

# **CENTER FOR AMERICAN PROGRESS**

**THE AMERICAN CLEAN ENERGY ECONOMY IN 2020:  
WHAT SHOULD IT LOOK LIKE AND HOW SHOULD WE GET THERE?**

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SUSAN MCGINNIS: Thanks a lot, John. And I want to welcome everybody to the first panel discussion of our conference day here, "Picking A Winner." I'm Susan McGinnis from Clean Skies News. I want to thank the Apollo Alliance and the Center for American Progress for including Clean Skies in this event today. We're always thrilled to be part of events like this, as this is sort of our bread and butter.

For anybody who doesn't know who we are, just very quickly, cleanskies.com is a Web site and a television broadcasting facility that is devoted in particular to energy and the environmental issues. So we report news on a daily basis. We air live events like this one on our site. We have panel discussions, debates.

And our mission is really to focus a spotlight on the energy and climate debate. So we are at cleanskies.com. And we have a show on Sunday mornings here in D.C. on Channel 7, WJLA called "Clean Skies Sunday" that's a half-hour look at energy and environmental issues. So thanks for having us here.

Today's panel is "The American Clean Energy Economy in 2020: What Should It Look Like and How Should We Get There?" We're going to be talking about competitiveness. We'll talk about jobs. We'll talk about innovation, policy and more. And we have convened a group of experts here very well-equipped to tackle all of those issues and hopefully spar a little bit with one another.

Rob Atkinson is founder and president of the Information Technology and Innovation Foundation, and this is a D.C. technology policy think tank. And he has also been an advisor to policy-makers. Bob Borosage is president of the Institute for America's Future. He's also co-director of the Campaign for America's Future. He writes for the Nation, for the Huffington Post on economic and national security issues. He's also advised some political campaigns for people like Barbara Boxer and Paul Wellstone.

Peter Brehm is the vice president of business developments and government relations at Infinia Corporation. They develop energy technologies and are now working heavily in solar, trying to bring solar power solutions to scale. He has 20 years experience in business and management. And Katie McGinty is a former secretary for the Pennsylvania Department of Environmental Protection. She's now an operating partner at Element, LLC. This is a private equity investing in clean tech companies. And she's also a director at NRG Energy. So welcome to all of our panelists.

And I want to start with a question to just get the discussion started. Feel free, anybody, to please jump in and give your opinions on what each other is saying and argue, if you want to. When time allows, we'll stop a little bit early. If there are any questions we'll have some microphones for any of you folks who want to ask a question — we'll bring the microphone over to you.

So our panel is a look at the clean energy economy in the year 2020, which is truly not very far off. And just to get — starting note, the big concern — and I think one of the big themes here today for the conference day is the U.S. competitiveness in a global frame. The president has said he will not stand for second place, but it seems whatever he can stand for is not is quite far from reality, from what we heard from John and Phil. It does not look like that's happening so far.

So I just wanted to — maybe I could start with Rob. And this is the big question — and we'll get into the specifics about what needs to be done — but just a sense of your optimism, Rob, about, can this train be turned around? Can the clean energy economy be grown here to be a leader globally? Can the jobs be kept here, and at the same time, to deal effectively with the climate issue?

ROB ATKINSON: Well, thanks. And thank you for having me here. You know, I guess maybe I'll be risking the skunk at the garden party here and say I think there's sort of this view, I think, among the clean energy community that — well, let's see, we've lost a lot of our industrial base and it's moved overseas and we're facing this competitiveness challenge, but now there's this new thing out here called clean energy and we'll just do that.

And I think what's missing in that is two fundamental factors. One is, it's not as if we're the only country who's come to that realization, as John alluded to. Virtually every single country is now competing in this very intently. Secondly, when you look at U.S. manufacturing overall — and I think this is really an interesting statistic — the apologists for the competitiveness of U.S. manufacturing, the many, many people in Washington who say everything is fine, they rely on BEA data, which is essentially BEA manufacturing output data.

And if you look at that data, it shows that U.S. manufacturing output has stayed relatively constant between 1990 and the present, sort of around 13.5 percent. The problem with that data, though, is if you take out one sector — which is, if you take out computers — and you could say, why should you take out computers? The reason you should take out computers is every time your PC doubles in processing power, BEA thinks it's doubled in output. And so right now, the computer sector of the U.S. manufacturing sector accounts for a large share of U.S. manufacturing output. So clearly, that's wrong.

So if you just take out computers, what you see is that non-computer output in manufacturing has fallen from around 13.5 — and sorry, the other number was about 14.5 — 13.5 percent in 1990 to less than 9.5 percent today. In other words, U.S. manufacturing output has fallen by about a third over the last 20 years, and quite significantly in that last four years.

So this, to me, is emblematic of a much deeper structural problem in manufacturing around two key things. One is, we're the only country in the world — only advanced country in the world — without a manufacturing policy. And secondly, many, many countries — China being the poster child, but certainly Europe, Japan, Korea, Taiwan, India — they systematically engage in what could be termed mercantilism. They protect their markets. They manipulate

their currency. They manipulate standards. They do all sorts of things to, in our view, make sure that they win in an unfair way. And we do almost nothing to confront that.

So I just would frame this all – and I just don't see any way we're going to be competitive in clean manufacturing unless we address these fundamental questions of why we're not competitive in overall manufacturing. If we do that, we should be able to do reasonably well, because I think one of the key things that people forget about the debate is, they say, well, China's good at this. They're good at all of these things; can we be good at anything?

And the sort of notion of competitive advantage is that you have to be good at something, relative to somebody else, as long as the other people aren't systematically cheating, which is what the Chinese — and what are we likely to be good at? Economic theory suggests it's basically products and services that have an innovation component. We're good at that. The Chinese aren't.

I mean, as much as you hear about the Chinese and innovation, the vast majority of the Chinese people — 90 percent-plus — don't graduate from high school. They just have a lot of college graduates because they have a lot of people. So we should be competitive in these innovation-based, next-generation products and services in the green economy. But I'm cautious unless we make these changes.

MS. MCGINNIS: All right. Well, it certainly sounds like a tall order. I guess the question is, can these challenges, can these steps be taken in enough time? Bob, how optimistic are you? I mean, as John was saying, there's a tremendous pull from the status quo.

BOB BOROSAGE: Well, I think urgency is a useful concept to help America move, and so we ought to feel urgent about this and we ought to feel urgent about the competition. But this is a broad industrial revolution that's going to take place in green technologies and there's still time to get in it. I don't think we ought to feel like the race is over and that we've lost. I'm on the Apollo side of this – half-full rather than half-empty.

But I would like to reinforce what Rob said. I don't believe you can get there with our current mix. I don't think you can get there with a stealth industrial policy, which is sort of what the president has tried to do. I don't think you can do that — get there without a systematic attempt to decide what our strategy is in relationship to both the hard and soft mercantilist nations across the world that are in this field and that are intent on becoming the manufacturing centers of it.

And innovation alone is not enough. I mean, I think we are now — we've seen sufficiently that America can do the R&D, create the innovation and immediately, it goes into production in China or in the nation — or in Germany, or in the nations that are engaged in a mercantilist policy. And a problem with that is that, over time, you won't do the innovation. That is, where things are made makes a difference.

The people that are making this generation of technology are more likely to make the next generation because they will inevitably find a way to train the scientists and the innovators.

They will have the machinists and the technologists and the engineers making the current stuff. And it is that mix of innovators, people who know what — how to make things, venture capital and entrepreneurs that actually create the next generation.

And if you don't — if you're not making this current generation of stuff you won't — you're much less likely to make the next generation of stuff. So I think this American notion that, hey, we can do the innovation; let the Chinese do the dirty work and the kind of boring jobs that we're happy to get rid of — I think that is a delusion that we have to overcome if we're going to capture our way into this.

MS. MCGINNIS: Peter has an inside view from industry on some of these very topics. You know what's going on in solar in the United States with jobs and seeing what's happening in Germany and China with solar? How optimistic are you?

