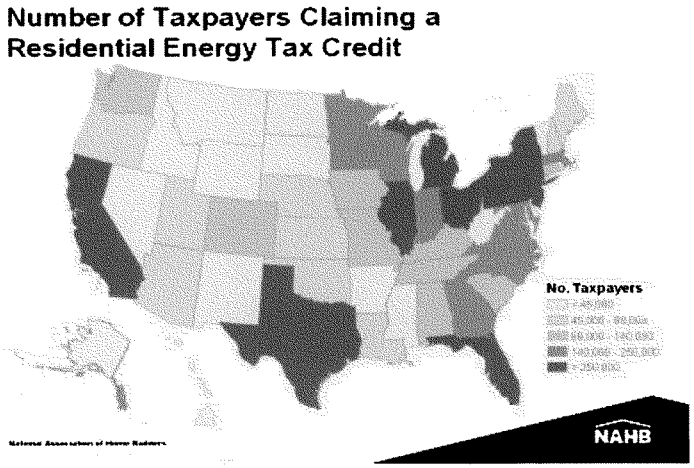
Using the 2009 IRS tax data, the net economic impacts of the 25C tax credit programs from a remodeling perspective are significant (setting aside the long-run energy efficiency benefits for homeowners).

- For tax year 2009, IRS data indicates $25.1 billion of remodeling expenses in connection with the section 25C tax credit
- NAHB estimates that this level of remodeling activity was associated with 278,610 full-time jobs
  - 135,540 of these jobs were in the construction and remodeling sectors
- Homeowners received a tax benefit of $5.17 billion from the 25C credit
- 93 percent of taxpayers claiming the energy credit had adjusted gross income of $200,000 or less

The 25C credit is claimed on the same tax form (5695) as a similar remodeling credit, the section 25D credit, which provides a nonrefundable 30 percent tax credit to consumers for the purchase and installation of certain power production property for a home. Typical uses include

solar, geothermal, fuel cells, and small wind energy. The credit is uncapped, meaning that all qualified expenses may be claimed. Labor costs are eligible, and unlike section 25C, the section 25D credit can be claimed against the AMT.[7]

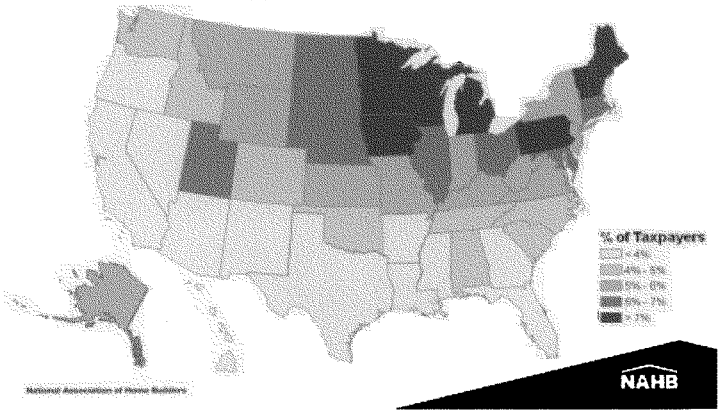
The map below tracks the number of taxpayers in each state that claimed either or both the 25C and 25D tax credit, although NAHB estimates that nearly 90 percent of claims were 25C related. Intuitively, larger states in terms of population had larger numbers of taxpayers claiming the credits.



In the next map, a slightly different picture emerges. This map presents the percentage of taxpayers in each state who claimed either or both the 25C and 25D tax credits in 2009. A clear concentration of tax credit use can be seen for states in the Northeast and upper Midwest. Why? There are two leading explanations. First, homeowners in states in cold weather climates have more to gain from energy-efficient improvements in terms of reduced utility bills. However, there is no reason to believe that warm weather homes could not also benefit from energy-efficient improvements.

