THE BROOKINGS INSTITUTION

PLUG-IN ELECTRIC VEHICLES 2008:

WHAT ROLE FOR WASHINGTON

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OPENING SESSION

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DAVID SANDALOW
Senior Fellow, The Brookings Institution

DAN REICHER
Director, Climate Change & Energy Initiatives
Google.org

Remarks:

JIM WOOLSEY
Partner, Vantage Point Venture Partners

PETER DARBEE
Chair and CEO, PG&E Corporation

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Moderator:

VIJAY VAITHEESWARAN
Correspondent, *Economist* and co-author, *Zoom*

Panelists:

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Founder and CEO, Project Better Place

MARK DUVALL
Program Manager, Electric Transportation,
Electric Power Research Institute

DERON LOVAAS
Vehicles Campaign Director, Natural Resources Defense Council

CHELSEA SEXTON
Executive Director, Plug-In America

DAVE VIEAU
CEO, A123 Systems

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MARY ANN WRIGHT
CEO, Johnson Controls-Saft Advanced Power Solutions

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Senior Fellow, The Brookings Institution

DAN REICHER
Director, Climate Change & Energy Initiatives
Google.org

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P R O C E E D I N G S

MR. SANDALOW: Hello, everybody, welcome. My name is David Sandalow, and on behalf of the Brookings Institution and our partner in this conference, Google.org, I am thrilled to welcome you to this conference.

Yesterday on the floor of the Senate, we saw how partisan divisions can block progress when it comes to energy policy. And today, at this conference, we'll discuss an issue that can unite Americans, findings ways to connect cars to the electric grid.

We'll hear from Republicans and from Democrats, from businesses and NGO's, from engineers and attorneys, from optimists and pessimists. Our objective is to inform, to explore, and perhaps to inspire.

We have at least three tools over the next 24 hours, starting with the extraordinary speakers who are sharing the stage. We'll also have video, like the one you just saw, some from old footage, some from

experts who have come into our studios to talk about this issue, and others from Google.org's recent call for videos on the question "Why I want to drive a plug-in hybrid?" We have almost a dozen electric cars out in the foyer and upstairs; and, in addition, we have each other. Looking at the list of more than 400 registrations here, I have to say it's easy to see what a superb group this is. There's a lot of enthusiasm, expertise, and a lot of learning that can be done from each other.

Ladies and gentlemen, last year more than 96 percent of the energy in our cars and trucks came from oil. That seems normal to us. We grew up with that. Our parents grew up with that. Our grandparents grew up with that. But it is deeply abnormal, I believe, to have a world in which the entire transportation system relies upon one commodity.

If the price of orange juice goes up, I can buy grapefruit juice, or soda, or milk. If the price of a hamburger goes up, I can buy a hotdog, or a salad, or pasta. If the price of oil goes up, most of

us have only one choice, and that is to pay more or drive less.

Now, in the view of many experts, no technology offers more promise for breaking our dependence on oil than connecting cars to the electric grid. But oil's dominance is deeply entrenched, in part because of government policies over the past century. How do you value, for example, the subsidy to a project from having the President of the United States and his entire entourage fly to Saudi Arabia to try to lower the price of that product? Now, the most recent effort in that regard was unsuccessful. But it has been a policy of presidents and secretaries of states of both parties for generations to do what it takes to secure the free flow of oil. Against the backdrop of that almost incalculable subsidy, what should be Washington's role in helping us reduce dependence on oil? If plug-in electric vehicles have social benefits, should private companies bear the entire cost and risk of developing them, or should the public, through its government, play a role? Is there

a common agenda with regard to plug-in vehicles that can unite Americans? Oor would this topic, too, become mired in partisan debate?

These are hard questions, and I will be happy if, over the course of the next 24 hours, we have a chance to discuss them and this conference shed some light on them. And with those brief introductory remarks, it is my great pleasure to introduce a man of really rare intelligence, expertise, and vision.

Dan Reicher has over 20 years of experience in business, government, and NGO's focused on energy and environment. He now serves as Director of Google.org's Climate Change and Energy Initiatives. From 1997 to 2001, he was an Assistant Secretary of State. He holds degrees from Dartmouth, Stanford, and Harvard. He's tried to overcome those handicaps and go onto a successful career. He's been a teacher of mine for many years. He's also a good friend. Ladies and gentlemen, Dan Reicher.

MR. REICHER: Thank you, David. And as much as I would have loved to have been Assistant Secretary

of State, I was actually Assistant Secretary of Energy. But I'm so thrilled to be here. I really want to thank David and Brookings for all the great work that has been done. And can you imagine this moment, gasoline at $4 a gallon, *The Power of Love*, we just saw that wonderful video, standing room only here in this hall. I just learned that the fire department has said no more. So great, great attendance, great interest in this event.

And I'm so thrilled to be here on behalf of Google.org. And I really want to thank David for his very kind introduction, and thank him for his great leadership over many years in and out of government, helping to advance our nation's climate and energy agenda.

I'm very honored to Co-Chair this conference today that asks how Washington can help plug-in vehicles with their many environmental economic and security benefits, get wired into our transportation system. I'd like to do two things in the next few minutes. First, answer an obvious question we get

asked a lot: Why is Google involved? And second, explain how this conference can make a real difference in advancing plug-ins.

So why Google? The brief answer is that through our new philanthropic venture called Google.org and as a company, Google is helping to tackle several of the planet's biggest environmental challenges, including global climate change.

We are focused on two of the most promising climate solutions, increasing vehicle fuel economy through plug-in vehicles and reducing our reliance on fossil fuels through renewable energy.

Our Co-Founders, Larry Page and Sergey Brin launched our plug-in vehicle initiative last June. We call the initiative, RechargeIT. We've assembled a talented engineering team, a number of whom are here today, including Alec Proudfoot and Rolf Schreiber, who will be giving a tech talk later today on plug-in technology. We've also assembled a great group of project managers. I want to particularly recognize Kirsten Olsen, who got RechargeIT launched, Adam

Borelli, who's been so helpful day to day, and Michael Terrell, who's been so instrumental in putting this conference together. We've developed in our testing a small fleet of plug-in hybrid electric vehicles at our campus in Mountain View. We're monitoring and posting the data from that fleet at Rechargeit.org. The great news is that the plug-in Prius's are getting about 70 miles per gallon, while our regular Prius's are getting about 45. Very significant improvements in fuel economies in these transformed vehicles.

And we've made some significant grants for research and advocacy. Later this summer, we will announce millions of dollars of investments in plug-in vehicle related companies based on more than 400 responses we received to our request for investment proposals.

One of the most compelling aspects of a plug-in vehicle is that as the electric grid gets greener, the cars get cleaner. Last December, our Google co-founders launched a second initiative, to make renewable electricity cheaper than coal fired

power, and thereby, accelerate the greening of the grid. Under RE<C, as we call it, we've assembled a crack team of engineers who are tackling some major renewable energy challenges. We're investing in companies with breakthrough technologies. We're engaging on policy here in Washington. We're figuring out innovative ways to use our own Google information tools, like Google Earth and Youtube, to advance RE<C, as well as how to help with broader consumer engagement with energy information and technologies.

And we set a very specific company objective, and that is to develop one gigawatt, 1,000 megawatts, of renewable electricity cheaper than coal, enough to power San Francisco, and to do it in years and not decades.

Our two climate initiatives, RechargeIT, and RE<C, together, frame our overarching vision, and that is to get to a day we hope, sooner rather than later, when tens of millions of vehicles are plugging into a greener grid.

This conference is an important step toward that day, because Washington has the potential to put a real charge into plug-in vehicles and the grid that will power them. There are a number of obvious steps, increasing federal R&D for batteries and other key technologies, procuring plug-in vehicles for the federal fleet, providing tax credits for car buyers, and setting new standards. But let me stress that accelerating the arrival of plug-in vehicles must involve more than the cars themselves. For more than 100 years, we have built the auto industry in lockstep with the oil industry. Each advanced the other in an integrated and successful fashion. Plug-in vehicles require that the auto industry focus on a very different industry, namely electric utilities.

The plug-in vehicles we expect to see over the next few years will remain small volume curiosities if we can't figure out how to successfully fuel millions of vehicles from our electric grid.

Washington also has a role to play here, arguably an even bigger one than advancing the

vehicles themselves. Helping to build a smarter and greener transmission system, accelerating the introduction of vehicles into the grid, including smart charging and vehicle to grid technologies, supporting real time pricing and other mechanisms that incentifies more economic use of our grid.

This conference brings together the key actors in building the advanced vehicles and the modern grid that will be required if plug-ins are really going to deliver their many environmental, economic, and security benefits. The good news you will hear is that while there are certainly challenges for the commercialization of plug-in vehicles, there are no technological or economic show stoppers. The other good news is that the people are on our side. In a poll we are releasing today, three of four voters support the government taking an active role promoting the development of plug-in technologies. Two out of three voters said they would vote for a candidate who supports federal efforts in support of plug-ins. And

two out of three voters are willing to spend more for plug-in vehicles.

We asked people all over the country to tell us why they want a plug-in car, or if they already have one, how it's working. You'll see their answers today and tomorrow in a series of Youtube videos.

And as you consider the Washington role, the role Washington can play in accelerating our plug-in future, I encourage you to think boldly and creatively. One of my favorite lines is from the French writer, Paul Valéry, who said that the future is not what it used to be.

With a new administration, a new Congress, $4 gasoline, and the climate crisis, I think this view couldn't be more relevant to plug-in vehicles. We are at absolutely amazing moment, where a commitment to change, backed by some bold and pragmatic ideas, could really take us down an exciting new road at the wheel of a plug-in charged up with green electricity. I'm reminded of a day when I was in the Clinton Administration and I flew into the airport in

Burlington, Vermont. It was the height of lease season. I had forgotten to reserve a rental car, and none were available for my three day trip. I hailed a cab and told the driver of my dilemma. He paused for a moment and then looked back at me and said, well, son, you can hire me for $900, or you can rent a U-Haul. Sure enough, when I called U-Haul, they said they had plenty of vehicles for $19, and they would deliver it to my hotel.

As you participate in this conference, I encourage you to find your own U-Haul moment, a really good idea, an important partnership, a new source of funding. With these insights, and we hope a new sense of optimism about the role Washington can play, I am confident we can really accelerate the bright future for plug-in vehicles. Thank you.

It is now my great, great pleasure to introduce a man who truly needs no introduction, but I'll give him one anyway, and that is the shy and retiring Jim Woolsey. Jim is a venture Partner with Vantage Point Venture Partners, a Senior Executive

Advisor to Booz Allen Hamilton, counsel to the law firm of Goodwin and Procter, and Chairman of the strategic advisory group of Pallat and Capital Corporation. He also is an advisor to Senator John McCain. Jim served five times in the federal government, including as Director of the CIA, Under Secretary of the Navy, and General Counsel of the U.S. Senate Committee on Armed Services.

Of late, Jim has definitely not been shy and retiring when it comes to issues such as national security, energy, foreign affairs, and intelligence. He also drives a plug-in. It is now my great, great pleasure to give you Jim Woolsey. Thank you.

MR. WOOLSEY: Thanks, Dan. It's a real honor to be here with you and David to open this fine conference and to see so many friends in the audience. To tell you the truth, though, since I spent 22 years as a Washington lawyer, and I spent some time out at the CIA, in the Clinton Administration, I'm actually honored to be invited into any polite company for any purpose at all.

People sometimes ask me why I kept leaving a perfectly fine law practice over the years to go into the government a bunch of times. Many of you work for the government, or have, you know why you work for the government, it's the public appreciation. I had an example of that, I had been at the CIA for seven or eight months, my wife and I were classmates in college, decided we'd fly to California for our class reunion, cash in the old frequent flyer miles, go see some old friends, go to the homecoming game, take a few days off. The first thing that happened is, my Chief of Security at the CIA said, actually, Mr. Director, we want Mrs. Woolsey to go on a different flight because we can't have anybody named Woolsey on the flight, and I said, but wait a minute, my name is Woolsey, and he said, oh, no sir, you need to fly an alias, and of course, my first thought was, uh oh, there go the frequent flyer miles.

So I went out to Dulles with my two security men, and we get on the aircraft, and those simpler times, they stopped by the cockpit, showed the pilot,

chief flight attendant, they're carrying weapons that they were authorized to by the federal government, we go to the back of the plane, the three seats right in front of the bulkhead, where you can't even lean back, I'm wedged in the middle one of these in between these two big security guys, and we fly out to California for four and a half, five hours.