PETER BREHM: I tend to also to be a glass-half-full kind of guy, but there's also a glass-half-empty viewpoint that my previous two colleagues have expressed. I guess probably the best way to understand what our chances are in the future is kind of be realistic about where we are right now.

If you look at, say, the major areas — some of the major industrial areas of renewable clean technology — you look at solar, wind, advanced batteries and say, advanced transmission, if you were to be — if you were to look at those industries right now on the solar side, two of the top 10 firms in the world are headquartered in the U.S. And of those two, one produces almost 100 percent internationally — outside of the U.S. — and the other one produces most of their product outside — probably two-thirds of their product.

In the wind field, we are 1-of-10 and losing market share. We only have one of the top 10 players in the wind industry. Advanced batteries, we only have one of the top 10 producers in the world. And I think in advanced transmission right now — on the hardware side, not on the software/smart grid side, but on the hardware side — I don't think we have any major players left, based on the U.S. We manufacture things here like wire, but that's not exactly the high-tech aspects of the business.

And I can't take credit for this — I think it was actually John Doerr at the ARPA-E conference yesterday or day before yesterday who made this observation — imagine, if you will for a moment that — we're talking about the clean energy revolution right now, but let's go back and look at the Internet or the IT revolution that started in the late '90s, went into 2000s.

Imagine, if you will, that there are five major players in the world, and those players are Microsoft, Google, Yahoo!, eBay, and Amazon. They pretty much are the biggest players in that space. Imagine if we were starting the IT or the Internet revolution right now and four of those five companies was based outside of the U.S.

That's actually a better ratio than the list that I gave you. I actually gave a list, about — we're at 10 or 15 percent of the companies. But right now, to use that analogy, four of those five companies would have been based in China. Or three of five would have been in China and one

would have been based either in Germany or Japan, based on the ratios that exist in the clean energy space. So imagine how different the world would be right now if that were the case. And that's what we're starting from.

MR. ATKINSON: Is that the glass-half-full side? (Laughter.)

MR. BREHM: I'll get to that later. I'll get to that later.

MS. MCGINNIS: Well, John Doerr is definitely familiar with what I understand is records of capital heading into — venture capital heading into clean energy. Katie, what's at stake with the U.S. now leading in one area and not leading in another area for the country?

KATHLEEN MCGINTY: Yeah. I think that if we were going to rest on our laurels, on the idea that we've always been good at innovation and no matter what happens in terms of the scaling up of these technologies, we can rest assured that that will still be our province and that's where we will still see a return in this new sector, I think that's history.

There's a very different development pattern unfolding here with respect to how the Chinese are approaching this sector. Before, it was a case where the innovation may happen in a place like the United States and then the mass, scaled-up production might happen in a place like China, where the product is not branded but is essentially job-shopped there. Very different right now, where China is climbing the technology ladder in this sector, beyond anything I think we've seen before in other sectors.

So those solar panels we're competing with aren't just a U.S. or a European-named panel that happens to be label made in China. No. They are SunTech panels. And that electric vehicle revolution — that's going to have a Chinese nameplate. So that's slicing up the pie. I think you're right to point out that not only does it mean we're going to lose a lot of the pie if we don't go after the rest of it, but I think we lose the entirety of the pie if we're not careful in watching how this technology trajectory is going. It is taking the entire life cycle, from inception to full-scale manufacturing, in one fell swoop.

What can we do? I think we've got some of the makings of the key policy here. John certainly recalled the president's leadership. But I think we have to be clear about what's distinctive about clean tech as compared to earlier technology revolutions and investment booms. So if it's information technology, for example, the difference there is a dramatic change in scale in terms of time and in terms of magnitude of investment dollars needed.

When you're talking clean tech, you're talking a long time to market and hundreds of millions of dollars, where, in information technology, if you had \$20 million, you had your IPO the next year. Here, if you have \$20 million, you might have your first engineering design of your first prototyped plan.

But that means we're talking about minimizing the risk of that capital exposure. And for me, it's the three M's: minimize equals money and mandates. Money — we've got some of that going now with the stimulus and state programs — and mandates with the state renewable

portfolio standards of what we might see emerge in Washington. We've got some of the makings of it.

And I guess just the last thing I'd toss out at the outset here is, is it too much of a lift for us? Can we do the lift of minimizing that risk to let that private dollar flow into this sector? It's a curious change of thinking. It seems to me in the clean-tech space and the renewable energy space, every time this country has embarked to build our fundamental infrastructure, it has been a journey of public purpose, paid for nearly entirely by the taxpayer or the rate payer.

Here, this sector and this revolution of building fundamental infrastructure is largely driven by private dollars and we're asking the public to step up in filling a financing gap. Whether it's highways, railroads or our antiquated energy system, the taxpayer bought it and built it entirely. I think we can find the dollars just to close the financing gap to enable what is an unprecedented amount of private venture and private equity dollars that are flowing into this sector.

MS. MCGINNIS: And maybe it's helpful to take a look at policies, as John was saying, in other countries. Rob's organization did a report with the Breakthrough Institute talking about or comparing policies of other countries. Can you tell us a little bit, the differences, or lessons maybe we can take from their policies?

MR. ATKINSON: Yeah. We did a report called "Rising Tigers, Sleeping Giant," which was definitely a glass-quarter-full report. And so we looked at six technologies — wind, solar, carbon capture, high-speed rail, batteries and I'm blanking on one other one. And then we looked at four countries — China, Japan, Korea and the U.S. — on three sets of areas. One is R&D and innovation policy in the space. The other is production and deployment policy. And the third were demand policies.

Let me just mention the R&D side. What we found was that the U.S. is significantly behind these countries in the share of our R&D in this space. For example, we are about — Japan, for example — excuse me, Korea is about double what we do on a per capita basis in green R&D. Japan is about 125 percent more than what we do in green R&D. China is making a lot of investments there.

Take another example. We get 20 percent of renewable energy patents in the world today. Japan gets almost that many with a GDP that's perhaps about 60 percent of our GDP. Korea, over the last four years, is doubling their energy R&D. Ours has gone up by a very, very small percentage, leaving aside the recovery act. So I think what we're seeing — and that doesn't mention at all, as Bob's talking about, the amazing production policies that these countries have.

I think one hears an awful lot about this notion that venture capital is going to save us. We're actually — private-sector investment in clean energy has actually fallen. I don't think that that's going to save us. It's certainly a key component of this. You can't drive this purely on public investment alone. But I think it's somewhat wishful thinking to assume that we've just going to get some VC money and this is going to do it. VC money has been falling while the

share of VC going to this has been increasing a little bit. I don't think there's going to be enough there.

I do want to make a related point, though, because I think one of the things these countries all get — and maybe Bob, maybe you and I don't disagree — but what I worry about, I hear some people say, innovation is not enough. And I agree with that, that innovation's not enough. But for some people, what that means is innovation doesn't matter. And I think some people will say, look, we're already here; it's really just a question of financing the system, the technology and the products that we already have today and we're good to go.

I think that's fundamentally flawed for two reasons. One is, we are nowhere close enough to getting the technologies we need to solve climate change. We've got to get an 80 percent carbon efficiency system in place to get 50 percent in emissions by 2050. The technology suite that we have today that exists won't get us there. Efficiency's not going to get us there. The current technology's not going to get us there, particularly at the price points. So we have to do innovation.

And it reminds me a little bit about where people were talking about the digital revolution in '95 as if we had the technology. What people don't realize, in '95 — if I had my USB key with me, that USB key, in 1995, would have cost \$10,000. Today, it costs \$5. That's the reason we have the digital revolution.

It wasn't because we sort of had this static technology in '95 on storage, on processing, on transmission, and then we just deployed it and funded it. We continued to innovate on a whole suite of areas to drive price down and increase performance. That's why we have the digital revolution today. And I would argue that we're really in the same boat today with energy. We're not there yet.

