

## **COMPETING IN THE GREEN ECONOMY: How the United States Can Win with Solar**

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Last year I was in Washington at a New America Foundation event in the Senate to talk about renewable energy. I spoke about how solar technology can really take off but we need to move fast with smart policies so we all can benefit from clean, renewable power manufactured right here in the United States. The easy first step was to pass the solar investment tax credit. Well...I'm back.

Not much has happened in terms of policy, but a lot has happened in energy. Coal prices have doubled. The price of natural gas is up 45%. To bring that closer to home, and to your wallet, the Maryland Public Service Commission said that an average home electricity bill will jump by \$137 and people I know in Maryland tell me their electricity rates went up 72% last year. Electric companies in Virginia are looking to raise rates in July by 29%, and Goldman Sachs has suggested that oil could get to \$200 a barrel. I wish policy makers could move as fast in making decisions as energy companies move in raising prices. If they did, we'd be farther ahead in taking the action I believe is needed to keep America competitive.

Washington is a town of speeches and debates...but climate change is not a spectator sport. While we argue, there is one thing that should be pretty obvious to everyone: we are headed to a low-carbon economy. Our oil-economy is under pressure and the impact of escalating costs is spreading to consumer prices for commodities, food, and all sorts of products.

Europe is implementing cap-and-trade, and the US is likely to follow after the election. Now is the time to get positioned so Americans can benefit and be competitive in that economy. The choice is simple: we can be leaders or followers, but a carbon constrained world is going to be the reality for our children. We need to act.

The first step is changing our mindset. Let me tell you a secret: renewable energy can deliver 100% of the world's primary energy demand by the end of this century. Solar, solar thermal, geothermal, wind, biomass, hydro, waves...we don't think about it because we believe the false assumption that oil must always fuel the economy and must always be dominant. It's just not true. The earth abounds in energy

sources. And I understand that unlocking their potential may be more difficult than just lighting up oil, gas and coal. The challenge is to move away from the destructive premise that we must burn our way to prosperity. It's a challenge to unlock the potential of renewable energy, but then again, aren't we facing a massive challenge in climate change?

And this is a challenge that America must lead. We must. I know this sounds like a political statement, but it's less about politics and more about mathematics, and I like math. The US is the world's biggest energy user. The US is the biggest emitter of carbon. And, in many ways, we are still the technology leader with an economy that rewards innovation. So, the focus is on us. The world is looking at our habits and trends. They are looking at our policies. They are looking at where we are putting our money and resources. We are not living up to their expectation or ours.

The world is moving to a low-carbon economy, and that's a big change from the current economic paradigm. America has the most to lose. But, we also have by far the most to gain if we can position ourselves to be competitive. Power generation is the biggest source of carbon dioxide (CO<sub>2</sub>) emissions in America and our country emits more than any other. If we refuse to control our CO<sub>2</sub> emissions in a meaningful way, we cannot expect China and India and other emerging countries to control theirs as they race to match our standard of living. And we can't just do the easy thing and continue a coal revival, allowing it to go above its current 50% of electrical generation (it's 80% in China) or we just accelerate negative impacts with dire consequences.

Building and operating traditional power plants is not that easy anymore. Optimal siting of plants faces a significant challenge due to risks of pollution and carbon emissions, threats of accidents, and other geological and seismic considerations, and operating costs are going up — making alternatives more attractive.

Well! This energy and low-carbon economy situation sounds awfully pressing and compelling. Just the thing to stir up action, collaboration, cooperation? Actually, not so much. Where is the action?

This is urgent ladies and gentlemen. Do we really have to wait until after the election for meaningful, positive legislation providing incentives for solar and other forms of renewable energy? I would like to believe we can act now. Let's eliminate the excuses. One thing that every CEO knows is that "hope" is not a strategy. And, one thing I've learned observing Washington: Doing nothing is not a policy. But that has been the policy response to the energy challenge for some time. Fear and difficulty of change has immobilized us. Policy makers just keep hoping that something will happen. Meanwhile, other nations are moving ahead and capturing the pole position in the low carbon economy.