As we're getting off the plane, the flight attendant comes over and whispers something to one of my security men, and he just cracks up. Since he was a big, solid guy, I was sort of surprised, and I said, "Murph, what's so funny?" And he said, what she just said, she said, "You know, I've been on these flights for 20 years and that is the politest and best behaved prisoner that we have ever –" so, like I say, that's why you do the government gigs, right, it's the public appreciation.

Well, let me just suggest a few thoughts from about 35,000 feet, about what we are up to here, should be up to and why. And when I say plug-ins, I include not only plug-in hybrids, electric vehicles

with range extension, all electric vehicles, anything you plug in in order to get all or part of its power.

The heart of the matter is to begin to use electricity and to use it as quickly as possible, to power a major share of our transportation, and to break that 96 plus percent monopoly that oil has over our transportation systems.

Why? Well, there are a couple of reasons. Rachel Kleinfeld, who used to work with me, called it the malignant and the malevolent problems, and I think it's a wonderful formulation. Malignant problems are problems nobody is trying to create, they happen because of the nature of the system, sometimes its complexity. One malignant problem, in a way, that we are causing by having oil be about 40 percent of the global warming gases we emit is, we are doing something analogous to putting the globe on smoking five packs a day.

It may not produce global metastasis at precisely this date or that date, but we are increasing the risk of serious problems with climate

change. And it's not only climate change; it's the nature of the energy systems themselves.

Hurricane Katrina came within a very short distance of busting up the Colonial Pipeline that comes up here to the East Coast. We were very near spending a substantial amount of time walking and bicycling, it probably would have been good for our cardiovascular systems, here in the east right after Katrina.

We, however, also have another set of problems connected with oil, malevolent problems, and those stem from a range of situations. First of all, since about two-thirds of the world's proven reserves of conventional petroleum are in the Middle East, another several percent up in the Caspian, you're in the ballpark of 75 percent of the world's conventional reserves being in a very chaotic part of the world. The infrastructure is where the oil is largely, so we can't protect it the way we can in this country. Two plus years ago, Al Qaeda came very close to taking down the sulfur clearing towers at -- cave in

Northeastern Saudi Arabia, they misrigged happily their truck bomb. Had they succeeded in doing that, they would have sent oil immediately at well over $200 a barrel, because two-thirds of the Saudi crude passes through those sulfur clearing towers, and it would take several – many, many months to get them rebuilt.

Then we have the fact that by borrowing a billion and a half dollars a day, headed up toward $2 billion a day, to finance our oil imports, we are paying, as Tom Friedman puts it, for both sides in the war on terrorism. This is not a good plan, to pay for the other side in a war, as well as your own, but we are doing that.

Lawrence Wright, whose book, The Leaning Tower, is I think the best book on, Pulitzer Prize winning, on the lead up to 9/11. It says that with a little over one percent of the world's Muslims, Saudi Arabia controls about 90 percent of the world's Islamic institutions. What does that mean? It means that the Wahhabi Doctrine, which if you read the fatwa, was in Arabic, what they say to one another,

not what they say to you in English, what they say to one another, the doctrine is somewhere between murderous and genocidal with respect to Shiite Muslims, Jews, homosexuals, apostates, and massively repressive of everyone else, including particularly women. It is essential Al Qaeda's doctrine, the only difference being the disagreement between Al Qaeda and the Wahhabis over who should be in charge, a bit like the difference between the Trotskyites and the Stalinists back in the ‘20’s and ‘30’s, but the doctrine is the same.

So when tens of billions of those hundreds of billions that we sent to the Middle East and other autocratic regime, when tens of billions go to the Wahhabis every year so they can set up madrassas in Pakistan and in the West Bank, and teach, among other things, little eight year old boys that their highest calling should be to become suicide bombers, we are very definitely paying for both sides in this war.

And if you wonder who’s really doing that, who is it, who’s teaching those little eight year old

boys to be suicide bombers, who's paying for that, next time you're in a filling station and you get out to charge your gasoline, before you take out your credit card, turn the rear view mirror just a few inches so you're staring into your own eyes, now you know who's paying for those little eight year old boys to learn to be suicide bombers. Tom Friedman also says the price of oil and the path of freedom run in opposite directions. It's certainly clear if you look at the behavior of Mr. Putin, Mr. Ahmadinejad, Mr. Chavez, and it does tend to in autocratic states, which are most of the states that own and export oil, tends to concentrate power in the hands of the state rather than building up alternative locusts of economic and political power.

So we have a huge set of reasons, including our payments for oil funding now a Shiite Sunni nuclear arms race between Iran and the Sunni powers of the Middle East. We have a huge set of reasons why spending hundreds and hundreds and hundreds of billions of dollars every year for oil, much of it

from the Middle East, is just about the single stupidest thing that modern society could possibly do. It's very difficult to think of anything more idiotic than that.

Now, we hear people call sometimes for energy independence, and what they tend to mean is, we will try to increase domestic production of oil, Alaska, the Continental Shelf, and if they're honest about it, they'll say, maybe, you know, we could reduce our share of imports from two-thirds of our imports to 60 percent of our imports or something. Look, the bulk of the world's oil is not here, and the cheap oil, cheap to lift, to exploit, is overseas in the Persian Gulf, so OPEC, no matter if we go to say 60 percent instead of 67 percent of our oil coming from abroad, OPEC is still going to set the price. It is a monopoly, monopolies do that. We don't have control just because we slightly increase our own share of production.

So we are in a situation such that we have to take some dramatic and decisive actions. I think

by moving toward plug-ins, we will be able to do that. First of all, the economic incentives to the average driver can be stunning.

I drive an A123 converted Prius plug-in, and when I'm driving on grid power here in the Washington, D.C. area, I'm driving at about two cents a mile. If we had off-peak overnight pricing, it would be about one cent a mile. Gasoline is about 16, headed up.

I can today, using the photo voltaics on my roof and the batteries in the basement, if I wanted to get off the grid for a night, just to demonstrate, I could be driving entirely on sunlight for about 20 miles. Now, these are early steps, these are early adopter steps that people are taking right now. But saying they're not going to go anywhere is like looking at a several thousand dollar, five pound cell phone in its own little suitcase in the early 1980's and say, well, who's going to be interested in having cell phones. I mean, clearly, they're always going to be big like that, and heavy, and expensive, right? Wrong.

The improvements in battery technology, the improvements in photo-voltaics, the improvements in a number of types of technology are going to make it possible, are beginning to make it possible for us to utilize electricity in a very decisive fashion, not only to save money for consumers, not only to produce the energy that we use for driving and for transportation domestically, but to be cleaner.

A Pacific Northwest National Laboratory study, along with one from EPRI and Natural Resources Defense Council, make it quite clear that in the country as a whole, on average, 20 – 30 percent of your global warming gases that you emit from an internal combustion engine, you are basically improving that by 20 or 30 percent by shifting to a plug-in. And in a clean grid area like the West Coast, you're improving it 80 to 90 percent. In one or two states that are very heavy coal, you're at the margin, or maybe not improving it. But as the grid cleans up, as Dan pointed out, as the grid is cleaned up, the cars will be cleaned up, as well. And Pacific

Northwest study also indicates you can have over three quarters of the cars on the road be plug-ins before you need a single new power plant, because with time of the day pricing and a smart grid, you can move in such a direction as to do your charging at night, do it in such a way that it doesn't stress the grid. That is also helped, of course, by the improvements in batteries and storage.

And finally, one interesting thing about driving on electricity is that it is so cheap compared to liquid fuels, I believe it helps protect the alternative liquid fuel, such as ethanol, methanol, butanol, from the Saudis at OPEC doing to them what they did in the mid-80's, when they drove the price of oil down and bankrupted their competitors, and then again in the late-90's, when they did something of the same thing.

If they can't make real progress toward destroying competition by turning on their reserve capacity and driving the price way down, I don't think they're going to get started, because it is, to put it

mildly, extraordinarily difficult for them to even think of competing with one to two to three cent per mile electricity. They'd have to drive oil down to something close to their lifting price of $3 or $4 a barrel and they're not going to do that.

I don't think they embark on that tact to try to destroy their liquid fuel competitors if electricity is there and getting an ever larger share of the market every year.

So at least in my judgment, we are also protecting these alternative liquid fuels by moving toward electricity. And if you have a plug-in that gets in the ballpark, let's say of 100 miles a gallon, which is about what I get with mine, and it's also a flexible fuel vehicle, so you're driving on 85 percent, some alternative liquid instead of gasoline, you're now up in the ballpark of 400 to 500 miles a gallon of gasoline.

And if you build that plug-in out of carbon composites, ten times more crash resistant than steel and half the weight, like what's now going into high

end sports cars and Formula One race cars and its Boeing 787, you double the mileage again. You're now headed at close to 1,000 miles per gallon of petroleum based fuel. I made those statements at a conference some months ago, and a friend from a major power in the Middle East that exports a lot of oil came up to me afterward and said, Jim, a thousand miles a gallon, you're going to destroy my country. And I said, we don't want to destroy you, but we do think you ought to get real work.

If we move decisively toward electricity, we can begin to help with a huge number of problems. But we should not be trying to do this in moderation. We should not be trying to do it over some really long term period. We should get ourselves in gear, hopefully in the next few months, but if not then, with the new administration of either Obama or McCain, and move out decisively, the way the United States moved to take charge of its economic changes in early 1942, matching the President's call for mobilization to do it.

We need to do to oil something analogous to what was done to salt at the end of the 19th century. Annie Korin came up with this wonderful analogy. Salt was the only way to preserve meat until very late in the 19th century. It had a monopoly. Believe it or not, countries went to war over salt mines. If you had a salt mine, you could dominate your neighbor. It was a very big deal. Today, the salt on the lunch table out there, do you know where it came from? Are we salt independent? Do you care? Does anybody care unless they're in the salt business? Of course not. It's a useful commodity that does some things and we buy and sell at international commerce.

Nobody dominates their neighbor anymore because they have a salt mine. We need to do that to oil, and we can do it with electricity the way electricity affected salt monopolies in the late 19th century. We can, we should, and we must, as a major national priority, destroy oil's monopoly, absolutely, totally, completely destroy oil's monopoly. Thank you.

MR. SANDALOW: Thank you, Jim Woolsey, for your vision, your clarity, your determination. I am thrilled to introduce Peter Darbee, a veteran of the energy telecom and investment banking industries, and Chairman of the Board, Chief Executive Officer, and President of PG&E Corporation, which is a $35 billion energy based company that owns Pacific Gas and Electric Company, one of the largest combination natural gas and utility companies in the country. Peter and PG&E are founding members of the U.S. Climate Action Partnership. Peter is also on many other boards. He has degrees from Dartmouth, and we're thrilled that he's here. Thank you very much, Peter Darbee.

MR. DARBEE: Good afternoon, greetings, it's great to be here, back in Washington. And I want to applaud the remarks of Jim Woolsey. He is so right about the challenges that we face as a nation and as people, citizens of the earth, with respect to the dependence upon oil and also the threat of climate change that we face.

I wanted to share with you my excitement about plug-in hybrid vehicles and plug-ins more generally and talk about the work that we're doing here today. I want to first, though, commend the Brookings Institute and Google for having this conference and thanking them for the opportunity to speak with you today.

We're excited about plug-in hybrid vehicles for a number of reasons, and the first of which is that in California, we have among the most progressive of states looking to change an innovation and sharing a concern about climate change.

The state estimates that by 2012 to 2014, we should have 58,000 plug-in hybrids there. And it's not surprising that Google is also headquartered in our area, and we work together with them on the problem of climate change and plug-in hybrids. We also have been, if you're not aware, great advocates at the federal level and at the state level with respect to climate change and legislation such as the

Lieberman-Warner Bill to combat climate change and implement mandatory controls over carbon emissions.

Third and very relevant to the discussion today is that we are currently investing billions of dollars in our grid and billions of dollars to promote a smart grid, which will enable plug-in hybrid vehicle technology.

The fourth is that we have, aside from the state of California, the largest vehicle fleet in California; so that we have tremendous opportunities to transform our vehicle fleet away from the more traditional combustion engine to compressed natural gas, which we have done, but also to plug-in vehicles.

So it's attractive to think about this new technology in front of us. It's very appealing to our customers, they communicate that regularly. It will enable us to be a constructive participant in the war on climate change. It will create an opportunity to grow our business by driving investments that will help our customers. We have a fleet, and we'll be able to move that fleet forward to a newer and cleaner

technology. And finally, and very importantly, we will be able to play a key role in enhancing the United States security position. When I see America's dependence on oil imports, I see $4, and perhaps $5 a gallon gasoline in the climate crisis, the citizen in me causes me to say, I wish we could transition to plug-in hybrid vehicles as quickly as possible and do it all tomorrow.