And I think that somehow to say that innovation is not quite important — and I know — I don't think you're saying that, Bob — but what I worry about is I've heard other people say that. Well, we don't need to worry about innovation. We'll just do production. You have to do both and we're not doing either one anywhere near adequately.

MS. MCGINNIS: Katie, can you give us a perspective of the Pennsylvania experience, when you were instrumental in bringing Gamesa to that state — and certainly there's state action and there's federal action mandates — what did you learn?

MS. MCGINTY: Well, look. What we found clearly was the days of — if there ever were days in this space where build-it-and-they-will-come and people were just sort of trusting that they'd put a billion dollars in the ground in a new clean power facility, for example, and they could just rest assured that the power would be sold — to the extent we ever had those days, those days are gone. When you're talking about investments like this, there needs to be certainty that if you build it, they will buy it.

What we experienced in putting in place our renewable portfolio standard was that with that clarity of market signal, that certainty — that is, hundreds of millions of dollars were invested

in our economy. We saw it just rush into the United States and into Pennsylvania, more than 3,000 jobs in three-and-a-half years, and about 1.5 billion (dollars) of new capital investment in our economy.

I want to come back to Rob's point. I think he's quite right, that venture capital alone is never going to get us to the kind of modernization of our energy infrastructure that we need. And it is true that there is a slight dip in terms of the overall venture capital and private equity into the clean tech sector in 2009. But as compared to the falling off of investment themes across the board in the general economic decline, this sector held up pretty. And in fact, in the second half of 2009, clean tech was the leading investment theme, more than information technology and life sciences.

But those dollars enough are not going to be alone — alone with not be enough. And I think what we're talking about here is what else do we need to do to enable that we've got the full recipe together so that we build out this sector and we can get to scale. And I do think it does come back to very clear markets signals that if you build it there will be a market for it, and that means we do need renewable energy mandates.

I think it also means that the public needs to step up in this sector in building a modernized energy infrastructure for the United States, as we have stepped up in every previous generation; to build the fundamental infrastructure that we need to compete as a society. But I guess I will toss — just to mix it up a little bit — in terms of what else we need to do. I do think that as we ask the American public to put their dollars into this sector, that the clean energy industry also needs to step up and say, if it's American dollars in, it's going to be American jobs created.

Looking for — fighting words for some, that domestic content — to make sure if we're going to buy it here, by god, we're going to build it here. And it doesn't happen all by itself. And I agree with Rob. You've got to get out there and you've got to insist on it and you've got to require it. And if you do, we can out-compete anybody in the world.

MS. MCGINNIS: Maybe Peter can comment on this, that — how big an obstacle or unproductive is this apparent division among different renewable manufacturers over whether these clean energy systems should be manufactured here, create the jobs here, or are they just going to go where it's cheapest — to China, to Malaysia?

MR. BREHM: You're putting me in a difficult spot. Among other things, I'm on the board of the Solar Energy Industry Association. There's, I think, 40-some-odd board members. And a good third, maybe almost half, are either foreign manufacturers or U.S. companies that primarily have foreign manufacturing operations. So the position of the Solar Energy Industry Association, of course, is create the demand and where the supply comes, it'll come from.

Obviously, we're part of the Apollo Alliance — in support of the Apollo Alliance, because we have a little bit of a different take, being a U.S. manufacturer. Just to give you a little background, we are a concentrated solar power manufacturer, which is kind of like the other white meat. People always talk about solar power as being PV, but in fact there's a whole

other industry called concentrated solar power where you use mirrors, you turn the sunlight into heat you convert the heat into electricity.

Ironically, that's one of the areas where the U.S. still technically leads. The U.S. and Spain are the market leaders in that technology, whereas in the PV space we're, at best, fourth place behind Germany, China and Japan. And I think China may be number one now, certainly in production volume. And we've developed our technology traditionally. We've been able to leverage small development grants that we've typically gotten through DOD, and less so, also from the DOE.

Just to give you an idea how tough it is for a company like ours, we are 0-for-11 on stimulus, things that we've bid. And this is a company that, through its history, has won 50 to maybe as much as 70 percent of the grants that we've ever applied for. So I literally got to the point last year where I was thinking, have we forgotten how to write grants? But we kept winning the traditional type of projects.

But I think because of the way stimulus was scored, if we were to bid on something, we, as a manufacturer — say we were to bid on something that might bring \$10 million in to our company to develop a technology or to deliver a technology. We would create, say, 10 manufacturing jobs, but those 10 manufacturing jobs will be around for the next 10 or 20 years. But if someone bid on a project where they were going to build a wind farm, importing wind turbines from China, they've said, well, we're going to create 200 jobs next week, and those jobs will last three months or so while you're building the wind farm. But those jobs are fundamentally not exportable.

Again, I keep saying I am a glass-half-full kind of guy, but it's very — it's much tougher out there than you think. At the high level, the policy is correct and the direction is correct. Obviously, something that creates demand, which is primarily the goal of renewable portfolio standards and some type of — however you end up doing it — some type of price on carbon — but policies advocated, as Phil mentioned, by Sen. Brown to make sure that supply comes from the U.S. is critically important. We're starting way further behind than I think our policymakers think and we're up against competition that is investing much more heavily than I think our policymakers in the government think and the citizens think.

MS. MCGINNIS: So Peter's a little bit frustrated with the recovery act. Katie might be able to respond to that, and also, the question of whether too many stimulus dollars or government dollars end up going to R&D and to the labs rather than to industry.

MS. MCGINTY: Let me amplify one point that I think is part of what Peter's also saying, which is, we have to live in the reality and the macroeconomic conditions that we find ourselves in. Our policies need to be attuned to those. So right now, the macroeconomic conditions are very daunting and discouraging for the building out of a new energy infrastructure.

We've got demand destruction in terms of the demand for electricity. That means the price of electricity has sunk. And we've got newfound reserves of natural gas, which has created a supply overhang and has also plummeted the price of gas. You put those two things together

and it makes it very hard on just pure private-sector finance to finance and build new generation of any kind, let alone clean generation.

So what does that mean? I think what that means is that for the foreseeable future — and this is Rob's point — that just private-sector dollars aren't enough and there's going to be need for public support to see a scaling up of this industry. And I guess tying those two things together for me says, look, it's one thing to put a mandate in place in terms of renewable portfolio standard than somehow try to torque that to say only domestic companies can play.

That, I think, is a very bad idea, and I don't know that anyone's suggesting it. But when the market alone is not going to support the financing on its own of these projects and we need the public to put their taxpayer dollars in to close the financing gap, when the taxpayer's spending money I think we need to insure that those dollars are building an industry in America with American taxpayer dollars.

And look, it's a hard thing for us. I'm as much of a free-marketer as anyone. But when Ontario puts in place a feed-in tariff and says, we are going to subsidize the price of the electricity here and give you a premium but you're going to build the qualifying projects in Ontario, we all sort of got that. Yeah, that makes sense and it seems fair. And I think we're going to need a similar thing here, or I worry that the American public won't continue to support the sector and will fall even further behind.

MS. MCGINNIS: Well, Jeffrey Immelt from G.E. said at the ARPA-E conference this week, Europe is going to win offshore wind simply because of the feed-in tariff. He said electricity bills are going to be higher there, but it is going to create jobs. And he said he's not really sure which is better.

MR. BREHM: Can I respond specifically to that point? Right now they're on a track to win — to wind. Excuse me; bad pun. They're on track to win. But if you go to offshore wind turbines, you want to go larger and larger. And to go larger and larger you probably need to go to high-temperature superconducting wind turbines. The U.S. still leads that industry. But the DOE is killing the high-temperature superconducting R&D budget; it's disappearing.