Take this example...1974. Richard Nixon giving his State of the Union address. Quote: "At the end of this decade, in the year 1980, the United States will not be dependent on any other country for the energy we need to provide our jobs, to heat our homes, and to keep our transportation moving." Well that was wrong. Nixon had a plan to take the US from being one-third reliant on foreign oil to zero. Perhaps we need to retake this super-ordinate goal. Instead, today we are twice as dependent — about two-thirds — on imported oil. So in 2008 the debate continues with one of the loudest suggestions to alter this equation being to drill and refine more in the US. This totally misses the point. It's not the biggest drillers who will win. It's those who can figure out how to untether themselves from oil. We have to embrace a new set of assumptions, a real game changer about where energy will come from. Stop looking into the ground and start to look up.

The US has the greatest demand for power and the greatest need for alternatives, and some of the most innovative solutions, but sadly, we are letting ourselves fall behind... behind countries like Germany, Japan and now China. There is no question that the world needs clean, renewable energy to sustain growth. Do we want to be the ones providing it, or buying it? We can be the leaders in markets like China and India — who are going to be the greatest investors in new energy infrastructure. With new clean tech solutions, America can be an energy exporting nation as well as utilize our own innovations to boost low-carbon competitiveness at home.

I know that one of the roles of any CEO coming to DC from Silicon Valley is to deliver a postcard from the future and explain what we are learning at the cutting edge. Among clean tech solutions, photovoltaic solar is a technology whose time has come. Everything we know about the potential of solar is changing as we start to apply Moore's Law-type principles to drive solar to a new level. This is one of the main messages I want to bring to Washington: a lot of the decisions and assumptions being made about solar are built on old data. Innovation is transforming solar before our eyes: the efficiency, competitiveness and ultimately the cost-per-watt are on a compelling curve. New technologies — like thin-film solar — are changing assumptions making

utility-scale solar energy possible. We are just now exploring materials that can capture the sun with greater efficiency, manufacturing efficiencies to further lower costs, and ways to make solar simpler and easier to install.

Let's dispel a few myths about solar power. First myth: it is too expensive. Today that is true in some areas of the world, but with incentives it's at parity with the grid in a host of economies like Spain, Italy, and California. And at peak power times, solar can be competitive in many more regions. By 2010, we expect Applied Materials' technology in solar can produce panels that deliver electricity at 10 to 15 cents per kilowatt-hour... only slightly above current costs, or possibly cheaper than coal in a cap-and-trade economy.

Second myth: Solar won't work without incentives. I believe that the industry will grow and take hold globally with or without them, the question is where that growth will occur and the rate of acceleration. We have seen the positive impact of incentives in Japan. Today they are minimal. With strong incentives, the US can develop a significant solar manufacturing and service job base, without them these jobs will materialize much later, or in other countries.

Third myth: Solar only works during the day, so it will never be viable... but think about it. We consume most of our energy during the day, when the sun is shining, and solar is a perfect fit to produce that energy. At the same time, new and old storage and transmission technologies are coming along to extend the reach of solar into the darkness. If I listen to my hybrid and electric car friends we will be able to store solar energy in millions of car batteries during the day and use it at night.

Accelerating the adoption of solar in the United States and around the world is a big task that requires big solutions. We aren't likely to make solar a meaningful part of the world's energy supply if we are content to only go from house to house, rooftop to rooftop. We need to invest in ramping solar to utility scale so Americans can get solar energy from their electrical outlets...which is where most Americans want their clean energy to come from.

Utility-scale solar is very different from a residential rooftop model. By displacing 10 megawatts of coal-fired generation capacity, a 10 megawatt solar farm could eliminate up to 200 metric tons of CO<sub>2</sub> emissions per day. This is an ideal application of thin-film solar. Utility-scale, distributed solar would ease peak loading on the grid. It ties into existing transmission lines and its proximity to the load centers reduces energy loss.

We need to be smart about how we build out a solar infrastructure. With solar on rooftops, a neighborhood can produce 50kW. Add solar to the big roofs and parking lots around the neighborhood — big box retail, schools, businesses — and you can get to a megawatt. Local substations can add 5 megawatts. And the city could be connected to a large open-

area solar farm producing a gigawatt. The only barrier to making this possible is the need to drive cost down and efficiency up... and that takes R&D and scaling... two areas where policy can be helpful and accelerate adoption.