On the other hand, as a CEO of a utility, I have to ask the question, are we ready? Is our industry ready? Today, our electric grid cannot support massive quantities of plug-in hybrid vehicles very well. And there's much work that we have to do in order to accomplish that, but I think much of that work can be done over a five year time frame in California and a ten year time frame throughout the remainder of the United States.

In short, we need to transform the electric grid in the United States. The Wall Street Journal has said that smart grid technology is to the success of plug-ins what the elevator was to the success of

the skyscraper, and I believe that that's true. But first, let's talk about the potential. EPRI forecasts that plug-in hybrids could cut greenhouse gas emissions four to five hundred million metric tons per year by 2050. It's like taking 82 million cars off the road. We could save three to four million barrels of oil per day, and we could improve substantially the quality of our air. For drivers, as Jim pointed out, electricity is significantly cheaper than gas. By one estimate, the amount of electricity required to drive 25 to 30 miles is perhaps nine to ten kilowatt hours, which equals about $1.50 if you're a customer of PG&E.

This is substantially less, of course, than what gasoline currently costs today, but who knows where the cost of gasoline will go in the future.

EPRI has indicated that consumers are very interested in this. But what are the implications for electric utilities, that's very important. The Oak Ridge National Laboratory study estimates that the impact is that we could potentially take 25 percent of the cars that are currently consuming oil and switch

them over to plug-in hybrid vehicles between 2020 and 2030.

However, what EPRI also found was that there were significantly different impacts on the environment and on our industry depending on what region of the United States plug-in hybrid vehicles were utilized and the level of adaptation of their regional utilities. And what I'd like to do is go through a little bit of that now. Specifically, in the worst case, where utilities were not well prepared for this challenge, what you could see is the additional need for 160 new large power plants in the United States. And those power plants would most probably be powered by coal.

This would lead to tighter reserve power margins and the risk of power outages. And it could also lead to substantially increased prices of electricity, rising by perhaps as much as 300 percent.

Now, the outcome could be very different if the drivers of plug-in hybrid vehicles were plugging those cars in at 10:00 at night as opposed to 5:00,

6:00, and 7:00 at night. In that event, the need for additional power plants might be zero. And in addition, the power generated to support those cars may well come from renewables as opposed to coal. And the cost increase in terms of electric rates might be on the order of one or perhaps two percent.

Other studies have indicated similar results. And the Pacific Northwest National Laboratory study has indicated that if we do charging at night, the existing generation fleet can support 73 percent of the nation's automotive fleet. And that would have the impact, Jim Woolsey, of cutting demand by the United States for oil by 50 percent. So the key question for us is "How do we ensure that the charging times for these plug-in vehicles is matched to the capacity of the system?" And the answer to that hinges on a smart electric grid.

PG&E is currently installing ten million smart meters, and this, by the way, is a huge undertaking. But we are the first of the utilities in

the country to be at the leading edge of installing smart meters.

So-Cal Edison, our neighbors to the south and our friends, are also engaged in a smart meter implementation program. And with these smart meters, we will permit the, and enable the – we will enable communications between the home and the vehicle and the grid, and also enable incentive pricing, which is so important.

So what's critically important is, we have time of use metering, which will charge high prices during the periods of the day when there are peak power usage demands, and will moderate those prices in the evening, when we have surplus or excess power. And plug-in hybrid vehicle owners will be able to take advantage of that. Now, with time of use metering, then it's up to the customer to make the rational decision. But it's pretty clear if the price is perhaps half of what it would be during the peak power periods, like 5:00, 6:00, and 7:00 at night, when everybody comes home, plugs in their car, turns on the

air conditioning, that would be a problem, as opposed to if there was a timer that turned on those vehicles' chargers at perhaps 10:00 and ran until 4:00 in the morning.

So what we need to do is implement this technology. And the good news is that the technology exists today, it merely has to be rolled out, in our instance, to ten million different customers, and we're looking at both the gas and the electric side of the business.

I want to say, though, that the Holy Grail, with respect to plug-in hybrid vehicles, is still some years off, and I think we need to be realistic about it. And we have worked together on that project with our friends from Google, and that, of course, is V2G, Vehicle to Grid. And this would create the opportunity for a power supply for us that is away and apart from the central generation facilities that we all know so well and have been a part of our life in California, and would create, in effect, rolling power plants. We did a demo on this with Google last year,

and in that demonstration, we took a Prius, and we reversed the flow of power back into the grid, and we were able to turn on a number of lights and appliances. So that is the future vision, but that I really think is somewhere between ten and 20 years down the road.

With that vision, we will be able to have vehicles that can communicate with the utility, and they can pick a price when the cost of power is least and activate the charger within the car and to charge it during that period of time, and to adjust the rate so that you minimize the cost to the customer. And the smart meter will track the sale and provide that the customer is paid or credited accordingly.

Now, this is a tremendous opportunity for utilities in the United States, and not all see it the same way. But we were early adopters, we're moving rapidly, and we see this as a tremendous opportunity, a business opportunity, but also one that will displace dirtier centralized forms of generation that

are used rarely during the course of the year, but during peak power needs.

The effect of the plug-in hybrids will be very positive on our plant and equipment because it will levelize the use of the power facilities, which today, many times generation facilities stand by and idle for 90 percent of the time, waiting to be ready, like the Maytag salesman of old, to serve the customer when they're needed. In addition to providing that capability, in the future world of plug-in hybrid vehicles with smart meters, and vehicle to grid capability, we have the ability for the plug-in hybrids to provide a bouncing voltage role, that they'll be able to help us balance the voltage in the grid, and in addition to that, increase the stability of the grid and the power quality. And these are things that are of increasing importance to our customers in the ever increasing electronic age in which we live.

So not only do the plug-in hybrids have a tremendous benefit from the energy security

standpoint, but they also have a key role to play in the battle against climate change, which we believe is an urgent need, it's a man made need, and it's something that we all need to marshal our resources to combat, and has been described by some as the greatest challenge that mankind has ever faced.

So as we look to the future, we believe that this technology, the innovation, the investment, can be helpful and can move us along with respect to energy security and the climate. But there are more things that need to be done along the way. In the near term, I think we will see the opportunity for vehicle to home activity before vehicle to grid, and that's where you can drive your vehicle home, and it can supply electricity into your home, much like solar panels do today, and much like as Jim described earlier.

Now, let's look at the most important question and really the bottom line question for this conference and for this community here in Washington, and that is, what can Washington do to help?

First, it's very important that Washington foster an environment of innovation and investment in clean and low carbon technologies, and they can do that by extending the renewable tax credits and also implementing a program similar to Lieberman-Warner or a derivative thereto that puts a price on carbon, that puts mandatory controls over carbon within the United States.

In addition, we're working with U.S. C.A.P. to advocate legislation of that nature, as well as new technologies.

The second thing we need is we need a nation-wide RPS, renewable standard. So far in the United States, we've seen approximately half states in the Union embrace RPS standards, and we feel it's critical that the other states in the Union join the more progressive states and put RPS standards in place, as well. Third, we need to continue to remove the barriers to new electric transmission. You know, all sorts of people in America talk about the need for more electric transmission, the FERC does, public

utilities do, the Governor of California does, but the reality is, for utilities in America and other companies, building electric transmission is an incredibly difficult task, it's a gauntlet, and government needs to take steps to remove the obstacles, and make it easier, and to facilitate more quick implementation of electric transmission.

It will be the electric transmission that is linked to the renewable portfolios that will create the clean energy that will power plug-in hybrid vehicles.

In addition, recently the House passed the Renewable Energy and Job Creation Act, and that cuts the cost of recovery time in half on depreciation for smart meters from 20 years to ten years. There is currently a bill pending in the Senate, and we encourage the Senate to do the same as the House and to pass that bill.

The fifth element is for companies like ourselves and for government to, where these entities have significant fleets, trucks, or automobiles, that

they shift and make it government policy or corporate policy in order to implement plug-in hybrid vehicles as quickly as possible. So we have a big task in front of us. But as Jim pointed out, and I think I made clear from my remarks, the technology is there. We have the underpinnings and it really is a question about national will. Will we move it forward?

PG&E has made the decision that we will, and we're asking and encouraging other members of the electric utility industry to join us, and we ask the members of the Senate and the House and the Administration to put in place the legislation that will make all of this possible. Thank you and I'd be happy to take any of your questions.

MR. SANDALOW: Peter is all ready to answer any questions. We have a microphone here if anybody would like to ask any questions; we've got a couple of minutes.

MR. DARBEE: There's one right down here.

SPEAKER: What is PG&E doing in the realm of generating electricity from solar and wind power?

MR. DARBEE: The answer is we're doing a lot. We have worked with a number of solar generation companies and start-ups, for example, Bright Source is one, Osser is another, and there are a whole panoply of companies that we have worked with. We've entered into contracts, some of the largest contracts in the United States I believe, on the order of 900 megawatts of capacity and solar. We've been particularly intrigued by solar thermal technology. We think that that has the greatest opportunity for cost reduction.

We're currently evaluating thin film solar technology, which has the opportunity to bring the costs down in that respect. We also have been a leader in cow power and capturing the methane from the many thousands, if not millions of cattle that we have in California.

The methane has 21 times the deleterious effect on the environment of CO_2, and so capturing that methane is very important. We're also exploring wave technology and title generation capabilities.

So we have seen this as a whole new opportunity. And currently we're evaluating at the senior most levels of the company how can we play in this field as an equity investor? Not only a company that's sort of contracting for a lot of this new technology.

MR. POCH: Hi, my name is Jim Poch with the Plug-In Hybrid Coalition of the Carolinas, and we have Duke Energy, Progress Energy, SCE, and G Santee Cooper, and Piedmont Municipal Power Agency; joint coalition, we have an action plan down there trying to create awareness. What would you like to see from them in the coming year, either working together or nationally, or what would you like to see other utilities doing following your lead?

MR. DARBEE: Well, one of the most important things is, we are working through the Edison Electric Institute, Tom Kuhn, the CEO of Edison Electric Institute is here with us today, and also with EPRI, to define a common standard for interface between the cars and the home so that we can most quickly and

easily create that interface, the automotive companies and the electric utilities can agree on a single standard, and that will greatly move things ahead.

So I think that that is one thing that's essential for an organization like yours and ours to work together on.

In terms of promoting the awareness, we're doing all we can in California. We'd be happy to work together with you in further getting out that message. And I think the combined messages about climate change and about energy security, they create a very compelling story for many of Americans, and the beauty also pointing out that the cost of electric powered vehicles is a small fraction of what gasoline is today, that can do a lot to promote that industry.

MR. SIEGEL: Hi, my name is Lenny Siegel, I'm a long term customer for the past year, I've also been a supplier with my rooftop photovoltaic and Mountain View. What is PG&E doing, or what's your position on feed-in tariffs and islanding, at least for homes, things that might stimulate other

homeowners in your service area to try to provide their own piece of the renewable puzzle?

MR. DARBEE: I want to make sure I understand fully the question that you're suggestion; so islanding homes, can you elaborate on that?

MR. SIEGEL: Basically, if the grid goes down, and we're generating solar from our roofs, right now we can't use that to power our refrigerators, computers, or whatever. A lot of people in my neighborhood would invest in more solar, and like we could plug in our cars, as well, if that were done. And it has to be done safely. I know there's technical issues, but what's your position on that?

MR. DARBEE: I haven't really had the time to go into the details of that. I'm sure there are a lot of technical issues. The overall stance of the company is to promote the plug-in hybrid vehicles, solar technology. As evaluated by third parties, their view is that we have been the most friendly of utilities in the United States in terms of enabling

customers to put in solar panels and to generate electricity, as well as hot water.

I, myself, have six panels on the top of my roof at home that not only provide a lot of energy, but I found that have the insulary benefit of really cooling the home and not requiring air conditioning.

MR. SANDALOW: Thank you very much, Peter. Thank you, Peter, for all your vision and leadership and for being with us today.

PANEL 1: IMAGINING THE PLUG-IN FUTURE

MR. SANDALOW: Our panel is coming on the stage, as you can see. I'm only going to introduce one of them, the Moderator of our program, our friend, Vijay Vaitheeswaran. And I want to tell you two things about him. First, as I think everybody knows, he's the Economist Correspondent, award winning in that respect.

Second, he is the co-author of a fabulous book called Zoom, which is for sale out in the lobby. Everybody should buy one. I'm sure Vijay would be

delighted to sign it. We will start this panel with a video, as well. Thank you.