So we have the two major players — American Superconductor and SuperPower — in the U.S. that do HTS, which could be used for transmission but also very, very large wind turbines. So that would be a perfect opportunity to leapfrog what the Europeans can do, because they don't play in that arena. Yet our DOE is literally — the superconducting HTS budget last year was 27 million (dollars). It's down to \$4 billion (sic) and they actually put something in the budget saying to create an orderly wind-down of the program.

MS. MCGINNIS: But the administration keeps talking about offshore wind. What do we need to do?

MR. BREHM: Probably not appropriate to say in a public setting. (Laughter.) Let me give a specific example to our industry to give you an idea of what happened with the stimulus. Within the stimulus package, there was \$2 billion for, notionally, R&D, which comes through

the DOE's Office of Energy Efficiency and Renewable Energy — \$2 billion. Congress specifically directed about half of that. So the DOE only actually had control of about half of that — a billion dollars. My industry — solar — got \$115 million out of that. Within solar, \$26 million went to the field that we're in — concentrated solar power.

All \$26 million went to the labs. Not one dollar went to industry. And of that \$26 million, a good piece of it — several million dollars — went to tear down concentrated solar power testing equipment that was developed in the '70s and '80s. It was an eyesore or something that they were basically going to take down. That's the kind of thing we're up against.

MS. MCGINNIS: Mm-hmm.

MR. BOROSAGE: Let me try to put a political context around this a little bit. I think what's stunning about the president is that he's made energy a centerpiece. He's made this the rock that we will build the new foundation of our economy on. He's made it quite clear that we have to win in manufacturing if we're going to have a country that leads in the 21st century, and that this industrial revolution in new energy and the green industrial revolution is the battleground.

In the recovery act, there was over \$100 billion that went to a broad range of things, including — partly because of the good work of Apollo in terms of investment tax credits for manufacturing — R&D, procurement, et cetera, et cetera. It's a lot of money. And so he's done — and he's pushed, with the energy act, a renewable energy portfolio standard.

So you can see the beginnings of a sensible policy in what's been done. There's worker training money in this, also. There's money for modernizing the grid and the infrastructure developments. All the pieces — from creating the market, finance, investing in infrastructure, investing in workers — are in the recovery act, which expires in the next year, essentially.

And we go into a period of PAYGO budgeting; of concern about deficits; of a desire to bring down public spending on the discretionary side; of total freeze by the president over three years on discretionary domestic spending, in which there will be a brutal battle about priorities, and in which over half of the discretionary budget — that is, the Defense Department is not in the freeze. And the president has been resistant to two basic things: the word "industrial policy." It's not only verboten from the 1980s under Ronald Reagan; it is still verboten in this administration. It may not be used, even though the president has picked the winner, which is new energy, and he's got the elements — pieces of an industrial policy.

And where that hurts us is exactly in being serious about supporting manufacture here, supporting the retooling of manufacturing plants, supporting the development of supply chains, doing domestic content legislation, "buy American" legislation so that the money that we spend creates the jobs here. The White House came out against the relatively weak "buy American" provisions that were in the recovery act. And it goes to the absence of a trade policy, where we are still wedded to the notion that we can have the largest exporter in the world play by a totally different set of rules and still compete.

So the president has taken us — has started us down the road, and I think it's been a sea change that ought to be recognized. It's very important. And it ought to be grabbed and pushed and celebrated. And we have a lot further to go and we're headed into a very hard time, fiscally. And so making this case about how important these investments are, how you can't get there without public investment at a large scale, and how this is our economic future and our national security imperative is going to be crucial to have any shot at doing this in the next period.

MS. MCGINNIS: So if we look at what we have in the works now, I guess looking ahead, likely carbon legislation, climate and energy legislation, possibly EPA regulation, maybe an agreement out of Cancun in December — what do you think, Rob, might come of our competitive position if all these things come together? Will carbon legislation enhance our competitive position abroad?

MR. ATKINSON: Not by very much, I would argue. If you look at the — one can make a viable case that carbon legislation would actually increase our trade deficit in clean energy products and services because our demand will go up. And unless we have a supply policy to complement a demand policy, then as John said, we could be the largest — I think we probably are the largest importer now and we could do even more.

So I think one of our problems, or suggestions maybe, with some of the climate change legislation on the Hill is, I think there's this sense — and particularly I think among what I would call neoclassical economists — that if you just price carbon, that magic happens. There's a wonderful phrase that Robert Solow, the Nobel Prize-winning economist, wrote 30, 40 years ago in writing about centrality of innovation to the economy. And by that, I don't mean just inventing new products, but new production processes, new workforce practices, new business practices, all that.

It's worth 80 to 85 percent of our GDP growth. And Robert Solow, when somebody wrote about, where did this all come from, and he said, "it's manna from heaven." In other words, "heck if I know; it just happens." And this is principally what most neoclassical economists, including some in the White House, believe.

I think there's a sort of equally dangerous view that it's manna from carbon trading — that if you just price carbon or derivatives, this innovation just magically occurs. And I think we have a natural experiment on that, which is Europe, where if you look at the price of carbon per ton for gasoline in Europe, for most countries it's around \$400 a ton. And the number of electric vehicles in Europe is five, 10, zero? The Europeans haven't invented a battery.

So don't get me wrong. I fully support some kind of pricing, carbon trading, whatever that is. I fully support that. But for us to think that that's going to get us where we need to go I think is just simply wrong. So what I would suggest we need to do in these is rather than set a high price or a higher cap, set it — and put almost no money to innovation, which is frankly what Waxman-Markey did.

I mean, very, very little of that went to innovation. What was our — we estimated — actually, Breakthrough estimated \$1.2 billion a year out of that bill — would have a lower cap or

a lower price and a bigger share to innovation. I think if we did that we'd both create demand and then supply. And by innovation I also mean the production side as well. So I think if we just sort of go along with somehow that we're going to raise the caps or pass the cap or tax or something, I don't think it's going to get us where we need to go.

MS. MCGINNIS: Mm-hmm. Anybody else want to comment on coming legislation?

MS. MCGINTY: Well, I mean, I think that Rob said it. I think it is not the whole thing, but I would say, though, that it is a critical, critical piece, and for several reasons. One, I guess to reiterate the magnitude of financial flows that we're talking about here to the tune of hundreds of millions of dollars per project, billions of dollars needed, that money doesn't flow to a sector unless there are very clear signals that this is going to be a place of stick-and-stay.

And putting that U.S. federal legislative stamp that we are going to stick-and-stay as a country on a strategy that minimizes carbon in our economy or maximizes renewable energy in our economy – it's not the whole thing, but it is very significant. And I guess I would say it's especially significant in the energy sector because as a commodity sector, people have been burned many, many times.

You have boom and you have bust; you have boom and you have bust. And having those long-term signals — again, we're here to stay; we're serious; we're going to grow in this regard — it is not everything, but I think it'd be hard to put a number on how meaningful a piece of the puzzle it is. And I think it is a very meaningful piece of the puzzle.

MS. MCGINNIS: Well, you can't really minimize how much demand has to do with this as well – simply, that we're in this deep economic crisis, it really is no small issue. So I wonder if Peter could give us sort of the Infinia experience as far as jobs, because I guess they will go where the demand is, and the demand is supposed to grow in China so much faster that it is here. But you were able to create renewable jobs out of traditional auto sector jobs.

MR. BREHM: A little further background. I think probably one of the reasons we were invited here is, if you believe President Obama's vision of converting the now-dwindling automotive industry jobs into renewable energy jobs, we are probably the best poster child out there. Our entire supply chain is primarily automobile supply companies in the Midwest.

Our largest vendor is Magnum, which is the world's largest auto supply firm. Our second-largest vendor — many of you may not recognize the company — it's Autoliv. They're a Swedish-based company, but a major operation in the U.S., both in Detroit and in Utah. And they're the largest manufacturer of airbags and supplemental restraint — or restraint equipment. So if you look at our supply chain, it is almost entirely in the Midwest with a few near us in the Northwest.

