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to the
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Chairwoman Stabenow, Ranking Member Cornyn, and members of the subcommittee, my name is Dan Reicher and I am pleased to share my perspective on principles for energy tax reform. I am Director of Stanford University's Steyer-Taylor Center for Energy Policy and Finance and a faculty member of the Stanford Law School and the Graduate School of Business. I also serve on the Board on Energy and Environmental Systems of the National Academy of Sciences, co-chair the board of directors of the American Council on Renewable Energy, and am a member of the board of directors of the American Council for an Energy Efficient Economy.

Prior to my role at Stanford, I was Director of Climate Change and Energy Initiatives at Google. I also served on President Obama's transition team where I helped develop the stimulus package for clean energy. Prior to my position with Google, I was President and Co-Founder of New Energy Capital, a private equity firm funded by the California State Teachers Retirement System and Vantage Point Venture Partners to invest in clean energy projects. Prior to this position, I was Executive Vice President of Northern Power Systems, a venture capital-backed renewable energy company.

Prior to my roles in the private sector, I served in the Clinton Administration as Assistant Secretary of Energy for Energy Efficiency and Renewable Energy, the Acting Assistant Secretary of Energy for Policy and International, and Department of Energy Chief of Staff and Deputy Chief of Staff.

The focus of this hearing is energy tax reform. Let me start with an important frame of reference. I believe the key to a more sustainable energy future involves simultaneous and coordinated progress in technology, policy and finance.

- We must accelerate the development of clean energy *technologies;*
- We need to adopt smarter clean energy *policies;*
- And we have to improve clean energy *finance*.

Today, I want to talk about three *finance* challenges with intimate connections to federal tax, regulatory, and fiscal policy. These challenges are:

- How to significantly lower the cost of financing renewable energy*;*
- How to dramatically increase investment in the energy efficiency of buildings;
- How to more effectively commercialize energy technology of all kinds.

1. Lowering the Cost of Financing Renewable Energy – MLPs and REITs

Without the need to pay for fuel, two factors largely determine the cost of large-scale renewable power projects. First, *equipment* costs**,** i.e. what you pay for buying and installing solar panels, wind turbines and the like. Second, *finance* costs, i.e. the cost of capital for a project.

Technological innovation has dramatically reduced renewable energy equipment costs over the last several years. But financial innovation has not kept pace in lowering the cost of capital for commercial-scale projects. As a result, the cost of financing today makes up an ever-greater fraction of the total cost of renewable energy projects, inflating the cost of the generated electricity, sometimes significantly.

Renewable energy projects struggle with high financing costs, not because of technology or off-take risks, but rather the heavy reliance on "tax equity", i.e. investment built around renewable energy tax credits, the Production Tax Credit (PTC), which has been used largely to back wind projects, and the Investment Tax Credit (ITC), which has focused largely on solar projects.

Tax credits are a challenge because:

- They have a very limited group of investors who can "monetize" them – i.e. a couple dozen investors nationwide with hefty tax bills to offset, such as big banks and a handful of highly profitable companies. This requirement for tax liability has sidelined many interested investors including tax exempt pension funds, sovereign wealth funds, and, importantly, millions of retail investors who trade stocks. The small group of eligible investors, facing little competition, can charge high rates for their scarce capital.
- The tax code's ownership requirements regarding the use of credits can tie up capital for years to avoid "recapture" of tax credit benefits, making tax credit-based deals relatively illiquid investments. This lack

of liquidity further drives up the rates that eligible investors can charge for their capital.

- Renewable energy tax credits generally have only short-term Congressional approval. The PTC, for example, was recently reauthorized for just one year. It has expired four times in the past 15 years and in some cases the credit has actually lapsed and had to be retroactively extended. The uncertainty around these credits makes them less attractive to investors and has created boom-and-bust cycles that have hindered the development of renewable power.

The good news is that there is a clear solution to the high cost of tax credits. Give renewables access to the very same mechanisms currently providing low-cost capital to traditional energy projects like oil and gas pipelines and transmission lines. These are Master Limited Partnerships (MLPs*)* and Real Estate Investment Trusts (REITs).