MR. VAITHEESWARAN: Ladies and gentleman, I'm Vijay Vaitheeswaran, as David mentioned, I'm a Correspondent for the Economist, and it's my tremendous honor and pleasure to be here with you today, and with such an extraordinary panel, our kick off panel, where we will be imagining the plug-in future, and the context of what I think is one of the most exciting times, which is, we're really at the cusp of a new golden age of innovation and cars and energy, of the sort we haven't seen in a century.

When I talk about innovation to people who are not involved with cars or energy, indeed, often to people who are involved with cars and energy, sometimes, until very recently, they're stunned.

When you think about the internal combustion engine and gasoline, the sort of iron nexus that's powered the 20th century economy, essentially unchanged for 100 years. And I know there have been lots of incremental technology changes, but we're talking

about one combination of fuel and engine technology that has been dominant to the point of near monopoly, as Jim Woolsey pointed out. It seems odd to talk about innovation. But there was an era a century ago when there was a real rivalry between fuels. In 1900, there were more electric cars on the roads of New York than there were gasoline powered cars. Henry Ford's Model T was a flex fuel vehicle that ran on corn ethanol or on gasoline.

And so what happened? We entered a century in which one fuel became dominant. And we have come to see the geopolitical, the economic, and ultimately environmental consequences of that addiction to oil.

I'm happy to report that, thanks to a real confluence of forces, technological, economic, political, and environmental, we're really at a tipping point. And to help us think through what this means, this new race to fuel the car of the future, we have a wonderful panel.

Just a word to my panelists, and also to the questioners, because we're going to

leave a lot of time for your questions, as well, we have other panels looking at where we are today with the specifics of the technology, we'll be talking tomorrow about the role of that federal policy and local policy can play. I ask that we lift our gauge to the horizon for a moment during our initial panel and really imagine the future very much as one that might be different from the immediate past, and look at the sense of possibilities. What's possible with the technologies we're talking about at this inflexion point, this moment of change? And I would put it, just shamelessly putting in a small plug for Zoom: The Global Race to Fuel the Car of the Future.

The central thesis in the book is that there is not only an extraordinary race going on to find the fuels, but that we've gone beyond just looking for one fuel. The real transformation happening that's helping move us beyond oil is the changes to the vehicle, I would argue, that is, the transformation, the electrification of the car, the advances in battery technologies, on board diagnostics that we're

going to hear much more about, and in a sense, that it's not just the juice, but the jalopy that's changing, and that's really the essence of getting over the old chicken and egg problem.

So with that, let me turn to the first of our panelists. They'll all give brief overview remarks, just to get the conversation going, and we'll continue in spirited debate, I promise you. Shai Agassi won't need an introduction to many of you, but he's, of course, a legendary entrepreneur, founder of Project Better Place. a few opening comments from you, Shai.

MR. AGASSI: Thanks, Vijay. If I tell everybody to go buy Zoom, can I get an extra minute?

MR. VAITHEESWARAN: He knows how to work the Moderator, doesn't he? Yeah, let's see what you've got to say.

MR. AGASSI: So we started with a bit of a different question in Project Better Place. Our founding question was how do you run an entire country without oil? So start from the top down with the

following question, how do you run an entire country without oil on the technologies we have today, no new science, without government assistance, so it's not paid by the taxpayer, with a time frame that is actually fast enough to get off oil before we run out of the planet, so a framing question for everybody.

I'll fast forward you to the end of the first chapter, which happened on January 21 of this year, 2008. For the first time, all four elements actually get that done. It happened in one place, which was Jerusalem. Israel announced that it's going to get off oil within a decade. Now, what are the four elements? We had a government that stood up and said, vision-wise, we get off oil within the next decade. We drive the entire transportation sector in the country not on gasoline. We're going to go electric. They put a policy in place that was extremely simple to understand, created tax differential between gasoline based cars and zero emission cars, zero oil cars, and they didn't even specify what zero oil car, just zero oil.

And the tax differential is 60 percent. So it's 72 percent for gasoline cars, ten percent for electric cars. And what they said now is, this is going to be in place until 2019, and if more people are going to buy the ten percent tax cars, we're going to start raising both prices up. So at the end, we want to be at at least 50 percent. So they said at 51.10, we're going to stop. So that gives us the tax we want.

Then we had a car maker, we actually had the only CEO in the car industry that actually is a CEO of two car companies, Carlos Ghosn, he's the CEO of Renault and Nissan, two different continents, stood up and said, we're committing to building these cars, electric cars, fully electric, zero oil, not even a place to put oil, and we're going to make them fast, we're going to make them fun to drive, they're going to be full sized, we're going to make many of them, different sizes, different cars, they're going to go 100 plus miles on a single charge on a battery, and they're going to have a feature which is a replaceable

battery. So you can actually exchange the battery if you want to go beyond the distance of a single battery.

So these cars have two conduits of energy into them. The first one, which is used normally most of the time, is you park your car, you plug it in, you walk away. By the time you come back, the car is full. The second way is, if you want to drive a long distance, instead of activating a power plant in the back of your car, you go into a car park, into a device that looks like a car wash, and as you go into a gas station, your depleted battery goes out, a full battery comes in, and you keep driving.

In a sense, the range extension is not inside the car, it's in the infrastructure. Just like it is today with gasoline, we don't drive with a second gas tank to extend the range of our cars, we use the gas stations to do it.

Now, that led to a – and by the way, it said we're running this through the normal programs in Renault and Nissan. This is now about a billion

dollar of investment in Renault and Nissan, not to make 1,000 of these, but to build a car that goes through the entire production cycle, so we can make 100,000, a million, or ten million of them, depending on demand, and those will be in the market, by 2011, it will be mass production, 2010, production, 2011, mass production, mass production being supply meets demand.

The third element was what Better Place does. We actually build the network. If you want to think of Renault Nissan as Nokia, we're AT&T. So what we said is you can't get these cars to be convenient until you have electricity in every parking spot.

So we put parking spots, electric parking spots, everywhere you have a parking spot. Across Israel, we'll put 500,000 spots of electricity in parking lots, mostly at work, at home, downtown, and retail. So when you park your car, you walk away, you come back, it's full. No credit card passing. If you want, you have a Sims inside your car.

And we buy the batteries, so you don't have the risk of the battery. We buy a lot of batteries, as some of the battery makers here will tell you. And what we do is we price it for the consumer in a way that is more affordable. We introduce a new business model, just like the cell phone companies. You can today buy your cell phone, own your cell phone, and not commit to a plan. Then you pay the full price. But if you commit to a plan, you get a very interesting discount model. So with our cars in Israel, if you're willing to pay what you pay for the drive on gasoline today at the price at the pump today, not even with price rises in the future, what you pay today, and you sign up for a four year plan, you get a full blown electric car, sedan, for free to drive.

If you want to drive it as much as you want, we have a plan that is sort of metro PCS. You pay an extra $50 a month, drive all you want. And with that plan in place, we created a new segment in the car

industry called Zero Zero, zero emission, zero dollars to drive.

Zero Zero actually changes the dynamics of the market, because if you have the option of going in and picking up a used car and paying gasoline or paying – or buying a new car, paying nothing for it, and paying the same amount of money to drive, you don't want a used car. If nobody wants a used car, nobody wants a new car.

So, in effect, we created a new segment that changes the dynamics of the market. Now, all this are the three elements that happen. We're putting the infrastructure in the ground, we're putting the swap stations in the ground, we're buying the batteries, and this story is interesting because of the fourth element. If there was no fourth element, this would be an interesting plan. The fourth element is we raised $200 million in seed capital from private sector to go put that infrastructure in the ground in two countries already, Israel and Denmark.

These are investors like Morgan Stanley. These are – it's Israel Corporation, it's the largest holding company in Israel. It's Vantage Point investors and a number of businesses around this. It's a bunch of individual investors who are here.

So when you looking at this for the first time, we've got cars, policy, network, and money all coming in in one place. Two months later, Denmark said, we'll do the same thing, by the way. We want to get off oil more than Israel, so we'll do 180 percent tax to zero, okay. The cheapest sedan you can buy on gasoline is $60,000; the cheapest on electric is zero. And sort of – if you fail the test, they send you over to another country. And when you look at that model, you actually start to see a model that can deploy everywhere in the world. To put the numbers in some sort of framework, at $500 per car in the country, $500 per car in the country, you can get off oil. In the U.S., that's $100 billion, that's two months of oil, two months of oil we can get off oil. Not a

single bit of new science required. No research, nothing.

MR. VAITHEESWARAN: Let me stop you there, Shai. That's a stunning fact. You mentioned the two zero of your business model, if we don't move on, we're going to have zero time, as well, so we –

MR. AGASSI: Buy his book.

MR. VAITHEESWARAN: Thank you. He's good, isn't he? This is why this man is successful. Let me turn to our second speaker, Mark Duvall, who's the expert on electric vehicles at EPRI, the Electric Power Research Institute. Mark, tell us about the utility perspective. I know that an important study that your organization has done in cooperation with NRDC will –

MR. DUVALL: Widely quoted today.

MR. VAITHEESWARAN: -- and widely quoted today, much invoked. I remember when it was just a glint in your eye many years ago when we talked about this out in Palo Alto. Now it has been done, it's been cited a couple of times. Maybe you could take

the opportunity to give us a little bit of the backdrop and the main takeaway. And if I'm not mistaken, I think the question that was – one of the questions it was meant to answer is, the common jibe I heard many times from conventional Detroit and other car markers that, oh, electric cars, come on, that's just a pollute somewhere else vehicle, right, you know, you're hiding the problem because you plug into a coal grid, it's obviously worse than gasoline, and that was a common jibe, your study debunked that, and so give us a quick overview as to how and why.

MR. DUVALL: Thank you. EPRI is – the Electric Power Research Institute is a non-profit scientific R&D organization dedicated to research focused on electricity and the electric utility industry. Fortunately, our august speakers took most of my opening comments. I will sell Shai some time after this is all over.

But what our study showed, and our study partner was the Natural Resources Defense Council, Google.org was a participant, what it did is, it took

the two main components of this, the electric sector and the transportation sector, showed how they would evolve dynamically in time with new technology and with the constraints of a future, of an electricity and a gasoline future, and looked at the intersection, looked at how electricity is served to those vehicles, how they're charged, what kind of plants are charged, how the electric sector builds new plants, retires old ones, and ultimately what we see is that the intersection of that sector, the existing constraints on it for emissions, for possibly in the future, greenhouse gas emissions, show that, in general, you have very wide ranging air quality benefits. There is no such thing as a coal powered hybrid. There is also no such thing as a wind powered hybrid.

The electric sector is a system, it acts as – it is driven by its constraints and by its opportunities, very much driven by economics, and ultimately, plug-in hybrids, 40 to 50 percent reduction in CO_2 emissions into the future. It was mentioned earlier three to four million barrels per

day, and potentially 500 million tons of greenhouse gas reductions, that's with electrification about 30 percent of total VMT, up through vehicles of about 20,000 pounds in total weight, gross weight.

So the potential is definitely there. There is potentially a billion dollar annual reductions if you look at all applications of electric transportation, or look at more aggressive implementation of vehicles like the Chevrolet Volt or pure electric vehicles, which definitely do a little bit more than we considered in our study. So the benefits are clear. One of the things that is a key component, there's two components of this, one on each side of the aisle. Automakers have to build the vehicles. And it will be tough in the beginning. Cars are not iPhones no matter what – how much we want them to be, and we will have to deal with the auto industry, which is very large, has a lot of inertia, and we can help them, and there's a number of ways we can help them.

But it is – an automobile is a collection of a vast number of very sophisticated technologies. And this will help the process of developing very good plug-in vehicles.

On the utility side, the smart grid is key. We have to accomplish this transition from gasoline to electricity or from petroleum to electricity with a minimum of cost. Economics will say if you want everyone in America to own one of these things, then the cost has to be as little as possible relative to the value.

We have $10,000 to $15,000 in net present value of savings in a plug-in hybrid with about 20 miles of electric range over the life of a vehicle, and that’s at 4 to 4.50 a gallon, so there’s a lot here to play with, there’s a lot of value in the energy sector in this and the value they bring to the grid. Capturing those at the lowest possible cost is definitely how you make this work for both the automotive industry, the utility industry, and most importantly, the vehicle owners and operators.

MR. VAITHEESWARAN: So what I'm hearing is that your analysis shows it is worth doing, though –

MR. DUVALL: Absolutely.