Clearly, our government has not grappled with the realities of what it will take to win in a low-carbon economy. While we wait, we lose our advantages. Solar goes to work fast: If we start a solar installation today it starts generating electricity in 3 months. A coal or nuclear plant takes 7-10 years – if you can get past the barriers to siting new plants. Operating at full capacity, a single 100 megawatt SunFab solar panel production line like those we are starting up in Germany today produces enough panels for a 10 megawatt installation in about a month. A *gigawatt-scale* SunFab facility could produce the same number of panels in less than 3 days.

The solar industry is moving fast, even if US solar policy is not. Applied Materials' solar business is ramping at a rate that exceeded even our expectations. In the past year we have announced contracts to deliver nearly 2 gigawatts of annual solar panel production — all outside the US. From what I can see, America is poised to fall further behind in solar and renewable energy. This is an election year, but you don't hear about the thousands and thousands of factory jobs in clean-tech being created overseas — and not here — just by the factories Applied Materials is installing alone. Germany has created 280K jobs in clean-tech.

Last year we conducted a Harris poll, and roughly 90% of the respondents supported government incentives for clean energy...and that was when gasoline was less than \$3 a gallon. Today, gas is up a buck, but we've seen nothing out of the Congress. Local and state governments are ahead of the federal government: more than 30 states and 600 cities have adopted policies aimed at cutting carbon emissions, yet there is no national policy. For private companies, complying with a crazy quilt of regulations makes it difficult to scale. It's a "hassle tax" that's real and inhibits investment.

We need a formula to make America the leader in renewable energy and be a leader in a low-carbon economy. It's a matter of pushing forward to make renewables a priority and getting behind them in a big way. I see three major steps.

First, give energy players the ability to put big amounts of money behind utility-scale investments. If individual electricity consumers are willing to invest capital into clean energy technologies, why shouldn't we make this easy for them? We must enable companies investing in solar manufacturing to obtain capital and provide them with incentives to invest in the US and produce clean power for Americans. Significant loan guarantees for manufacturing and energy installations have a double benefit: clean energy

plus high-end manufacturing jobs. But we need to do more to level the playing field and attract the renewable energy factories now being built in Europe and Asia.

Second, we need to back R&D in a way that shows we are serious about making progress with renewables. If we hope that innovation can help get us out of the energy bind, then we should be doing a lot more than we are doing. It's been proposed that the Department of Energy spend \$156 million for solar R&D next year. Applied Materials alone will spend more than that this year, and we're doing so without the benefit of the federal R&D tax credit, which has been expired since the beginning of this year. Again it's a competitiveness issue. Do we want to follow or lead?

Finally, Congress must pass, and pass now, a long-term extension of the 30% solar investment tax credit — with removal of the utility property exclusion. I know there is a lot of work going on to pass a bill, but let's find one that can pass and do the job. Utility-scale is the quickest and most cost-efficient way to rapidly grow a clean-tech infrastructure and drive down costs. Both Republicans and Democrats say they ardently support this... but we are still waiting. A one-year extension is not the answer and does not give the reassurance to investors that the credit will be there in a few years... Let's get this done. This is investing in the future of America.

The urgency with which government must deliver a rapid and fundamental strategy to reach a low-carbon economy is growing as we move to a post-Kyoto world. The United States needs to lead, but right now we are on a path to be a second-tier player in clean energy technology and about to export our future energy manufacturing and our competitiveness in a low-carbon economy. Who will be the next energy exporting countries?

We are at an inflection point with clean-tech. And we must make a choice: either act now or miss an opportunity bigger than the Internet as big as say Energy. I know which choice Applied Materials has made. I know the choice I have made personally. I know which way Silicon Valley has come down on the question. Now we need to see how America will choose.

Energy and the environment are the two biggest social and economic issues of our time. America has the ability to make a difference...to control our own destiny... to leverage our strengths to be competitively positioned within a low-carbon economy on a global basis.

As I tell everyone at Applied... Hope is not a strategy. Doing nothing is not a policy. Tackling the reality of this challenge and the implications to our country's future competitiveness and tackling it head on is the only way that America wins.