MLPs and REITs combine the fundraising advantages of a classic corporation, i.e. the sale of stock, with the tax benefit of a partnership, i.e. a single layer of taxation. Since Apache Petroleum launched the first MLP in 1981, MLPs have reached a total market capitalization of over $400 billion. REITs have a total market capitalization of over $500 billion, with IRS rulings opening up REIT investment for electricity transmission, gas pipelines, and other energy-related projects.

The use of MLPs and REITs would give renewable energy projects access to far greater pools of capital and, as a result, developers would no longer have to pay scarcity prices for project capital. For example, First Wind, a major wind developer, has stated that its current cost of capital in its tax equity-based investments is 14%. The company expects its cost of capital under MLPs will be 6-8%. Barclay Bank's analysis of MLPs reports a range of yields for energy MLPs, with 7% in the mid-range. So it is reasonable to expect renewable energy projects financed using MLPs to attract capital at approximately 6-8%. Cutting the cost of capital in half for a capital-intensive industry like renewable energy will have a profound impact.

Furthermore, with publicly traded shares, MLPs and REITs would allow millions of Americans to invest in our nation's renewable energy future. They would also open an attractive secondary market for renewable energy investment by allowing the entry of new investors beyond a project's initial phase of tax benefits, thereby enhancing liquidity in the renewable power marketplace.

In recent meetings, traditional MLP investors have expressed serious interest in adding renewable energy projects to existing oil and gas MLPs. They see a variety of potentially attractive aspects to such "hybrid" MLPs, including portfolio diversification.

Clearly, there are an array of advantages to MLP and REIT-based financing of renewable energy projects. The problem is that under current law renewable energy projects are not eligible MLP and REIT investments.

The MLP Parity Act, cosponsored by Senators Coons (D-DE), Moran (R-KS), Stabenow (D-MI) and Murkowski (R-AK) was introduced in April 2013 and would change this situation for MLPs. It is an improved and expanded version of a bill introduced in 2012 in the 112th Congress. The bill continues to include eligibility for renewable power generation and biofuels and widens the scope of projects that qualify for MLP status to include carbon capture and storage, energy storage, building energy efficiency, waste-heat-to-power, and biochemicals.

The MLP Parity Act was also introduced in the House by Representative Ted Poe (R-TX), Mike Thompson (D-CA), Peter Welch (D-VT), Chris Gibson (R-NY), and Cory Gardner (R-CO).

Regarding REITs, the Treasury Department -- on its own -- could issue a broad "revenue ruling" extending this financing mechanism to renewables. The IRS has already extended REITs, through private letter rulings, to, among other things, cell towers, transmission lines, and billboards lit with LED bulbs. There shouldn't be a big jump from these technologies to a revenue ruling including renewables. For example, an LED -- essentially a solar cell running in reverse -- mounted on a billboard is quite analogous to a solar panel on any number of structures, including buildings.

Thirty-five members of Congress – both Democrats and Republicans -- wrote to the President in December 2012 urging his strong support for both REITs and MLPs. The letter said in part:

> *"Opening MLPs and REITs to renewable energy would level the playing field by giving renewables the same access to low-cost capital enjoyed by oil, gas, coal, and transmission infrastructure projects. Small tweaks to the tax code could attract billions of dollars in private sector investment to renewable energy deployment, reduce the cost of renewable electricity by up to one third, and dramatically broaden the base of eligible investors."*

In their letter, the Congressional members did not take a position about an important related issue, i.e. with adoption of MLP legislation how to go forward with the extension of the PTC when it expires at the end of this year, and also how to address the phase-down of the ITC at the end of 2016*. I want to emphasize strongly that my support for MLPs and REITs should in no way signal that I endorse an immediate phase-out of the PTC or any weakening of the current ITC.* The PTC and ITC have been critical catalysts in the growth of US renewables.

The bottom line is that MLPs and REITs could significantly cut the cost of financing renewable energy projects and with further technology progress help make

renewables fully competitive in the near future. Congress and the Administration should open up these mechanisms to renewables and other clean energy technologies and do so soon.