MR. VAITHEESWARAN: -- there will be, of course, technological challenges along the way, enabling technologies, infrastructure particularly of the sort that Shai is working on in Israel and Denmark need to be put in place. But particularly as the grid itself decarbonizes over time, we'll see ever increasing benefits from electrification of the fleet.

MR. DUVALL: That's absolutely the case.

MR. VAITHEESWARAN: Great; to push a little bit further on the environmental question, let me turn to our next speaker, but with a quick comment first to our – the people logging in online. This is also being webcast, by the way, folks. And if I could ask them, for those of you who are interested in our online audience to send questions for this panel, you can email questions to electricvehicle2008, that's all one word, no punctuation, electricvehicle2008@atlanticvideo.com. Great! Let me

now turn to Deron Lovaas, who is a Vehicle Campaign Director at NRDC, the Natural Resources Defense Council. Give us your perspective. We've heard a little bit about the infrastructure and some of the perspective from the utility side of things. Your organization was, of course, involved in this study that was mentioned. Can you tell us, from the environmental perspective, where do you see plug-in technology and the broader electrification transport fitting in?

MR. LOVAAS: Sure; and we're proud to have collaborated with EPRI and look forward to more of the same in the future. For us, what needs to happen, particularly with the light duty vehicle portion of the transportation sector is a flip. And actually on that note, in this week's Automotive News, the headline is "A Wild Ride as Market Flips to Small Cars."

We live in incredible times, and we need to flip the whole light duty vehicle sub sector so that it is, as opposed to 96 percent dependent on oil

derived fuels, it only uses ten percent of such fuels by 2050. So that's a huge delta that we need to fill between here and 2050. What goes into that delta, the – line that we see emerging over the past few years is a moderation in vehicle miles traveled. So that's what we need to do. It is a huge change by 2050 to decarbonize this portion of the transportation sector. The good news is that we're taking big steps in terms of policy. We took two very big ones in last year's energy bill, putting into place higher fuel economy standards for light duty vehicles. And for the first time ever, and this is a little known fact, we require fuel economy standards to be set for heavy duty vehicles, as well. So that's what we did last year.

Something that's overlooked is that the next biggest step that we could take to decarbonize the sector is to put in place an economy-wide cap and trade system. We actually analyzed the potential effects of the Lieberman-Warner Bill on light duty vehicles and found that by 2050 more than 60 percent

of the fleet would be plug-in hybrids in the most aggressive scenario that we analyzed.

And that's just with cap and trade, along with the complimentary policy of a low carbon fuel standard, which was also in the bill. And that may be a little known fact. So what people may not realize is that there would be a huge squeeze put on oil and oil imports when we put a cap and trade system into place with a declining cap over time. A climate bill really is also an anti-oil addiction bill, so that's something that we need to make sure that people know about, because unfortunately, the debate last week was very truncated and very political, and we need to make sure that there's more light than heat around this topic when Congress and the new administration take it up next year.

MR. VAITHEESWARAN: Good; I know our panel on federal policies will pick up on this in much more detail tomorrow. But it does sound like you see plug-in hybrids as one of the important parts of this

portfolio of technologies that you see cleaning up the transportation.

MR. LOVAAS: They're a big part of the future. By 2050, we see all vehicles being flex fuel vehicles, and nearly all vehicles being plug-in vehicles, so they're a very big part of the future.

MR. VAITHEESWARAN: Great; let me turn to Chelsea Sexton, Executive Director of Plug-In America. And for the cognoscenti in the room, you'll know she's also one of the stars of *Who Killed the Electric Car*. So we have a real celebrity in our midst. Tell us a little bit, Chelsea. When you're not hobnobbing with the George Clooneys and Ed Bagleys, I know that you're also known as someone who hobnobs with the grass roots, playing an important role in organizing the grass roots movement for plug-ins. Can you tell us a little bit about what you're hearing and how that movement has evolved? We talked about, of course, the policy, and the economic, and technical issues, but doesn't the heart of this movement have to depend upon people actually wanting to drive these cars?

MS. SEXTON: Very much so; she blushes really easily, too. So Plug-In America is an organization that is composed primarily of former or current EV drivers or plug-in hybrids, or those who wish they had them. It's a consumer very grass roots organization. It's one that grew very organically out of ashes. When vehicles are being crushed, and this was when people said, you know, we kind of just can't stand by and let this happen without being noticed.

And so it grew from a series of campaigns of said cars into an effort to get more cars built, and to work in three primary areas. And we do some work with the industry. We work directly with automakers, big and small, helping them understand the market, doing a lot of interpreting between sort of the industry usually sequestered back in, you know, the middle of the country somewhere and the consumers. We work with the policy makers, folks who create new policy, as well as rehab old policy. So, you know, state level in California with folks like CARB, and we

work on a federal level, and also some local level stuff.

And we do a lot of work directly with consumers, you know, consumer education, teaching people it's possible, getting the mass for it. And we find that those three elements really do push against each other a lot, but they're very mired in kind of a chicken and egg dilemma.

You know, policy makers don't want to make policies and create incentives for vehicles they don't know are coming. Automakers stand on this premise, we want to build cars that people are requesting by the millions, and people aren't requesting plug-in cars in that sort of volume, ergo, they must not want them. And we kind of stand back going, you know, we went around the country and most people don't even know that electric cars or plug-in hybrids are possible.

So we face this challenge, you know, I use this iPod analogy lately that, how many of us looked at our walkmans about 15 years ago and said, gosh, I wish this were the size of a deck of cards and I could

watch t.v. on the thing, you know. We didn't know we wanted iPods until they were here. So we spend a lot of time, you know, working with a bunch of other organizations, kind of the grout between the tiles, as it were, but running around showing people the iPod and getting them to ask for it, and we are known to do it sometimes in non-traditional ways.

It was actually pointed out right before the panel by David Sandalow that this is the most obedient he's ever seen me, as they were lining us up for the panel, and I think that's got to stop right now actually.

So we're known to do it very traditionally sometimes, we're also known to do it a little bit more feisty. We did put Bob Lutz's email address on the internet, you know. But at the same time, GM's doing the Volt, so you know. I certainly won't take credit for it, but I don't mind whatever little part that played.

And we also have done some lesser traditional communication devices. A few years ago we

decided there was not nearly enough conversation about the subject, and so a few people got together and did what you do when you're from LA and no one will tell your story, and we made a movie. And there are at least four of my co-stars in this audience, and I'm not above outing them, there might be more. And we are working on a sequel, and the premise of it is sort of who's resurrecting, who's saving the electric car. So, you know, we're an organization that grew out of actions, we believe in giving tools of action to other people, so you guys all have homework to resurrect the electric car so we can make a movie about it.

MR. VAITHEESWARAN: Well, fantastic. So you heard it here first, folks. Who Saved The Electric Car, starting in this room, a curtain call, and casting next door followed during the break. Our final speaker, Dave Vieau, is from A123, which is a pioneering company in what is probably the most exciting space in technologies today, and that is energy storage and batteries. They're working on some

real path breaking technologies for energy storage on board.

And I actually had the privilege of being in the same material science laboratory back at MIT 20 years ago as the founder of A123. And you'll know, of course, that Yet Ming Chang has gone on to great fame and fortune and may have, you know, created a company and the technology that's going to save the world. I ended up as a journalist. So you can kind of work out which of the two of us was the clever of the two in the lab. In any case, I'm delighted to have Dave on our panel. If you can give us an overview of, again, what in many ways is a lynchpin technology that could well prove a snag, or could be a great obstacle, or one of the wonderful enabling technologies.

MR. VIEAU: Thank you. Well, being a battery guy, when we look at the plug-in hybrid revolution, we think it's all about the battery. But truthfully, when you listen to the transmission issues and all of the other infrastructure issues and the

vehicle issues and so forth, it's a pretty big problem that we've got.

But unlike Shai's business, we can start with existing technologies. When we came out six years ago, what we had to do is, you want to start an American battery company, we went over to MIT and licensed some new lithium ion chemistry that had some great promise for changing the way we would perceive performance of battery technology for transportation.

And you throw in a Department of Energy 100,000 SPIR grant to get yourself going, you want to raise some money, hire some bright scientists, and then go about the process of trying to build batteries that actually take advantage of the new chemistry and prove that it will work. So from that start, of course, we're looking at the automotive business as a great opportunity for this technology. If you look at the hybrid vehicles that we drive today, that we enjoy today, that have changed the landscape for us, the batteries in those vehicles are I would call five or ten year old technology, effectively. And although

they're very, very good performers, they are relatively heavy and large for the amount of mileage that you get from them.

In the typical hybrid today, if you just drove pure electric on it, you'd get maybe a mile or two out of that and it would give it up.

And the barrier that's kept the industry from going forward is having both cost effective and performance effective batteries that could fit in the vehicle and provide the long term performance that you really have to have.

So we started out with what we call Nan phosphate technology, it provided an advancement in the size and the weight, the overall power we could deliver, and certainly some improvements in safety over other lithium ion technologies that had been on the market at the time. So a significant technology break through, to say the least. But we really didn't have a big demand for batteries for automobiles at that time. If you went around the industry, which we did, there wasn't an opportunity really for big

improvement or big access to the market, and batteries, certainly in North America.

So while we were waiting for $130 a barrel for oil, we hooked up with Black and Decker, who makes a lot of cordless power tools, and we developed systems that would allow them to advance the power tool industry by building batteries. And so we built and have built millions and millions of batteries now and proven that we can make this technology scale that we had while we were waiting for this PHEV revolution.

Then we came across a little company in Canada called Hymotion, and they had what we think was a really cool idea for how you could take an existing hybrid vehicle and you could advance it into the plug-in hybrid world.

And at first, from our view, it was a demonstration. And the importance of the demonstration was that the industry, by and large, didn't get the idea, and maybe still to a great degree today, that a plug-in hybrid really made any sense at all. And the only way you do it is you've got to build some. And

short of building a new car and starting from scratch, you start out with existing cars. And this idea was basically, leave the car basically alone, but add a reservoir of energy to the back of that car, add energy to it so you can increase the electrification of the vehicle. Don't change the vehicle in any significant way other than adding this amount of energy. And if you could do that, and you could get 100 miles per gallon, you're going to get the attention of people.

And so what we did is we acquired that little company. We put it together with our people. We added the financial resources and the technical resources to provide safety testing and durability testing and crash testing and the things that you need to do if you're going to employ in this particular arena, and today we've got that Hymotion product ready for launch for public consumption and for fleets around the country.

Then we got together with BAE Systems. That's a maker of hybrid drive systems for buses, and

they supply the Daimler bus system that drives to New York, and we helped them develop a system using our new technology that allowed them to save 3,600 pounds per bus in weight of battery systems by using this new technology, and more than double the fuel mileage, and those are running in commercial service in New York City today. And we've engaged with a number, a large number of automakers and new car companies with new models in which to create the batteries for the volume population which we're all looking for.

So over the next two to three years, we expect to see a number of hybrid vehicles, a number of plug-in hybrid vehicles, and certainly a number of electric vehicles, pure electric vehicles, that will be out driving around our streets, and we're very proud to be a part of it.

MR. VAITHEESWARAN: Very good; so we've heard from our – a range of experts on the topic. I'm going to take the Chairman's prerogative to ask them some questions of my own. But I encourage those of you with questions to start forming a line here at the

microphone. We are webcasting this, so we do want you on the mike for the questions, please. So I'll turn to those questions in a moment.

But first, let me turn to my panelists. Shai, the two countries you're working in first, Israel and Denmark, present interesting – two questions in my mind; first of all, these are both, obviously, small countries, right, relative to say the United States, a continental economy like the United States; is this an infrastructure play of the sort you're working on that is amenable to small countries, but might be quite difficult on a continental scale, and that something may be marking way from the grid perspective, as well? Are the challenges – and does that perhaps suggest that we might have multiple solutions in different parts of the world?

MR. AGASSI: I think there are multiple solutions for different time frames in the world. If you have zero infrastructure, obviously a plug-in hybrid vehicle makes more sense than a swappable battery until you got a swap station. Now, the

question is, when do you get the infrastructure in place, not do you get the infrastructure in place, because when you look at the cost, the cost of putting infrastructure in place is much cheaper than carrying your own power plant with you in the car.

So when you're looking at it from a global market perspective, you would rather do something in infrastructure if people share in it, just like we do the grid, nobody has – we have a few people with generators at home, but not most people have generators at home. Now, could you do the U.S., let's start with that question. I think if we look at the mobile phone metaphor for a second, when we bought phones, you know, 15, 20 years ago in the states, we used to get coverage maps, right, and it would say, you know, here's the coverage map for this region this year, six months from now, a year from now, a year and a half from now, now we know there's terrible coverage everywhere you go, but you sort of have the same coverage everywhere.