But I have to very much echo the comments of my colleagues up here, is that the policy that creates demand in absences of policies that ensure that the demand and the technologies are developed in the U.S. are probably ultimately counterproductive. To go again to John's comment, we're just going to end up being a bigger importer.

One of the reasons I became involved with the Apollo Alliance, I think that they invited me to events like this, is about two years ago I made the observation publicly in a forum that it really does us no good whatsoever if we replace oil imported from Saudi Arabia with wind turbines and PV panels imported from China. That's, unfortunately, the tack that we were on at the time. Through the Apollo Alliance and through the support of Washington state legislators, particularly Sen. Murray, I've actually been in front of the administration on a number of times.

And the argument I've tried to make — and I would test it with my colleagues here and welcome the feedback — which is when you're developing a renewable energy or clean technology policy, usually the metric you look at is something along the lines of the number of — tons of greenhouse gas emissions or the megawatts or renewable energy deployed. That's usually the metric.

And what I started with in the Apollo Alliance early this summer — Phil took a number of us on a tour here of Capitol Hill — that's really the wrong metric. The metric ought to be the number of clean tech and renewable energy manufacturing jobs created in the U.S. And I argue that point because the first two metrics are very good metrics. They're very good goals. But the first two metrics — you don't necessarily get the jobs. With the other, using jobs as your key metric, you by default get the other two metrics.

And that would be my argument and that would be the policies I'd encourage. Because our biggest demonstration site is in Spain, because Spain has a specific feed-in tariff for concentrated solar power technology. By the way, they have a very nice feed-in tariff for photovoltaic technologies as well. But they realized within a year that all the photovoltaic panels were coming in from China. So they capped that program.

They actually have capped both programs, but they capped the PV program well below what the demand would be. Otherwise — where now, if you want to do a project, you end up having to go through a lottery and a number of other things, whereas the program where, as I mentioned earlier, Spain co-leads the U.S. still in the concentrated solar power — that technology, that program is still relatively well-funded.

MS. MCGINNIS: All right.

MR. BREHM: Because I'd be interested in my comments from my colleagues on that.

MS. MCGINNIS: Well, I'm going to turn the question back to you, because you'd have these statistics better than anyone. You know, I think part of the reason we as a country have gotten into a habit of thinking we can't compete on the manufacturing side is that we understand our labor costs to be higher than other countries might have. And so we have felt, well, because we don't want to purposely decrease living standards in the United States, I guess that means we just can't compete in this sector.

But as I understand the statistics — even if there's any truth to that, as I understand the statistics with respect to solar panels and PV, only 10 percent of the overall cost of the panel is a

labor-related cost. And if that's the case and if we otherwise have advantages in terms of quality — and we still do have advantages in terms of quality of manufacturing, in terms of performance of what we make, if we still have advantage of being closer-coupled to the innovation part of the spectrum, should that insistence that we have that we want to pay people a decent and fair wage necessarily translate into, “well, I guess we can't compete on the manufacturing?” How do you see that?

MR. BREHM: You probably asked the wrong person, because again —

MS. MCGINNIS: (Laughter.) Remember, you're glass-half-full. Remember, we need a cheery response here.

MR. BREHM: Okay, I'm trying. I'll see if I can try to come up with one. Again, part of the issue for us is that when people think of solar power you always think of PV panels and that's not the business that we're in. To use that specific example, the unfortunate issue — unfortunately it's going to go back to a glass-half-empty-type answer — the DOE has spent most of its resources over the last 10 years.

When I started in this business in 2004, the DOE budget was probably \$10 for PV for every dollar for concentrated solar power. One thing I can stay very much positive about — the current administration and Secretary Chu's leadership — in the budget this year, it's about 1-to-3. The proposed solar budget's about 300 million (dollars). About \$100 million is for CSP. About \$200 million is for PV.

The specific problem with PV is relatively — it's somewhat clear-cut to someone in the industry. Photovoltaic is fundamentally a commodity semiconductor business. That business went to Taiwan 20 years ago. I cannot think of a commodity semiconductor — particularly successful commodity semiconductor business in the U.S., with the exception — I don't recall the name of the company, but it's in Idaho. There's a chip — Micron — and they're very much a boom — commodity business, so it's very much boom and bust.

But other than that, Intel has pretty much sold their commodity semiconductor business. AMD spun theirs out. It's probably not the best example to use. And unfortunately, it goes back to my earlier point, is traditionally most of our R&D money and emphasis — in fact, we're, in Washington state - Washington state actually has one of the best feed-in tariffs in the world.

It's small, but the actual amount of money, it applies to PV only. So the largest manufacturer in Washington state, we cannot sell our product in Washington state because the incentives in Washington state don't allow our product. So that's what we're up against. So, sorry about that. You kind of walked into that one.

MS. MCGINNIS: (Laughter.)

MR. ATKINSON: I think, to one of Katie's points, in some ways I agree with you. In other ways I don't. When you look at wage levels largely around the world, they're completely irrelevant and completely unrelated to whether you're running a trade surplus or a trade deficit or

not. Japan and China both run big trade surpluses. Japanese and certainly German wages are much higher than U.S. wages. Wages are irrelevant to this because what's supposed to happen in international relations is dollars — excuse me — the value of currency adjusts to reflect your cost structure.

If you know Dan Luria's work — Dan is at ITI in Michigan, and Dan has done a very interesting analysis of a sample of a typical \$10 million U.S. manufacturing facility here and if it were to move to China. And yes, Chinese wages are less than 10 percent of American wages. But the cost differential is actually not very big. It's around a 30 to 40 percent cost differential because U.S. productivity is so much higher. You have shipping cost, as you alluded to. You have coordination cost that you don't have there. You have other costs. And that 30 to 40 percent happens to be at the low end of what people would argue Chinese currency manipulation is.

So there's no inherent reason we cannot compete and run a trade surplus in manufacturing without lowering our wages. There's just no inherent reason for that. The reason we run a trade deficit in manufacturing, I would argue, in part because we haven't done enough on the national policies to boost our manufacturing productivity and innovation as other countries have; and secondly, around trade policy.

We haven't confronted these other countries who systematically cheat and distort. Whether it's using standards to keep foreign products out, whether it's manipulating their currency, whether it's tariffs that only apply — in the Chinese case, they'll have tax subsidies for exports. India just decided they're going to have tax subsidies for computer exports, which is one of the stupidest policies one can imagine.

If anything, you want tax subsidies for consumption. So there's a whole array of these things and we do almost nothing to deal with it. Our trade policy largely ignores those things. We address sort of one at a time, once in a while. And I think until we get serious about that, we're not going to be able to succeed in this space.

MR. BOROSAGE: So does getting serious mean matching them, or does it mean confronting their cheating, as you call it?

MR. ATKINSON: I think we I distinguish between two kinds — the problem with neoclassical economists, Bob, as you know, they would consider —

MR. BOROSAGE: They don't care.

MR. ATKINSON: Well, they don't care, number one, you know. It's just consumer sovereignty, so they don't care. But secondly, they would consider doing something like funding your company with an R&D subsidy or production subsidy as in the same camp as a total ban on imports. It's all industrial policy in their mind. And I think that's simplistic thinking that's ideologically driven.

I would distinguish two kinds of policies. There's the kinds of policies that can help us that are positive-sum that are going to drive productivity, innovation, all those things and we ought to do a lot of that. And then there are negative-sum policies that the Chinese are doing — but not just them; the Japanese and the Europeans and others — that are really just simply about a zero-sum or negative-sum game, just restrict what others have, to keep others out, to give their stuff an unfair advantage. And so I know there's a space in the middle where those things blur. But I think there's also lots of clear cases where you can say this is one and this is the other.

MR. BOROSAGE: And as to the latter?

MR. ATKINSON: As to the latter?

MR. BOROSAGE: The stuff — the policies that are restrictive and are keeping our exports out, et cetera? What's our policy? How do we confront that? You have China, which is quite systematic of both the coerced technology transfers of subsidies for exports, of demands that if you build a plant there you can only build it to export, as they did with wind energy —

MR. ATKINSON: You have to move your R&D there. You have to — (inaudible) — property. Yeah.