2. Increasing Investment in Building Energy Efficiency: The SAVE Act

The second challenge is how to greatly increase the capital invested in energy efficiency upgrades of commercial and residential buildings.

Many call energy efficiency low hanging fruit. I'd go a step further: energy efficiency is low hanging fruit that grows back. Every day we are inventing and deploying ever more efficient energy technologies. My favorite example is the standard U.S. refrigerator that used about 2000 kWh per year in the early 1970s and -- pushed by a series of DOE efficiency standards since then -- now doesn't use more than about 400 kWh.

Deutsche Bank tells us there is more than a *trillion* dollars worth of energy to be saved in U.S. buildings over the next 10 years. And the bank says that we're looking at about a $300 billion dollar investment opportunity to achieve those savings. But there is barely trickle of investment being made in energy efficiency improvements in existing buildings. Even when opportunity stares us squarely in the face we don't seize it. Three percent of U.S. commercial buildings are renovated each year, yet only about 1 in 10 includes serious energy saving improvements. The numbers are even worse for our homes. Yes, on new counter tops in the kitchen. No, on an energy-sipping furnace in the basement. This is a big loss for the economy — and the climate — when you consider that buildings use about 40 percent of all the energy consumed in the United States.

The largest efficiency opportunity – deep energy retrofits of exiting buildings -- just isn't occurring at a significant scale. Let me be clear, this is *not* a technology issue. It is straightforward to do a serious upgrade to a building's heating, cooling and related systems using well-proven equipment and techniques.

Instead, this is a *finance* issue. How do we help investors of all types see their way clear to large-scale investments in building efficiency retrofits --- and make some money in the process?

Financial institutions have three concerns to varying degrees about investing in building energy efficiency improvements. In simple terms they are:

- **Credit risk** – will the borrower pay the money back?
- **Performance risk** – will the building upgrade save the amount of energy projected?

- **Asset risk** – could the retrofit actually hurt the value of the building?

There are a number of innovative financing mechanisms that are being tested to address these risks and potentially leverage large amounts of private capital for building efficiency retrofits. These include:

- On-bill repayment (OBR)
- Property assessed clean energy (PACE)
- Energy Services Agreement (ESA)
- Energy Savings Performance Contracts (ESPC)
- And others…

Each of these financing approaches has its advantages, and its challenges. For example Fannie Mae and Freddie Mac recently halted use of residential PACE, at least for now. The jury is out on each mechanism and it remains to be seen which can best address the risks -- real and perceived -- that plague private investment in building efficiency upgrades. I urge the Committee to take a serious look at these and other efficiency finance mechanisms and find ways to support their expanded use. In the mean time, there are policy mechanisms that might help in a number of ways.

In the automobile world we cracked the code on efficiency through fuel economy standards that Congress directed EPA and DOT to set. The most recent standards will increase the auto fleet average to about 55 miles per gallon by 2025.

We haven't taken a similar approach to buildings. But there are other policies that could advance building efficiency retrofits. Let me highlight one, the SAVE Act introduced by two members of this subcommittee, Senators Bennet (D-CO) and Isakson (R-GA).

To summarize the legislation, when you apply for a federally backed home loan, which represents more than 90 percent of all new mortgages, lenders include the costs of real estate taxes and homeowner's insurance to determine if you qualify. But they don't consider one of the biggest expenses of owning a home: the cost of the energy it consumes.

Consider two homes for sale with an identical price tag and similar features. But the energy bill for one is $2,000 a year and the other, $5,000 -- a $30,000 difference in home operating costs over 10 years. This simple information, if provided in a clear and timely manner, could make a real difference in a buyer's purchase decision. It might also encourage the seller to replace the old central air conditioner, rather than just gussy up the kitchen.

And, importantly, what if a lender included this information in calculating mortgage terms? *"Buying an energy efficient home? Get a better mortgage!"*

This is exactly what the SAVE Act would do. It would *require* a lender to take the projected energy savings of an efficient home into account when presented with a qualified energy report. Under federal law, borrowers have to report on whether termites are chewing up the beams in an attic. So why not provide the incentive for a homeowner to discover an inefficient furnace devouring cash in a basement — and help the homeowner find the low-cost financing to replace it?