What we're doing is basically looking at it from the same kind of perspective. Draw a 120 mile circle around every city in the west side of the United States and you'll get these transportation island, LA is one. Most Angelinos don't know there's anything outside of LA, and you just go in the circle.

But then you go on one artery and it connects to the next island. It's Vegas, where most people go in and out of the strip. You could create these circles of coverage, and when you created coverage, you're free to go.

On the east side, these circles actually overlap with each other. So the New York circle takes you all the way to the edge of Long Island, takes you all the way to Philly.

MR. VAITHEESWARAN: Does this make sense, Mark, the cell phone model of –

MR. DUVALL: -- are very well known in the industry, where they run electric forklifts and ground support equipment at airports and all these things, and they do it because it's more cost effective. They

win, not because of minor reductions, they win because of cost, and maintenance, and fueling, and especially now. They did this back in $2 land, so – however, each event, whether you swap out a battery, you fast charge someone, or you put in a street side charger that charges people overnight who don't have garages, you're talking very, very low cents per hour opportunities for revenue.

So whatever you do, you have to do it on a very cost effective basis if you're going to make it work, because you have a huge capital investment and you've got to recover that investment.

So without getting into the details of any one plan, public infrastructure is, or multi user infrastructure is definitely a challenge that has to be addressed, more so for electric vehicles and plug-in hybrids. But the City of San Francisco said the other day that only – they think only maybe a small fraction of their vehicle owners have garages to park them in, to access infrastructure. So they have a high median income, they're going to be early

adopters, they have the highest density of Primus's I think in the country, and that problem will have to be addressed, but it has to be addressed very cost effectively, because I'll say this, vehicles are expensive, batteries are expensive, and in the future, in this rosy future, I believe that we'll have a vehicle that has a lifetime battery, and we'll be very well aware of that, that plug-in hybrid vehicle batteries will ultimately last a lifetime, and we'll get to that point before we get to a truly cost competitive. We will always have to pay a little more up front for the savings down the road.

MR. VAITHEESWARAN: Thirty second rebuttal.

MR. AGASSI: I actually don't believe we have to pay more up front. I think that – we have to pay more up front, we tried that, it didn't work. I think –

MS. SEXTON: We can talk about that.

MR. AGASSI: No, but I think the situation is such that if we have – if we go to consumers and we say every electric charge you pay for in a

transaction, you need to pass your credit card and it's a hassle, is a problem. If we put a network and an operator in place, where your contract is a one time contract, where interaction is everywhere you go, you can charge, it's not just your home meter, where you're not limited by infrastructure, and the car price is cheaper, it's not more expensive, then you don't see small fraction, then you see a tipping.

MR. VAITHEESWARAN: Hold that thought. I'm delighted to see there's a robust interplay of market forces pushing different business models. This is a sign that there might actually be profits to be made in doing this, and not only, you know, addressing the public goods problem, so this, to me, is actually a very good sign.

We have a long queue of people waiting, so let me start taking questions. I might take a couple of questions at once and then put them to my panelists. Just a couple of ground rules, please. I'd be very grateful if you could identify yourself, and if you could make your question short, direct, and

preferably witty, as opposed to a long gas bag comment, I mean nobody wants any of those, that's the Chairman's prerogative. Go on, sir.

MR. KLINE: I'm Stan Kline, my company is Open Secure Energy Control Systems, and I have two comments that I want to –

MR. VAITHEESWARAN: Please, a question, there's a lot of people behind you.

MR. KLINE: It's real quick. Well, I want to get your reaction to both of these. First, I did a back of the envelope calculation, and I calculated that if every car in the United States had the specs of a Chevy Volt, a 30 percent penetration of wind power would take care of all of the battery charging, and by comparison, Denmark is at 25 percent wind power, headed to 50 percent. And I'm glad you mentioned Denmark.

The second point is that the information infrastructure of the electric grid is just as important as the electric infrastructure and the

market infrastructure, and I'd like your reaction to those two comments.

MR. VAITHEESWARAN: Very good; so we'll take – sir, right behind you, let me take another gentleman.

MR. STRAUSS: Yes, my name is Carlos Strauss from Cortona Academy. My family owns a school in Northern Virginia --

MR. VAITHEESWARAN: Into the microphone.

MR. STRAUSS: -- in Northern Virginia, and two years ago I got a bumper sticker from CalCars that said 100 miles per gallon on my car. I put it on my car and was amazed at how many people would stop and say, wow, this car gets 100 miles per hour. It's a PT Cruiser, it didn't, but people would see that. Then I bought a bumper sticker a few weeks ago from GMVolt.com that sponsors the Volt car, it says electric on it, and I swear that angry men in pick-up trucks have been threatening to ram my car because they do not like the word electric.

I notice that every one of the panelists that keep saying electric cars, electric cars, electric cars, and so I did a personal study, and I talked to 70 people, and I said, would you rather buy a plug-in electric car or a car that gets 200 miles per gallon commuting to work, and almost 95 percent of them said, I want a car that gets 200 miles per gallon commuting to work. I'm talking about the General Motors Volt car.

So I think it's a big mistake not advertising that these cars get 200 miles per gallon and advertising that they're electric. Electric, I think people don't want, 200 miles per gallon, everyone understand that.

MR. VAITHEESWARAN: I think that's actually a very powerful point, the gentleman makes more of a comment than a question. What ordinary people want, of course, are energy services, what my good friend, Emory Lovins likes to call the cold beer and hot showers, right. Nobody cares about electrons, and similarly, what people want from cars are reliable,

fun, safe mobility, personal mobility, and electric, nobody actually cares about the benefit, other than maybe the people in this room.

MR. STRAUSS: They don't understand it, that's what I'm saying.

MR. VAITHEESWARAN: Right.

MR. STRAUSS: They don't understand electric car; 200 miles per gallon, you don't have to explain it, just put an asterisk by it –

MR. VAITHEESWARAN: Let me – and go to Chelsea. You've dealt with the grass roots; how do you deal with the question of how you ask the question and what do people respond to, because again, you've got a lot of experience canvassing more than 70 people?

MS. SEXTON: Actually what jumped out at me the most was sort of the speculation that maybe GM might have made a mistake in marketing, and God knows they've never done that before. You know, just as there are a number of different issues that bring people to the table, climate change, economics,

national security, there are a number of different messaging things that they'd like to hear. So, you know, really what it comes down to for the consumer is "What does this mean for me?" And one of the things that we've learned is that people like to conspicuously non-consume. Part of the reason, the Prius is more successful than the Honda Civic hybrid, it looks like a Prius. And we have the same experience on the EV program, the more distinctive ones got more attention.

So that's really what it comes down to. People want to know what it means to me, they understand 100 miles per gallon, some of them understand electric, but as we've covered, some of them don't know what electric is, or it means a golf cart. So that's the issue, but it's real world economic terms for the consumer.

MR. VAITHEESWARAN: You wanted to jump in?

MR. LOVAAS: All I was going to say is that I think you hit the nail on the head. I mean all you have to do is look at the automakers, a very expensive

television advertising in recent years, right up front, for a change, because of the remarkable occurrences in the oil and gas price markets, MPG, MPG, MPG, it is what people care about, I agree.

MR. VAITHEESWARAN: The first gentleman asked a couple of questions. Mark, do you want to take the question about electricity infrastructure?

MR. DUVALL: Yeah, absolutely. I believe that that much wind could charge every vehicle in the United States. A single large power plant can probably charge two million plug-in hybrid electric vehicles. So the kind of wind he's talking about, remember, this is a huge system, 900,000 megawatts, growing at one to two percent a year, depending on the region of the country, so it can definitely handle it, it can definitely handle it.

MR. VAITHEESWARAN: I mean the Great Plains have been called the Saudi Arabia of wind. But don't we need significant improvements in grid infrastructure, whether it's DC lines or, you know, better means of both storing and transmitting?

MR. DUVALL: I think it's important to state that the utility industry is doing hundreds of billions of dollars in investment in new generation technology renewables, smart grid, and if you're into disruptive technologies and you like new innovation and new ideas, that's where a lot of that is going to hit. These – they have to do this anyway. The key is that when the plug-in hybrid comes to market or electric vehicles come to market, the grid integration piece is already done, so that these vehicles slide in, we use the onboard intelligence that every car has a surplus of, and we use it to have these vehicles act as intelligent great agents right off the bat. If we do that simply for charging, we'll get the lowest possible cost, consumers will get the cheapest electricity, and everyone will go away happy.

MR. VAITHEESWARAN: We have a question from the internet, from our webcast. And this very beautifully named gentleman, Vijay Tulsiani asks "Do solar powered cars have a place in the plug-in future?" Anyone feel like handling that question?

MS. SEXTON: Sure.

MR. VAITHEESWARAN: Well, Chelsea, I mean the EV-1 was a natural successor to a solar car, wasn't it, if I recall my history?

MS. SEXTON: It was a natural successor from a solar car. I'm not sure that it would have worked the other way around.

MR. VAITHEESWARAN: Right.

MS. SEXTON: You know, but we heard it a lot, just put solar panels on your car, put sails on your car, put wind turbines on your car, I mean everyone had the improvement, and you know, if they were rude, I'd hand out job apps. You know, I think right now the best thing to do, by far, given the state of solar, is to put it on your house and let it run that house when you're not, you know, charging your vehicle with it. So that's still the best marriage between renewables in general and vehicles. Will we maybe get to solar panels on cars one day, yes, but we're not there yet.

MR. VAITHEESWARAN: Very good; let's have a couple more questions. Sir, please identify yourself, and a short, sharp question, a little better than my earlier questioners, please. I think my patience is running short.

MR. KATZ: Hi, my name is Seth Katz, and I have two questions about the Project Better Place initiative. The first is, particularly in the European Union, I know that there's a lot of privacy concerns with billing, and in particular, it seems like there could be some potential here for either a company or a government to track people's movement. What are the issues that you've confronted with that?

And the second question is just, if you have a city, let's say like New York, where the population all goes to the city during the day, and then leaves the city at night, do you have a problem where all the batteries accumulate in one place and there aren't enough batteries in the initial place during the day, and then at night you have the reverse problem, you

know, because everyone is moving their battery in the same direction?

MR. VAITHEESWARAN: Great questions; sir, the next gentleman, we'll take your question, as well. And please identify yourself.

MR. FRANK: Well, let's see, I'm Professor Andy Frank, and –

MR. VAITHEESWARAN: Professor Frank, if you could speak into the microphone. It's great to see you, sir.

MR. FRANK: Yeah; I'm Professor Andy Frank, and I may have, I don't know whether I started this or whatever, but I've been working on plug-in hybrids for 30 years, and I have a couple questions. One of the things we're supposed to do is talk about how this is – plug-in hybrids may affect the world as we move forward.

Now, Shai has some very nice ideas about getting Israel involved and stop using the oil and all that. But your neighbors right across the border, five miles away, aren't going to like that very much,

because they sell oil, oil is their commodity, oil is what makes them go. So my main question is, what do you do about the oil companies? Oil companies have enough profits now to buy the world, and so the $200 million that you're raising isn't going to do much. So the question is, shouldn't we be considering the entire world, including the oil companies, including the coal companies, in our policies to move forward? That's the first question.

I think that's an extremely important question, because if we don't make the oil companies our friends, they will be our enemies, and that's worse. And, you know, I'm a technologist, and somehow or another I'm getting into geopolitics, but nevertheless, in order to make this kind of technology move forward, we have to consider that.

The second thing is, the use of, or the shift of oil into the use of electricity I think should be starting right from the starting gate, including renewable energy. Renewable energy and V2H, as mentioned by PG&E, all those things must occur

simultaneously with the introduction of the car. And this business of waiting five years or ten years into the future, we can't do that. I think, this is a statement and not a question, I think the panel – I would like to hear the panel consider how we would introduce all these technologies simultaneously so we can get this thing moving faster than later.

MR. VAITHEESWARAN: Very good; thank you, Professor Frank, of course, a godfather of plug-in hybrids. And, of course, he has worked for many decades on this technology. And I know from having spoken with him over the years and visited with him, that he has fought many bitter battles, difficult battles with car companies and oil companies.

I wonder – let me turn to my panelists. Based on that experience, he asked sort of two interrelated questions, one is, what about the power of oil companies and other folks who have a strong interest in the status quo, and a related sort of solution he offers, rather than incrementalism, to go

for a big bang, that you need to do multiple things at once.