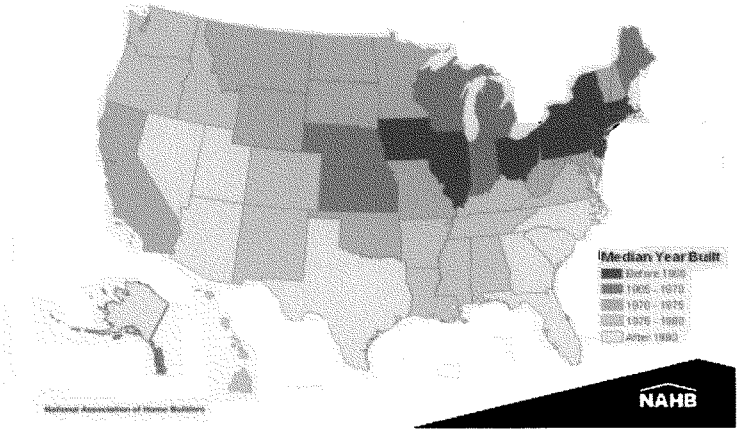
[7] Although the tax code does not allow taxpayers to claim section the 25C credit against the AMT, the annual AMT "patch" typically allows taxpayers to claim section 25C and other personal, nonrefundable tax credits against AMT. The simple, straightforward approach used in section 25D offers a model for improving the section 25C tax credit. A 30% tax credit that includes labor costs and is automatically AMT-preferred is simple, straightforward and effective.

Percent of Taxpayers Claiming a Residential Energy Tax Credit



Thus, the second explanation, and the stronger one, is that the states with relatively more common use of the energy tax credits also contain older homes. The following map details the median year of construction for housing units in each state, and there is indeed a rough correlation between tax credit use and older housing with concentrations of both in many northern states.

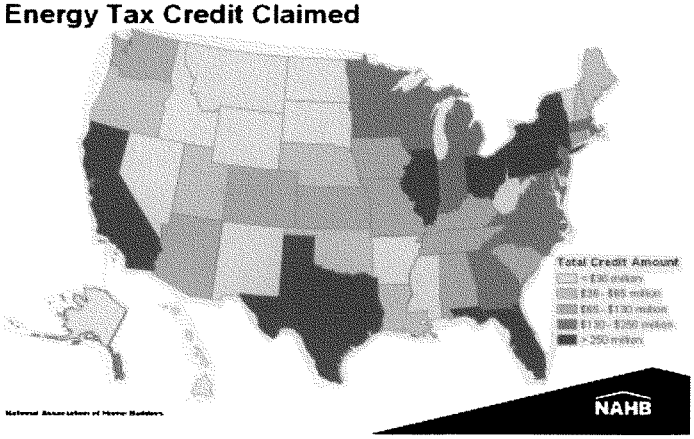
Median Year of Houses Built



A homeowner with a 50-year-old home is much more likely to improve their residence than a homeowner who has purchased a newly constructed home, with new construction more common in the southern part of the nation.

The last map tracks the total amount of the tax credits claimed. Overall, in 2009 taxpayers claimed nearly $5.9 billion in 25C and 25D tax credits. For the two tax credits combined, ***93 percent of tax credit claims were made by taxpayers who had an adjusted gross income of no more than $200,000***, which is indicative of a middle class tax program.

Total Amount of Residential Energy Tax Credit Claimed



With respect to the 25C credit for energy-efficient remodeling of existing homes, the IRS data indicates a total of $25.1 billion of qualified expenditures in 2009.

Because the tax credit in 2009 was limited to $1,500 per taxpayer, not all of this activity was generated by the credit. In fact, according to the IRS data, just a little more than 71 percent of these costs ($5.404 billion versus potential $7.539 billion) were allowed in the 25C calculation due to the $1,500 limit. Moreover, due to other tax rules, only $5.172 billion of the $5.404 billion were allowed as realized 25C tax credits.

The first portion of the 25C credit is due to energy-efficient building envelope improvements, with 13 percent of the 25C claims associated with insulation, 34 percent with windows and skylights, 9 percent with doors and another 9 percent with qualified roofing materials. The second part of the credit deals with energy-saving appliance installation, with 16 percent of the total 25C claims connected to heat pumps, air conditioners, water heaters and stoves; 17 percent with hot water boilers; 3 percent with air circulating fans used with a natural gas, propane or oil furnace.