Similar legislation was introduced in 2011 but failed to advance. But a new slightly pared down version now enjoys the backing of essential business organizations, including the National Association of Home Builders and the National Association of Realtors. And there is an immediate opportunity to attach the bill to the Shaheen-Portman energy-efficiency legislation that could be on the Senate floor in the near future. Senators Shaheen and Portman last year successfully shepherded another energy efficiency bill through Congress and across President Obama's desk. There are few legislative moments in Washington these days where the stars are so well aligned.

And it doesn't take an act of Congress to get started on the energy information front. Eight cities, including New York, San Francisco and Washington D.C., and two states -- California and Washington -- have already adopted building information laws requiring public disclosure of the energy performance of commercial buildings. Additionally, a new one was recently proposed for more than 3000 of Chicago's largest buildings.

It's too early to tell how much of an impact these laws will have on cutting energy use overall but the signs are promising. Of course better information won't, by itself, fully capture the nation's vast building efficiency potential. But making sure that consumers and businesses know how much money they can save through energy efficiency improvements is a good first step. And in combination with progress on energy efficiency finance we'll be in a stronger position to finally exploit this immense opportunity.

I strongly encourage the subcommittee to support the SAVE Act -- including attaching it to the Shaheen-Portman bill -- and also find ways to improve private sector finance of efficiency retrofits of commercial and residential buildings. With these steps we will be making a large and cost-effective down payment on our energy future.

3. Improving Energy Technology Commercialization

The third challenge is how to improve energy technology commercialization. This is a challenge that hinders the advancement of clean energy of all kinds -- from advanced nuclear power and carbon capture -- to wind, solar, geothermal, and biofuels. And it is a challenge that affects every kind of energy player from small

venture-backed start-ups and big companies --- to government labs and university researchers.

The key issue with commercialization is the huge amount of time -- and massive expense – often required to take an energy technology from a pilot project, often backed by venture capital investors, to a point where it can be deployed at commercial scale --- using project finance and other traditional funding mechanisms.

I spent four years at Google as Director of Climate and Energy Initiatives. It was fascinating to see Google information products developed and deployed. In simple terms Google software engineers would sit at computer screens, write sophisticated code, test it extensively, press a button, and soon after millions would be using it. Google often measures product time frames in months.

In stark contrast, in the energy technology world we generally measure time frames in decades --- from what it took to get nuclear power to commercial scale, to the successful development and deployment of natural gas fracking, to on-going efforts to take solar mainstream.

And to multiple decades we must add the hundreds of millions or billions of dollars it often takes for a single technology to be fully commercialized. Clean tech venture capitalists in Silicon Valley have leaned this lesson painfully -- and at great expense -- over the last few years.

I worked for a venture-backed wind turbine company. We had a wind turbine technology that offered some significant improvements over current designs in terms of efficiency and maintenance costs. It operated well at small scale and venture capital was secured to build a much larger utility-scale version. The company built two large turbines and they performed well. But project financiers said they needed to see about one hundred turbine-years of operation before they would invest in large-scale projects using the turbine. For two turbines that would mean 50 years of operation, a timeframe far too long for this little company. Alternatively, that would mean 50 turbines running for two years – an investment requirement far too large for a thinly capitalized operation like ours, without a well-endowed corporate partner.

The problem my company and so many other early stage energy technology companies face is this:

- The amount of money needed to build the first commercial-scale project is often ***far too much*** for most venture capital investors;

- And the bet on the successful commercialization of the technology is usually ***far too risky*** for the traditional energy project finance world.

Welcome to the "Valley of Death", where so many promising energy technologies die. A few large U.S. energy companies like GE have the capital and the staying power to pull some technologies across the Valley. But too often there simply isn't the funding – and the patience – to commercialize a high-risk advanced energy technology.