We did see sort of big banks with cellular telephony, with PC's in some ways, how they challenge the main frame paradigm. Does it work when we talk about energy automotive infrastructure? Yes, go ahead.

MR. LOVAAS: Well, I think, unfortunately, you have, with the oil industry, your wonderful work, by the way, is about these two industries and how they're headed to a split, right, a divorce. The auto industry is being pushed by prices and new fuel economy standards to turn out more efficient products and to turn to hybrid electric vehicles, et cetera, et cetera. Unfortunately, the prices that we've seen recently seem to be having an opposite effect on the oil industry. They're buying back stock, they're turning to traditional exploration production activities, turning away, in some cases, from renewable alternatives, and it kind of makes sense.

If you're a shareholder or if you run one of these companies, and you're getting such an obscene amount per unit of your product, then there's not much incentive to change your way of doing business.

And this is why, you know, I know we're going to talk about federal policy on some later panel, but for us, the solution is to put a price on carbon, put a cap and trade system in place, put coal under that, put the fuels industry upstream under a cap, and push that cap down over time, and require the oil industry to be part of the solution as opposed to what they're entrenching themselves into now, which is becoming a bigger part of the problem, unlike the auto industry.

MR. VAITHEESWARAN: So a public policy as a way of forcing a reluctant industry along in the right direction is what you suggest? Shai, you're in, you know, the business end of this business; have you found obstructionism, have you found it difficult, and how would you pick up on Professor Frank's comment?

MR. AGASSI: First, on Professor Frank's comments, and then the first question.

MR. VAITHEESWARAN: Yes, of course. We haven't forgotten the earlier question.

MR. AGASSI: Unless somebody else wants to answer about Project Better Place. First of all, as usual, Professor Frank's on the money on this thing. Interestingly enough, our largest investor in Israel is Israel Corporation, they own the refineries in Israel. Israel refineries are effectively big oil in Israel, so they import all the oil into Israel, they refine them, they send them to all the gas stations.

Our investor and partner in Denmark is called DONG, Danish Oil and Natural Gas. O stand for oil in that case. And it's interesting that these guys get it first. Because when they look at the equation, they look at the math, if the economics are beyond what we see, they look at the battery, divided by miles, add the electricity, the clean electricity, they get to a price that is roughly in the six to eight cents a mile, and say if you can do six to eight

cents a mile, I'm never going to get there with my oil, so I'd rather move into your business. We're seeing it in all the global oil companies, they're running towards the end of their known reserves, and they're saying, I need to be in business of supplying transportation energy, if that's the next thing, if that's what's beyond petroleum, maybe that's where I need to be.

So we're starting to see a lot of interest at that level, obviously different in the case of national oil companies, but it's coming in there. There's interest also on the generation side. Just a small anecdote, in Israel we said we only want to use clean electrons, so we want to put in, even though it's hard to measure an electron on the grid, but we said we want to add to the grid a clean generation, the same amount as the cars that we're putting in. So for every car, we'd put 1.2 kilowatt solar generation in Israel.

MR. VAITHEESWARAN: Making your cars sort of energy neutral or carbon neutral.

MR. AGASSI: Build a virtual oil field.

MR. VAITHEESWARAN: Right.

MR. AGASSI: Okay. We Tivo it, we sell it in the peak hours to the grid, we buy it back from the grid. But, by and large, we put the same number of electrons as we use. We went to the Infrastructure Ministry and we said, you know, we need to put an area here of solar because it's a big area, it's not too big, but it's – I said, okay, what if there is oil in there to supply all the cars in Israel, and we want to dig in, and they said, but there is no oil, I said, yeah, but let's say there is, and they said, well, if you can prove it, we can let you build, and we basically said, let's build a solar plant right here, and that – let's put it before the cars come in so we have full coverage.

MR. VAITHEESWARAN: Right.

MR. AGASSI: On the case of New York, I think one of the things you have to remember is that most of the time you will drive and fill and not swap. In the swap station, basically all you need is the

number of batteries to cover for practically 30 minutes worth of swaps, because 30 minutes later, the battery that you put out 30 minutes ago is already full, and you put it back into the next car.

So we always think of who fills up the gas station with gasoline. In this case, the electrons keep on coming, the grid knows that it's sending electrons. It's just the last ten inches that you pour in with a mechanical device. Everything else comes in through the grid.

MR. VAITHEESWARAN: Dave, a last quick point before we wrap up our session.

MR. VIEAU: Just a quick point on the issue about the oil company. I think, from a technologist perspective in looking at technology adoption over the last 35 – 40 years of my career, we can't sit there and say we're going to depend on the government making this happen, although I mean I hope that the government does take the initiative and does step up, and we looked at it and said, that's not going to do it.

And we certainly are not living in fear of the oil companies and the position that they've got. Our position has been, if we can drive cost out of the solution, if we can make the economics of it work, then fundamentally the batteries last for ten years, and the cost per unit of energy stored gets a reasonable space.

And we have a line of sight to that as an industry, not just as a company, but there's a line of sight to that point. Now, we're void by the fact that oil is at $130 a barrel. Unless we're talking $20, we probably wouldn't be having this conversation here today, frankly. But the fact that it's there and it's not likely to go back, I think we're heading in the right track in that regard. And the other thing I want to say is that I think Shai is on the right track with his thinking about this stuff, and I'm hoping what he does, he's able to change MPG to DPM, which is dollars per month.

MR. VAITHEESWARAN: That's a great note to end on. We have run out of time. My great apologies

to the people standing there. I think we have – the real lesson, to quote Edwin Land, the Founder of Polaroid, sometimes coming up with a new idea means stop having an old idea. We've certainly seen a lot of that from our panel today.

Let me bring back Dan Reicher again, he's going to tell us about what will happen during the break.

MR. REICHER: Thank you, Vijay. What a great line, not just the juice, but the jalopy, I love it. Thank you to our panelists. Chelsea, I love it, as well. We are the grout between the tiles, that's a new one. And thank you to our speakers, Peter Darbee, thank you, Jim Woolsey. This has been a great set of talks, punctuated by some wonderful YouTube videos and this great webcast. We now have a real treat, and that is three technology talks out here in the lobby. You'll get to hear from some real engineers talking about their cars and their excitement about those cars. Alec Proudfoot and Rolf Schreiber of Google will give you an overview of a car in our fleet, the Google fleet, this is a plug-in Prius that was

converted by A123, and they'll also talk about our broader recharged initiative.

Will Kempton, a real leader in this industry from the University of Delaware, will give you a live demonstration of vehicle to grid. He will show you how electricity can, indeed, go from a car back to the grid. And we're confident, Will, that that will actually work here today. And Diarmuid O'Connell from Tesla will talk about the all electric Tesla sports cars.

These talks are going to start in ten minutes out in the lobby. The break will go until 3:45 rather than 3:30. I only want to add one more thing, which is that we have a number of cars here for people to see. Upstairs in the hotel, in the front of the hotel, you'll see a GM Volt, we have our Google Recharge It car here, we have an Ebox, we have a Toyota Prius plug-in demo, we have a Tesla, as you've already heard, and last, but certainly not least, we have the Zero X electric motorcycle. Enjoy, and see you at 3:45. Thank you very much.

PANEL 2: PLUG-IN ELECTRIC VEHICLES: WHERE ARE WE TODAY?

PANEL 2: PLUG-IN ELECTRIC VEHICLES: WHERE ARE WE TODAY?

MR. REICHER: Could I have everyone's attention please? The session is about to begin. Well, there was a lot of electricity in the air during that break. I'll tell you, people really enjoyed seeing the cars and there's more to come, so welcome back.

We now have the next session of the conference, and it's my great pleasure to introduce Mark Fields, who is Ford's president for the Americas. In this role, Mark is responsible for all operations involved in the development, manufacturing, marketing, and sales of Ford, Mercury, and Lincoln vehicles in the U.S., Canada, Mexico, and South America. He formerly served as executive vice president, Ford of Europe and Premier Auto Group where he led all the activities for Ford's premium vehicle business group, and for Ford brand vehicles manufactured and sold in European countries. I talked to Mark before the

session and he said that 12 out of his 18 years have been outside of Michigan, so he has a very very thoughtful perspective, a very thoughtful global perspective on the automobile market.

He was named a Global Leader of Tomorrow by the World Economic Forum in 2000, and CNBC's Asian Business Leader/Innovator of the Year for 2001. He holds an economics degree from Rutgers and a master's in business from the Harvard Graduate School of Business. With that I give you Mark Fields.

MR. FIELDS: Well, good afternoon everybody. It's a pleasure to be here to talk to you and as we talk about looking at the business case for a technology that, as you know, holds a lot of great promise. But, of course, with every one of those that holds great promise, there's lots of questions, and I know that's what we're here to talk about over the next couple of days.

Plug-in hybrids offer a very very compelling transportation solution and one that's only going to fully achieve its potential through a shared

commitment to both innovation but also collaboration between the various constituencies. Pursuing this and other advanced technologies requires us to collectively, and I mean collectively, address our toughest challenges that we face today: Our economy, our environment, and, of course, our security. And these are significant concerns for every sector that I'm sure is represented here today.

Now the auto industry and our customers have been hit by -- and hit hard by -- rising commodity prices. Record-high fuel prices that all of us are paying and continued difficulties in the housing market have further accelerated the shift away from large pickups and sport utility vehicles to small and midsize cars and crossovers. Concerns over climate change and energy security also must be addressed.

Now responding to this fairly daunting challenge, set of challenges, will require literally all sectors of the economy and society to join forces to work together towards common goals. And as we continue to push the frontiers of vehicle

technologies, we absolutely must strive for solutions that are sustainable in the truest sense, from a social standpoint, environmental, and, of course, economical. And at Ford we're working very very hard to be part of the answer.

As we accelerate the development of products and technologies that people want and value, really driving green is at the heart of our business and our plan to achieve future profitable growth in the business. And we're committed to finding energy solutions and technologies that will deliver meaningful fuel economy improvements, and reducing CO_2 emissions and petroleum consumption at the same time, and ultimately allowing our customers to spend less at the pump. And today we allocate more than two-thirds of our $7 billion annual research and development budget to that challenge alone.

Now there's no silver-bullet solution, so we're pursuing multiple technology paths, recognizing that commercial viability is an essential component for success. To effect change and essentially to

reach beyond the experimental realm, innovation must be sustainable for the company as well as affordable and accessible for our customers. We call it the democratization of technology, which really is part of our heritage at Ford Motor Company. Now Ford's comprehensive sustainability strategy involves developing near-, mid-, and long-term solutions to benefit millions of customers without compromising their expectations for quality, safety, fuel economy, and performance. And we're committed to delivering technology that will be affordable to our customers and can make a real difference by being applied to literally millions of vehicles. The cornerstone of our near-term portion of that strategy and our sustainability plan is something that we call eco-boost. This is a high-volume, turbo-charged, direct-injection engine that allows and offers our customers engines that deliver up to 20 percent fuel economy improvement, and up to 15 percent less CO_2 emissions, and very importantly, a boost to the driving enjoyment. It's a fun car to drive as well as being

environmentally responsible. Eco-boost essentially delivers the performance of a V8 with the fuel economy of a V6, or the performance of a V6 with the fuel economy of a four-cylinder engine. And the new Lincoln MKS luxury sedan will be the first with this new engine next year, followed quickly by our new Ford Flex, which is just coming into the marketplace, and our F-150 pickup truck. And it will migrate across the lineup so that by 2013, we'll build up to half a million vehicles annually with eco-boost. It's affordable technology with a high-volume impact. And importantly for our customers, these engines will pay for themselves years faster than small diesels or full hybrids.

Our plan includes literally hundreds of product actions as we essentially strive to squeeze everything we can out of improvements in things like vehicle aerodynamics, engine efficiency, lightweight materials, all geared to what's very very important to customers these days and what they're demanding, and of course, that's increased fuel efficiency.

We're expanding also the use of fuel-saving six-speed transmissions. And late this year we're launching two new full-hybrid sedans: The Ford Fusion and the Mercury Milan, expanding our full-hybrid fleet to five vehicles, and we're planning clean diesels for both the F-150 and our large SUVs.

But, of course, other technologies are going to be necessary to reach our long-term goals of CO_2 reduction and energy security. And among the most exciting obviously is the focus of today's discussion, vehicles that offset carbon-intensive petroleum use, operating on domestically sourced electricity that, with the proper support, could be made accessible to customers nationwide. Now last July we formed a unique partnership with Southern California Edison, the first time our two industries have formerly committed to work together to accelerate the commercialization of plug-in hybrids. After all, we now share a common customer in a very all-new way. And one of the first things that we've learned is that our industries first know very little about each

other, and developing a common language between our two industries and companies was one of our first goals. And we've now jumped into a number of specific things in that relationship, including things like identifying all the key stakeholders required for success, plug-in hybrid electric vehicle total lifecycle analysis, helping develop the appropriate electricity rate proposals, and a whole host of other technical standards required to really realize the full potential of plug-in hybrids.