MR. BOROSAGE: — et cetera, et cetera. And they're making these huge — wonderfully — these huge commitment and investment in alternate renewable energy and the electric grid, et cetera, which is a terrific thing for the climate and for that country.

MR. ATKINSON: Look, don't get me wrong. I think what China —

MR. BOROSAGE: How do we respond to that?

MR. ATKINSON: — I think what China's doing in their R&D support, in their universities, in their training, all of that, great. If China end up developing the really clear solar cell or solar concentrator, whatever, that's great. That's great for the world. But it's that former thing — that former set of practices — that I don't agree with. How do we address that?

I think we have to take a graduated approach and we have to start by doing something, which is pretty much what — we're not doing almost anything right now. And I would start — for example, in this space — if I were the president I would create a clean energy SWAT team in USTR. I'd give them however much it needs to do that — \$5 million or whatever it is — and just have a bunch of people who, their day job and their night job is to confront — identify and confront clean energy mercantilist policies around the globe and start to go after them.

And you start to go after them in a graduated way. You start with negotiation. Then you start bringing a lot of cases. Whether you can win — here's the other thing: USTR — well, we don't want to bring cases because we might lose. Yeah, you're going to lose a lot of cases, but you can't win unless you take cases.

And so I would really just start taking cases and start pressuring, and also, building alliances with some countries who generally look at the world the way we do. I think Great Britain looks at the world the way we do. I think Canada does. I think there are other countries who we could build an alliance with. So I guess I'd start there and see where that goes and then figure out what we do next.

MR. BOROSAGE: Would you combine that with a policy that's "buy American" here — that says if dollars in, jobs here that is our version of an industrial policy to make sure that when we make these investments, we get the jobs?

MR. ATKINSON: You know, I know this is going to sound like a cop-out: I actually haven't thought about that issue enough in this space, and it's something we're doing this year on a project. I guess I would say some of that is legitimate. Like for example, there's a requirement in the ATP program — which now is TIP — that if you get a grant, you have to commercialize it here in the U.S. So I think some of that is good. But I don't know exactly what I think about that. So some of it I think is good.

MS. MCGINTY: Go from the really big picture, just before we run out of time on two quick, more micro things, but that have been very, very effective. So within the spectrum of the stimulus incentives, the — (inaudible) — tax credit program has been very effective in a down market in continuing the build-out of renewable energy in the United States.

But there's one little piece of that program where it requires that projects must be under construction in 2010. That is having a very adverse effect now in seeing the next level of growth in this industry because these projects don't happen overnight. So if you have a requirement that it has to be under construction this year, this means we're only stimulating projects that have been in inventory for three or four years.

It does not mean we're stimulating new demand. And for that manufacturing capacity we do already now have in the United States, those plants are not seeing new orders. Now, further into the weeds, this program is scored by OMB clear out to 2012. So it would not even cost more. So Congress, can we remove the "under construction in 2010?" Thank you.

MS. MCGINNIS: So we talked about trade policy, industrial policy — I just wanted to ask if anybody wants to comment about, do we have the right workplace policies, educational policies at work to grow the future clean energy workforce here? Arum Majumdar, the other day, said he's seeing kids just beating the door down to get into clean energy jobs. I mean, is that a very optimistic part of this picture?

MR. BREHM: Speaking from a small manufacturer in the U.S., we get tremendous interest, but at the same time you have to have the business and be able to grow the business to actually bring the people on. So there's tremendous interest.

You could argue that one of the reasons we're in the kind of — Phil left — but with Phil's commission on the financial industry, in my generation, most of my peers coming out of MBA school went into investment banking or management consulting. With the evidence of

what happened last year or last couple years, saying maybe that wasn't the best career decision. But now we have an entire generation that's very, very interested in this field. We just have to make sure that the opportunities for them exist here, and I would say that they haven't grown as quickly as we would like.

MR. BOROSAGE: I think the administration has tried to pretty serious about creating job programs, particularly around the retrofit business – retrofitting housing and other buildings and construction. And I think Joel Rogers will describe what's happening at an urban level on this. And there has been money for that. It's has a hard time, I think, getting deployed in sensible ways. But they have done that. I think the broader question of education and training in the country is still — we've only just begun to touch on in any serious way.

MS. MCGINNIS: Well, we're going to open up the forum to questions in just a moment. I just wanted to maybe get some concluding remarks from you guys. Again, the big question — Katie, can the U.S. address in general these monumental challenges of addressing climate change, growing the clean energy economy, creating the jobs here through policy, through technology? Can we innovate ourselves out in problem in time?

MS. MCGINTY: Well, I think the time is now. I think we can. And frankly, I think we have to. This is a sector that we have to win. We have to win in this sector for the whole variety of national security, economic and environmental reasons that have been well-articulated here.

But I think there's something even more fundamental. Vaclav Havel has a saying about the definition of hope. And he said, the definition of hope has nothing to do with whether you win or lose. It has to do with having the opportunity to work on something that one feels is good. The value, the human integrity and pride piece that comes from a good job. We're failing to put our people to work in building our future in this sector. We have the opportunity to do that.

We've talked about a lot of technical things here. But I still stand firm. If we ask the American people to rise to a challenge; if we give them the basic tools and show them the confidence that we are going to stick and stay in this sector, not only can we win but we will absolutely win. And I think we're on the right path. We just need to have the public and body politic will to take these next steps. Some money, some mandates and we win.

MS. MCGINNIS: Well, this panel was supposed to be a look at how we get there by 2020. Bob, what's your sense of how well underway we'll be by that point? I mean, will we even be to where we achieved this 17 percent — is it 17 percent emissions cuts by then?

MR. BOROSAGE: Well, if we get that standard passed, which is a pretty low bar, even itself. I think the key question is leadership. The public is open to this. The public finds manufacturing to be important, overwhelmingly. It wants America to support its manufacturing industries as opposed to its finance industries, for obvious reasons. The public is excited about new energy and new energy as a source of jobs and growth. So I think you've got a broad consensus in the public that it's time to move, and they are mostly irritated that we haven't moved.

So the question is, obviously there are massive entrenched interests with huge resources, and we've seen in Washington around healthcare and financial reform — and energy — the effectiveness of entrenched interests in limiting and diluting and impeding change. So it really is about leadership, and leadership that's bold. And I think the major thing is, in some ways, the president, to me, has gone part of the way there. I don't think you can do this transition with a stealth industrial policy.

I think you have to not simply lay out the goal. You have to lay out the elements and argue it and push it and educate Americans to it and educate legislators about it and take on the folks standing in the way quite directly. And we haven't done that yet. I do think we've started. I think the reality is, of course, that there's no reason not to.

If the Germans can do it at the very high end with the most expensive labor — with a labor that's far more expensive than ours — and the Europeans understand the importance of it and the Japanese do and the Indians do and the Chinese do and each of these countries finds in their own individual political systems the way to move dramatically in this area, it seems perverse if we can't step up to the challenge and meet it.

MS. MCGINNIS: What if we don't do it, Rob? What if we're second, third, ninth or 10th in the world? What's at stake?

MR. ATKINSON: Well, I think what's at stake, frankly, is the future of the entire world as we know it. And the reason I say that is what we sort of forget in this debate — and sort of surprisingly, sometimes — is why are we doing this? Ultimately, we're not doing this for jobs. Jobs is a nice little bonus; it's a good thing to get.

We're doing this because there's a fundamental systemic crisis in the global climate. And we simply cannot solve that with the current suite of technologies that we have today. And so at the risk of being obnoxious, let me suggest that right now I would argue clean energy is a luxury good. When I got a little thing in my mail from my utility saying, hey, you want to buy some wind energy? And if you do, it's going to cost you a surcharge.