I went from the wind company to help launch a clean energy project finance company called New Energy Capital with backing from the California State Teachers Retirement System and Vantage Point Venture Partners. Day after day our firm received investment proposals for energy projects based on technologies with profiles that simply exceeded the risk threshold of our capital. Had the underlying technologies been proven in a lab? Generally yes. Had they operated in a pilot plant? Sometimes. Had they operated at commercial scale for a decent period of time? Rarely. We received so many project proposals but there were so few where we could actually make an investment. So what were we left with? Well, the not so little secret is that the biggest chunk of our initial capital was used to finance corn ethanol plants – a technology well proven at large commercial scale, for decades.

I went on to Google where we made venture capital investments in an array of promising technologies but many of them today are dying or dead or in the Valley, some appropriately, some not. One interesting one is called Enhanced Geothermal Systems or EGS. It borrows some technology from natural gas fracking. EGS involves drilling down deep into hot dry rock, fracturing the rock, and then circulating water through the hot rock to power a steam generator and make electricity.

EGS at scale could provide a massive 24/7 renewable resource but the companies trying to develop the technology are often starving for cash to show the technology can work safely and to push it down the cost curve. Google was willing to invest a few million dollars to help one EGS company with pilot-scale work. But the tens of millions -- or hundreds of millions -- it will cost for scale-up was simply not an investment the company would make, particularly with the associated risks.

It is helpful to understand that it took billions of dollars from private companies and the government -- and multiple decades -- to get natural gas fracking to scale with challenges like horizontal drilling, hydraulic fracturing, and seismography. The DOE alone stepped up with more than $100 million in R&D funding and the federal government has provided billions of dollars worth of tax credits for gas drilling. George Mitchell of Mitchell Energy is rightly called the "father of fracking" but Mr. Mitchell had a major partner in the U.S. government.

Similarly, it is important to note that DOE and its predecessor agencies – the Atomic Energy Commission and the Energy Research and Development Administration – provided much of the capital, measured in the many billions of dollars, and a good amount of know-how over several decades to get nuclear power to commercial scale.

EGS may also require a sustained government commitment, like both its first cousin fracking as well as nuclear power enjoyed, to address significant commercialization challenges. DOE is currently providing some support but it is an open question whether additional U.S. funding will be available over the long haul in our current federal policy and funding regime. Other countries are also pursuing the technology so it might well be that EGS -- which was pioneered in the US -- makes it across the Valley of Death on the backs of nations like Australia, Germany, the United Kingdom, or Japan.

So can our nation address the problem of the Valley of Death? Let me give you a quick rundown of some of the solutions.

The first solution is the federal government's loan guarantee program. As Peter Davidson, Executive Director of DOE's Loan Program Office (LPO) stated earlier this month in Senate Energy Committee testimony: "Lenders and bondholders are often unwilling to finance innovative technologies at scale that do not yet have a history of credit performance, despite realistic projections of a market rate of return." The loan guarantee program was designed in part to address this challenge.

There is much to discuss about the loan guarantee program but let me just say that I think it has received a great deal of undue criticism. Just three of the 26 projects that have been funded have defaulted (one of those is Solyndra) and losses to date represent just 2 percent of the $35 billion portfolio of closed and committed loans and loan guarantees – and less than 10 percent of the roughly $10 billion in loan loss reserves that Congress set aside for the program.

Looked at objectively DOE's Loan Program Office (LPO) has done what it was directed to do under three different programs adopted by Congress in 2005, 2007 and 2009. Thus the $465 million loan to Tesla enabled it to reopen a large shuttered California auto manufacturing plant to build innovative electric cars, create 3000 jobs, win the 2013 Motor Trend Car of the Year award, and repay the entire remaining balance of on its loan nine years early. The LPO has provided a guarantee to one of the nation's first commercial-scale cellulosic ethanol plants. There is an $8 billion conditional commitment to the first commercial nuclear power plant to be built in the US in three decades. And the LPO has supported the world's largest photovoltaic and concentrating solar power plants currently under construction.