An economic impact model has been developed by NAHB that enables estimating total employment and economic income impacts from home building and remodeling.[8] The model uses Bureau of Economic Analysis (BEA) data and BEA input-output tables to generate

[8] http://www.nahb.org/generic.aspx?sectionID=734&genericContentID=103543&channelID=311

economic impacts by sector. The following table presents the impacts that result from $100,000 of remodeling activity.

Income and Employment Impacts of Remodeling on the U.S. Economy

	Number of Full-time Jobs	Wages and Salaries	Proprietors' Income	Corporate Profits	Total Income
$100,000 Spent on Remodeling					
All industries	**1.11**	**$52,709**	**$13,810**	**$16,147**	**$82,667**
Construction	0.54	$25,573	$6,601	$4,232	$36,406
Manufacturing	0.18	$8,136	$824	$4,529	$13,489
Wholesale and retail, Transportation and warehousing	0.16	$6,432	$849	$2,307	$9,588
Finance and insurance	0.02	$1,487	$71	$1,459	$3,017
Real estate and rental and leasing	0.01	$315	$1,652	$758	$2,725
Professional, Management, administrative services	0.12	$6,970	$2,191	$764	$9,924
Other services	0.09	$3,797	$1,623	$2,098	$7,518

Source: NAHB estimates, based primarily on data from the U.S. Bureau of Economic Analysis.

The jobs are measured on a full-time equivalent (FTE) basis. Thus, NAHB estimates that every $100,000 of remodeling activity creates 1.11 jobs on an FTE basis. 48.6 percent of those jobs are in the construction and remodeling sector.[9]

Putting all the data together, the IRS data and the NAHB economic impact model indicate that for 2009, a total of 278,610 full-time jobs were in connection with the 25C credit—135,540 of these jobs were in the construction and remodeling sectors. The program supported approximately $13.2 billion in wages for these workers and $7.5 billion in net business income.

Treasury Inspector General Report on Residential Energy Credits

On April 19, 2011, the U.S. Department of Treasury Inspector General for Tax Administration issued a report on the residential energy efficient tax credits (IRC 25C and 25D) and came to the conclusion that inadequate processes were in place to verify eligibility for the credits. Specifically, the report stated that:

> *The IRS **cannot verify** [emphasis added] whether individuals claiming Residential Energy Credits are entitled to them at the time their tax returns are processed. The IRS does not require individuals to provide any third-party documentation supporting the purchase of qualifying home improvement products and/or costs associated with making energy*

[9] The Direct Impact of Home Building and Remodeling on the U.S. Economy. NAHB Economics.

efficiency improvements and whether these qualified purchases and/or improvements were made to their principal residences.[10]

While the report did note a number of deficiencies with the IRS process for establishing verification of eligibility for the credit, some of the credits claimed are legitimate despite the inability to establish eligibility for the credit. In addition, the IRS notes that it can improve its processes to add additional safeguards and improve its ability to verify eligibility. WDMA stands ready to assist the government in making sure that the credit is only going to those who truly deserve the benefit.

To that end, WDMA has recommended consumer-friendly verification techniques to the IRS with the goal of improving the system for assuring that the tax credit claimed on returns are actually for qualifying energy efficient windows, doors and skylights. Currently, no documentation is provided on tax returns about the qualifying product. Taxpayers must maintain documentation in the event of an audit.

There are a variety of methods that should be explored to provide an identifying number or code that could be included on tax returns to help the IRS establish the eligibility of a product for the tax credit, which could be implemented for use with electronic filing. WDMA will continue to work with Congress and the IRS to improve the system of product verification.

Conclusion

Without question, the nation is facing the twin challenges of reducing energy consumption while spurring job creation. The 25C residential energy efficient tax credit encourages middle-class homeowners to undertake important and beneficial energy saving upgrades, which in turn supports American jobs across the housing industry supply chain—from manufacturing to distribution to sales to installation. The 25C credit has been popular because it works.

We would like to work with the Finance Committee in extending the 25C tax credit for 2012 and beyond at a level that will support the nation's energy goals while continuing to create and preserve American jobs.

WDMA would like to thank the Subcommittee for this opportunity to provide this statement and looks forward to working with them on this important issue.

For More Information Contact:

Ben Gann
Director of Legislative Affairs
(202) 367-2346
bgann@wdma.com

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