So I'm like, okay, I'll buy 50 percent of my energy from wind. I didn't want to buy 100 just because on principle, I'm like, the government should do some of that; this is a public thing. But you know, I'm reasonably well-off. I live in Washington. I'm a professional. I don't see the Indians just saying, instead of spending money on food, which we don't have very much of, or shelter, we're going to intentionally buy expensive energy.

So energy, right now — unless we drive the costs of energy down — clean energy, non-carbon energy — in a very radical way, we're simply not going to solve the problem. That, to me, goes to America's sweet spot, because I don't — maybe there's some other countries that could do this as well as we could, but there aren't very many of them. I mean, I think the U.S. is uniquely positioned to do this.

So unless we have a slightly more aggressive goal that we're not just trying to deploy the current suite of existing products, but that we're trying to take a leadership role — and there, I

would go to Peter's point. You mentioned our lead in superconducting systems. You know, that's a lot of where we should be focusing on: technologies and systems that other countries can't do. The Chinese, for all that we hold them up as supermen, they frankly have a pretty backward industrial system in a lot of ways. They do commodity production. They're not very sophisticated. They're trying to get better. But we are much, much more sophisticated. We have a much better technology system, technology base.

And I think we have to not forget that we could — this is by no means a mature revolution. We're not even close to even coming up that S-curve. And that's, I think — we can't lose sight of that. We need to be thinking about taking the leadership role in this next generation of technology systems, couple it with a trade and manufacturing system so we don't lose that. But I think if we just try to compete on the commodity stuff, we can do a little bit of it but it's essentially a losing battle.

MS. MCGINNIS: Ending on some optimism. Peter, any final comments? You agree; we can get there?

MR. BREHM: I wouldn't be here, obviously, if I didn't agree. I think the policies we have and the policies we anticipate having get us 90 percent there. The problem is, unless we got the extra 10 percent it may be all for naught. And it's the point the Apollo Alliance being here is that we need that extra 10 percent.

It's not huge compared to the — I think it's going to be ultimately much more difficult to pass a policy with a price on carbon than it would be to pass a policy that would encourage the manufacturing and production of renewable energy technologies in the U.S. So it's going to take both. We're very close. We just need to go that little extra bit. And then we win.

MS. MCGINNIS: Does anyone have any questions? We have a couple of microphones. Okay. They'll find their way back there. Tell us who you are.

Q: Good morning. I'm James Jones from 360 Sustainability. Picking up on what Rob said and the other panelist said about the need to move beyond what we have in terms of existing technologies and really looking for pioneering new technologies, this past weekend I attended Harvard's social enterprise conference, and part of that conference was a competition of about 300 teams of grad students from all over the country who came up with social enterprise ideas. Many of them included clean energy technologies.

One of the things, though, was that the focus was on the innovation and not the next steps of actually manufacturing that. Many of them had already received funding and were looking for additional funding. How can we tie funding sources for those exciting new pioneering innovations that so many of the young people have to not only the idea but also innovating it? So the funding would actually have a stipulation that you have to not only have the idea but actually have some form of manufacturing and moving it to the next step?

MR. ATKINSON: You know, there's a very nice article that Pete Engardio wrote on the cover page of BusinessWeek probably in June of last year — and as many BusinessWeek people,

he's former BusinessWeek because he's gone and Mike Mandel's gone and all — but Pete's article was very interesting. Pete talked about — building a little bit on Katie's point — is in the last revolution of technology revolutions, we did pretty well because either they cost a lot of money, but we did it, like NIH, or they didn't cost very — relatively small amounts of money, like IT. You can capitalize an IT company without having to break the bank.

But this next set of technology revolutions, whether it's clean energy or materials, nano, are big capital-intensive things. You can't just sort of create a software program in your college dorm room and then go out and get \$20 million and then grow the company, like Facebook or something. And that's something where we just simply don't have a real systematic set of policies to do that. We've sort of relied more on this innovation-VC-Silicon Valley ecosystem, which we've done very well by it. Other countries are more systemic about saying these are big, capital-intensive projects. We've got to support them.

So I think there's a lot of different ways you can do that. But I think we need to do a couple things. One is, we need a real strategy. We need a real roadmap. One of the things that we don't know very much about is, what is the current state of the U.S. technology supply chain? There are real gaps in that, real weaknesses. And I think we need to be able to figure out — so it may be that you want to produce something in the U.S. But good luck; you're not going to be able to.

And the second thing we need to do is, I think we need to systematically use tax policy. And whether that's sort of project-based tax funding — so you develop a project and you can tax — or something more systemic, such as allowing first-year expensing of capital equipment, even in green manufacturing or something. Unless we do that, I don't think we're going to be able to catch up because these other countries are seriously doing that.

That, by the way, Bob, I would argue — which I know you don't agree — we agree here — that to me would not be industrial policy because the economic evidence suggests there are clear spillovers — or what economists call externalities — from new machinery and equipment. So this was something that to me would not only correct the market failure here, but it would level the playing field with other countries.

Q: (Off mike.)

MS. MCGINNIS: Wait for the microphone. Here he comes.

Q: There is a great new book out called "Up from Wall Street." It's written by Tom Croft. He works from Hartland Capital, Steel Valley Institute in Pittsburgh, Pennsylvania. And he's kind of nailed it in terms of how we're amassing \$35 billion of sustainable funds to go out and support the green economy you talked about.

MS. MCGINNIS: There was a question right behind him.

Q: Hi. William Thomas, EcoAnswers US. Peter, this is kind of a question related to the 10 percent that you just spoke about. It's kind of a comic (ph) question. Obviously, if we don't

look at energy efficiency first before we even speak about renewable energy to fix what currently is broken, I think that is something — and also the educational piece — part of the problem I see with the whole renewable acceptance is the education of the actual end user. And I think that extra 10 percent, when you talk about R&D, maybe we should focus on equally educating the market of what actually is going on and what is available.

Because — and what I've seen over the last several years with the sector is that there is definitely a demand side. But the supply side is somewhat short. And then educational piece of people actually understanding what is going on, what the rebates are, what cap and trade is. And I think if the market was a little bit more in tune.

You know, we as Americans, when we tag onto something, we just go with it. The iPhone, we went with it. I think a lot of what's happening in the sector is people — the end user, the American public, the person that pays that utility bill every month — doesn't actually know what all is available for them to be more inclined to adapt and move it forward. And I think maybe if we spent a little more time doing that, we'd see the sector grow much faster.

We've just involved in actually producing LED lighting in America and bringing that technology from and bringing those jobs from China. And one of the things we found in our marketing approach is that when our end user — client — found out that we're actually producing the bulbs, creating jobs for all here stateside, it actually leverages the fact that they get sometimes more interested in the technology because they know they're supporting the American economy and the jobs are coming back from abroad.

(Inaudible) – more on what should we do to educate, and to fix what is — I mean, why would I want to put a 25-kilowatt array on the roof when I'm burning bulbs that are not efficient, when I can fix the problem first and then use less solar and drive the sector twofold?

MR. BREHM: I very much appreciate your question. It's very timely. Clearly education — well, to take a step back there, I don't know the polls. I'm hoping someone here can bail me out. But there was a recent poll by an entity that's primarily a Republican polling firm, and that poll basically concluded that the American people, when you talk about clean energy policy, if you couch it in terms of new jobs and energy security, are overwhelmingly in favor of developing it.

And I don't recall the poll or the name of the pollster. But — the Luntz poll. Everybody in the room probably knows the polls. (Inaudible.) Thank you. And it basically speaks very much to the point of my questioner here. The public, once educated, is very, very supportive. I have to be a little bit careful here, because I am on the SEA board and SEA looked at basically creating kind of a "Got Milk?" program for solar. It's been up in front of the SEA board many different times. And unfortunately, the board decided not to go forward with that policy. I would have argued that that was a very — clearly, I was in favor of that policy.