Looking ahead there is remaining loan guarantee authority that DOE is considering for innovative fossil energy projects in order "to assist the private sector as it clears a path to commercialization" for technologies like carbon capture, low-carbon power systems, and efficiency improvements in fossil energy systems.

We won't know for a number of years the overall performance of the entire loan guarantee portfolio but there is a serious likelihood that US taxpayers will do well – and do good – with their investments. Despite this fact the prospects are not

positive that Congress will recapitalize the loan guarantee program, in part because of the highly partisan debate about its merits.

If the Congress decides not to support additional funding I strongly recommend a second look at an approach that received serious bipartisan support just a couple of years ago. I refer to the Clean Energy Deployment Administration (CEDA). CEDA was reported out of the Senate Energy Committee in the 111th Congress with strong bipartisan support including from Senators Bingaman, Landrieu, Murkowski, Brownback, Corker and Sessions. But despite this bipartisan push the legislation stalled.

Senate support for CEDA reflected a strong recognition of the challenge of energy technology commercialization. It also reflected concerns about the loan guarantee program: the multi-agency review process, the uncertainty of the budgeting cycle, and, overall, a sense that the financing of capital-intensive energy projects with serious scale-up risks – with leadership from and in close collaboration with the private sector -- was not a great match for the structure, oversight, risk tolerance, and financial tools of the Department of Energy

I believe that CEDA – with some independence from DOE and in strong partnership with the private sector – could more nimbly and efficiently support the scale-up of clean energy technologies, and U.S clean energy competitiveness, than the current approach. CEDA would have a broad array of tools to accelerate the commercialization of clean energy technology including direct loans, loan guarantees, letters of credit, and other credit enhancements. It would also have the authority to issue bonds, notes, debentures or other obligations or securities. These tools go well beyond the current loan guarantee program that DOE is administering.

Initially funded with an appropriation of $10 billion, CEDA could become a *self-sustaining* entity based on "profit participation" mechanisms that would allow it to take a financial stake in the projects it backs. Also, while CEDA would be established as an agency within DOE it would be under the direction of an administrator, a board of directors, and technical advisory council. It would enjoy an important degree of independence from DOE including, for example, from line reporting and the Secretary's reorganization authority. The best analogy is the Federal Energy Regulatory Commission (FERC), an independent arm of the DOE.

Congress should enact the CEDA legislation. Supporting the scale-up of innovative technologies of all kinds will help reduce the cost of energy for all Americans, enhance our national security, and address climate change. It will also position the U.S. to capture a massive global export market that is growing by the day – and create large numbers of good paying jobs in the process

If Congress does not recapitalize the loan guarantee program -- or establish CEDA -- we can rest assured that the biggest player of all in commercialization today will continue to move aggressively. I refer to China. Day by day, more and more US

companies struggling through the Valley of Death are looking to China for rescue. The Chinese are investing heavily in the commercialization of clean energy technology from solar, wind and batteries to electric vehicles, carbon capture, and advanced nuclear. Some of the struggling companies that the Chinese have acquired were actually the recipients of significant funding from U.S. taxpayers. And in some cases Chinese firms are buying these companies for pennies on the dollar.

We could and should have a long conversation about the pros and cons of China's approach to energy technology commercialization in terms of U.S. jobs, security, and environment. But suffice it to say the Chinese are pushing hard in the clean energy arena. With massive quantities of capital, well-trained engineers, smart government officials – and an overall plan -- China intends to dominate the market for global energy infrastructure. This is a market that the International Energy Agency estimates will involve $38 *trillion* of spending between now and 2035. And this is a market that the U.S. should have a serious piece of, not only because of the economic, security and environmental upside, but also because it involves many technologies invented and demonstrated here, often at taxpayers' expense.

In closing let me just refer you back to my initial frame of reference. Technology is indeed the great driver of progress in clean energy but without smart policy as well as plentiful – and cheap -- capital, we're not going make progress very fast in this high-risk, high-return, and highly competitive area. Congress and the Administration can do much to advance clean energy through thoughtful policymaking and targeted support of the energy capital markets.

Thank you for the opportunity to testify.