It ended up being the manufacturers basically on one side opposed to the "Got Milk?" program for solar — would have been called maybe "Got Solar?" Who knows — but the installers — basically, the distributors were very, very much in favor of it. Unfortunately, the

SEA board is primarily dominated by manufacturers. So there was an attempt, at least, within one industry to try to develop a program to help educate the public, but unfortunately, it did not go forward. And maybe we could use a gentle push from our policymakers and maybe Congress to encourage us to do that.

MS. MCGINTY: Can I add to this a little bit, quickly? I'd say two things, one in support and maybe one to build on what you said. So in support, the lack of education, the lack of consumer awareness about things energy is one of the reasons I think that is so compelling to start to move towards things like smart meters, for example. And when you realize the dearth — the absence of information that the average consumer has on how much electricity am I consuming and what's the cost of it.

What we found in Pennsylvania, in passing a bill two years ago that does mandate that every rate-payer have the opportunity for a smart meter, and that it be bidirectional communication equipment, which means that that consumer knows in a real-time basis what their consumption is, is vitally important.

But the thing I'd say, thought, in addition to education. Energy is one of those sectors where there are, as the economists say, these really sticky inelasticities of demand. It's really hard to move the needle for a variety of reasons. It's not on our radar screen. We don't have the information. Or I'd love to take mass transit but there isn't any. So lots of inelasticities.

And I think, coming back to something Rob said earlier, the macro price signal maybe is not enough. And that's where in the energy sector, we do need targeted policies so that every consumer, highly educated about energy or not, buys a TV that's highly energy-efficient. Why? Because we require that. And so setting those sector-specific standards, I think, is a very important complement to the education piece that you've highlighted.

Q: Hi. My name is Lindsay Woolsey. I'm with the Corporation for a Skilled Workforce. I wanted to come back to a question, Susan, that you raised about the other education piece – the education and training piece. Because I'm worried that we're going to do what we have always done, in that we will create energy policy over here and we'll create workforce and education policy over here.

And I worry about that for a couple of reasons. One, I think when we talk about education and training of workers that are truly going to be the ones to take these jobs in the new energy industrial revolution, I worry that we're not thinking about who those workers are today. We go automatically to high school. We think, how are we really preparing our young people to get excited about careers in the energy industry?

The reality, if we're talking about 2020, is that 80 percent of the workforce in 2020 is already in the workforce today. What that means is that we're talking about adults and adult learners. We're also talking about 88 million adults in this country that don't even have the basic skills to succeed in the workplace; that need not only basic skills remediation, but occupational training that will get them the middle-skill jobs that the energy industry is promising.

So I want to just open this up for real discussion about how these two policy arenas are truly being integrated. Because it's not going to be enough to just talk about education and training in bits and pieces within the energy policy arena. We're going to have to integrate the two. And I know that this afternoon we have a great panel with Joel Rogers and Andy Levin from Michigan who understand what this looks like at the state and local community level. But I'd love the panel's opinion on what this can look like and what it should look like at the federal level as far as integrating these two pieces.

MR. BOROSAGE: The administration has tried to do this in tandem. Its focus has been on the community college network and turning that into a place that can do both retraining and training of high school graduates and be linked clearly to employment opportunities and to local industrial demand so you're actually training people for jobs that exist.

But we're very bad at that thus far. It's only just begun. And we don't have an active federal labor policy that can even provide the community colleges with the information. So a lot of it requires — it has to be done at the state and local level. And the administration I think is kind of following that model of trying to get resources that makes it possible but seeing to the extent there's planning on a labor market process of what jobs are there, et cetera; seeing that more at a state level than at a national level.

MR. ATKINSON: I would just add to that by saying one of the reasons why I think some of these other countries are successful is that they're somewhat small. Some of these countries that are out-competing us are smaller than Pennsylvania. And we, I think, have a relatively myopic focus here inside the Beltway, where we think the feds are going to do a lot of this. What I would suggest we do is that we have some sort of clean energy state technology growth fund where we have a systematic program that fund the Pennsylvanias of the world, which you guys were doing great stuff, but underfunded. Michigan's doing great stuff.

So that to me would — have states come up with coherent strategies for going the clean energy economy, of which workforce would have to be a key component. Frankly, the states are better at dealing with workforce issues than the federal government. They're more aligned. They're more closely linked to their employers. They know their clusters better than Washington could know it. And so I think we need to think about really new institutional partnerships that would drive this industry. And to me, having a partnership with the states would be a really good way to go.

MS. MCGINNIS: We have time for one more question. Okay.

Q: Just sort of a quick comment on that, just to let you know. That's already happening right now. There's more than 20 states that have clean energy funds. And there's something called the Clean Energy States Alliance, which is a coalition of these clean energy funds that are already doing exactly what you're saying. And then we are looking at ways to partner with the feds, DOE, to do more direct procurement, joint technology development stuff at the same time. I can give you more information about that.

MR. ATKINSON: Yeah. No, my point was not so much that the states — the states are doing a lot and a lot of states, as you mentioned, have plans. But my point is if that's — if you look at the overall state economic development, or what people call TBED — technology-based economic development — which clean energy would be a component of that — Washington largely ignores them and doesn't give them any dedicated funds.

So I think it's time for Washington to say, we're going to allocate a couple hundred million dollars a year specifically to states to do these kinds of things, and then build off all the good work that these states are doing. But I would venture to say that every single one of those states is underfunded; that the opportunities are much greater than their resources are right now.

Q: Through the stimulus package, we were able to get a lot of the state energy funds to go directly to the states that do have entities like this. And they're using it really effectively. The other thing is, I must admit, I missed the beginning of your talk. But I've really appreciated, Rob, a lot of the things that you've said.

And you've talked about putting more money into innovation. And I'm wondering if when you say that, do you mean — how do you mean? In the existing system or do you have thoughts and strategies about how to change the way that we do RD&D innovation in the U.S.? Which I would say is fairly broken.

MR. ATKINSON: This is actually work that we're going to be doing this year. My colleague, Darrene Hackler, is here from ITIF, and she's leading a project specifically that will look at some of that. But I think one of the sort of generalized statements I would make — and it's certainly not just with our clean energy innovation — it's without our overall innovation system — is that we tend to have this bifurcated view; there's basic research and then there's something out here that companies do, which is applied. And secondly, that companies kind of do this on their own.

We released a report last year that Fred Block at UC Davis did for us. It's called Where Do U.S. Innovations Come From? And it looked at the changes in the U.S. innovation system from 1970 to the present. And what we found was that in the 1970s and through the '80s, most innovations in the U.S. came from single, large Fortune 200 companies acting on their own.

They have a lab, they think about something, they develop it, they innovate it, they produce it, they market it; we're done. Since really about the mid-'90s and particularly in this decade, most — the lion's share of these award-winning innovations now come from collaborative partnerships, engaging universities, federal laboratories, small companies, large companies. And our innovation policy hasn't reflected that change.

So I think that therefore what we need to do is a lot more policies that build these collaborative partnerships. So for example, one policy that Sen. Bingaman included in the energy act in 2005 — which if we did a poll I would guarantee you that none of you know about this unless you were on the Senate Energy Committee — but they created a collaborative R&D tax credit for energy R&D.

So if you're doing energy R&D and you're doing it at a university or federal laboratory, you get a 20 percent flat credit on that research. Those are the kinds — first of all, I would expand that to something like 40 percent — but those are the kinds of programs. And I also think the other thing we need to do is — Brookings proposed these energy discovery hubs, these sort of partnerships at the regional level with universities, companies, labs. I think we need to do a lot more of these partnership programs and not just sort of rely on DOE doing this sort of one firm at a time kind of thing.

MS. MCGINNIS: Okay. I think we're going to have to end it there. We're going to take a short break. I want to thank all of our panelists for a really great, compelling discussion today. Rob Atkinson from ITIF, Bob Borosage from the Institute for America's Future, Peter Brehm from Infinia and Katie McGinty from Element. Thank you so much for a great discussion. (Applause.)

(END)