Now through our partnership we're beginning to understand the very complex issues at hand, regional and national in nature, and we're working to lead our collective industries forward in developing solutions to the technical as well as the economic challenges. Southern California Edison is one of our country's largest utilities, with more than 25 years' experience testing electric and plug-in vehicle batteries. And we're working together to figure out how to best accelerate the commercialization of plug-

in hybrids and reshape our respective businesses for the future.

Earlier this year the partnership was expanded to include the Electric Power Research Institute. Now, EPRI brings a tremendous amount of experience and expertise in electric transport, and also provides a national perspective for us to ensure that our program really addresses any regional differences related to plug-ins and the electric grid on a nationwide basis.

Now to advance this technology, we're already road testing the first of twenty vehicles, Ford Escape plug-in electric hybrid vehicles, that we will be providing Southern California Edison. And as we start going on with this testing, imagine getting up to 120 miles per gallon for the first 30 miles following a full charge. Those are the kind of numbers that our Escape plug-in hybrid can achieve. Its reduced fuel consumption comes from a 10 kilowatt per hour high-capacity lithium-ion battery that can be charged from a standard 120 volt electrical outlet and

then discharged during the driving experience. It's recharged overnight from a standard home outlet, and based on typical American driving, a fleet of vehicles, such as our Escape plug-in hybrid, have the potential for displacing 60 percent of fuel consumption nationally. And the range restrictions do not pose a problem. When the battery charge has been partially depleted, the vehicle continues to operate as a standard hybrid electric vehicle, or what's known as a blended plug-in HEV.

A recent addition to our demonstration fleet is a plug-in hybrid electric vehicle that's capable of operating on E85. As a leader in both hybrid and flexible fuel technology, Ford we feel is well positioned to bring the two together in the plug-in vehicle and to demonstrate the potential for CO_2 reductions and also energy security.

We also have many partners here at the Conference today, and I'm pleased to announce that our partner, Johnson Controls-Saft, will provide the batteries for our 20-unit fleet of the Escape hybrid

plug-ins that I just mentioned. And we believe strongly that partnerships and collaborations are absolutely critical to bringing emerging technologies from the laboratory onto the street.

And, of course, plug-ins are not without their challenges. While the basic architecture is similar to our current hybrid electric vehicles, there are a number of engineering challenges. And solutions need to be found for systems that would traditionally rely on a conventional engine -- things like emissions control, trans-actual lubrication, even cabin features like window defrost and heating, those type of things. We've also been working on other technical hurdles and we're confident that we have the expertise to properly design a robust plug-in hybrid. But in order to deliver plug-in hybrids to the mass market, challenges that lie outside of the automotive realm must be addressed. Viable solutions to these issues can only come from partnerships with other sectors of the marketplace.

First let's go through a couple of them: First, there's the battery. The advancement in lithium-ion technology is what makes plug-in hybrids possible, but the technology is still new for vehicle applications. For example, will lithium-ion batteries prove durable, especially when they're subjected to the vibrations and bumps of 150 thousand miles of real world street use? Will they meet customers' expectations in the extremes of, let's say, a Minnesota winter or an Arizona summer? Will the packaging and controls that we have on the vehicle provide the level of quality and safety that consumers demand and expect from our products? Now while they're getting closer, battery manufacturers have a ways to go before they can commit to providing batteries that meet OEM safety and durability requirements, and at a cost and volume necessary to support substantial production, and at a level that would affect national petroleum consumption and carbon dioxide emissions. Will the batteries be able to do all that and be affordable to the average consumer?

It's also important to note that most battery supply today is currently being developed in Asia. And for those looking to plug-ins to answer our energy security concerns, we must ensure that we have a domestic battery supply. Moving from imported oil to imported batteries clearly would not address this growing concern.

The other major prerequisite for commercial viability is a robust recharging infrastructure. Now recharging, as you know, is as simple as plugging in the vehicle and not much different from any other household appliance. But the infrastructure to provide that plug needs a lot of work. Among the factors to consider is access. Nearly everyone has electricity, but how many potential consumers have garages? Access to overnight charging isn't readily available for most people, for example, who live in apartments or townhomes or condos. Or for that matter, for suburban families with teenagers or simply too many outdoor toys that are stored in the garage that you can't get into the garage. Sounds like some

of you fit that bill. Now 100-plus years of experience with gasoline has insured that a nationwide infrastructure so that when you decide to go from New York to California, you don't have to worry about getting fuel. But a public recharging infrastructure for plug-in hybrids simply doesn't exist at this time -- and I know that Shai Agassi talked a little bit about that in his remarks.

Another area is payment. Now perhaps the most perplexing issue is when you're not at home, you know, how do you pay for the electricity that you use to recharge your vehicle? Or for that matter, how do you know how much that electricity will cost? Because, as you know, rates vary from region to region and soon from hour to hour, and this is not like sitting in the airport and you see everyone plugging in their laptops or their cell phones before they go.

Another area is the utilities. The petroleum industry involves only a handful of participants, but in the U.S. there are literally thousands of utilities which would need to unite in

recharging protocols and billing to provide the seamless infrastructure needed for a mass market.

Now we're working to find the right answers, and through our partnerships with Southern California Edison and the Electric Power Research Institute, we're looking at things such as the charging infrastructure, how the vehicle connects to the home, and how the vehicle connects to the grid if it's not charged at home, as well as other opportunities to advance the battery market to essentially bring costs down and to perhaps provide distributed energy storage to strengthen the overall grid.

Now through this collaboration we're really gaining and starting to gain some real world experience with customers throughout the country. And that experience and the data that we collect will help us do the necessary business analysis to determine the viability of plug-ins. Now I think we'd all agree that we want to reduce carbon dioxide emissions and improve our nation's energy security. But how do we achieve these goals in a sustainable way? Making a

business case that provides value to the customers, value to the utilities, and, of course, I feel strongly that domestic battery production must be prioritized. The Energy Independence and Security Act of 2007 went a long way towards developing research and development and demonstration programs for plug-in vehicles and batteries. We now need to execute this and ensure the programs get the appropriate funding.

And just as the Department of Energy recently placed nearly $400 million with various ethanol producers to hasten commercial applications, bold and dramatic incentives are needed to accelerate the commercial development of high-energy power batteries right here in the U.S. It's a critical factor that requires support, and there are others that, without subsidies, simply we cannot advance. Plug-ins hold the potential to dramatically reduce CO_2 emissions, help address our nation's energy security issues, and contribute to economic stability and employment. Setting the stage now is absolutely critical to move beyond a low-volume manufacturing

cost penalties and advance to full-scale production with cost efficiencies making the benefits of plug-in hybrids accessible to customers nationwide.

Now in order for us to succeed, we must make this a national priority. We're doing our part to transform the industry and invest in new technologies. However, in a global environment with global competition, a substantial government partnership is required. Now the governments of Japan, China, Korea, and India are all significantly funding the research and development and the deployment of plug-in hybrid vehicle technologies. This is a race we absolutely must win as a nation. We should not trade one foreign energy dependency for another. For us, the energy future vision for success is clear. We must achieve the most economically efficient carbon reduction and fuel economy improvements as possible. And whatever we do, our actions must be affordable for our customers and our business. We simply can't do it alone. Government should be a key partner in promoting American manufacturing and the fight against

global warming and for our nation's energy security. We won't be successful unless industries and governments all start working together in a constructive way.

So in conclusion, among the key actions the government can take are things such as creating a new industry-government partnership to aggressively advance battery research, development, and commercialization; things like injecting significant federal funds into advance plug-in vehicle technologies and into facility retooling to produce these vehicles; enacting comprehensive climate-change legislation requiring regulatory policies that stimulate innovation rather than just imposing new mandates; and enacting one national standard for fuel economy rather than allowing a patchwork of state and federal regulations. We will only be successful if we work together towards those shared goals and our shared goals. Industry, utilities, battery suppliers, the government, we all play a very critical role in driving the development of successful plug-in hybrids

that people really will want. And today I'm convinced we're at a juncture, we're at a very critical juncture. Continued government investment, incentives for industry to continue pushing on research and development of this emerging technology, and rewards for our customers who incorporate into their lives our keys to real and lasting change, and a future of greater energy independence in which we can all thrive.

So with that, I want to thank you for your time. MR. SANDALOW: Thank you very much Mark. Thank you both for your work on this issue and for your frank assessment of the challenges associated with success. And that really is the topic of our next panel, and as the panelists come up, I just want to set the stage here a little. We hope that you got excited about the opportunities for electric vehicles in the first session, and in this session we're going to talk about "where are we now" and what are the challenges in trying to realize the potential.

I will introduce only one of the people up here, just like in the last session. The moderator, whose name Juliet Eilperin, is known to anybody who lives in Washington, D.C., and pays attention to energy and environment issues. I have to say, Juliet is astonishingly and intimidatingly productive. Anybody who follows her by-lines will find day after day thoughtful pieces on energy and environment, and now as I understand it she is also spending half of her time covering the McCain Campaign, and she's here moderating our session. I appreciate that. We appreciate that very much.

One reminder for those in the live webcast audience, you can send your questions to electricvideo2008@atlanticmedia.com.

We are going to start this session with a wonderful video. We have had an outpouring of interest in this topic, in this conference, from the Hill, with lots of offices calling to express their interest and enthusiasm, and we're honored to have a

special video statement to open this session from Senator Evan Bayh. Thank you.

(VIDEO PLAYBACK)

MS. EILPERIN: Thanks so much. Now in journalism we care about accuracy, so I'm going to start this panel with a correction, which is that the correct URL for commentating if you're watching the webcast is electricvehicles2008@atlanticvideo.com. So just so you can help participate.

Now I'm going to do a rapid introduction. You have the bios of everyone, but for people who might be watching the web, I'll just give a brief introduction, then everyone's going to give brief remarks, and then we'll go to questions.

So immediately to my left we have Felix Kramer, who's an entrepreneur and lifelong environmentalist, concentrating on innovative ideas, events, and businesses in energy and technology. He builds ambitious and first-ever projects and companies, and in 2002, working with entrepreneurs, environmentalists, engineers, and drivers, Kramer

founded the non-profit California Cars Initiative to put plug-in hybrid vehicles on the map through technology demonstrations, advocacy, and buyer demand.

Next to him is Thomas Kuhn, who is president of the Edison Electric Institute, which is an association of investor-owned electric companies whose members generate and distribute approximately three-quarters of the nation's electricity. And I'm always bothering people in his shop, so it's great to have him on the panel.

Alan Madian is an economist, management consultant, and investment banker, who has provided services as a policy advisor, strategy and implementation consultant, financial advisor, and expert witness for more than three decades.

Then next to him we have Bill Reinert, who is national manager of Advanced Technology for Toyota Motor Sales, U.S.A. His primary function is to coordinate Toyota's various research, development, and marketing activities related to alternative fuel-based vehicles and emerging technologies.

And then at the end, last but not least, we have Mary Ann Wright, who is vice president and the general manager of hybrid systems for Johnson Controls, and also leads the Johnson Controls-Saft Advanced Power Solutions joint venture. Ms. Wright joined the company in March 2007 and is responsible for accelerating the growth and executing the launch of hybrid, plug-in hybrid, and electric vehicle battery programs with an emphasis on state-of-the-art technology, manufacturing, and electronics integration.

So with those brief introductions, I'm going to have people give opening statements. And then just the one framing question, which I'd like to pose as you talk about your different perspectives, is that as someone who simultaneously is covering energy and environment and the campaign, I've spent quite a lot of time with John McCain and a little time watching Barack Obama talk about how technology is essentially in many ways going to help save us from two of the problems facing the nation, which would be climate

change and dependence on foreign oil. And so they talk extensively about these issues, about plug-in hybrids, and I'm interested in, you know, how much can we depend on the technology that we're here to discuss today to work to ease those two questions, and how close are we to reaching implementation on a broad scale? And so with that, Felix, if you want to start out.

MR. KRAMER: Good afternoon. In 2006 we brought a plug-in hybrid car to Washington, D.C., and we showed it to senators and congress people. I never imagined we'd have this level of interest two years later. The message we were giving then was that this makes sense now because of what electricity has going for it: Cleaner, cheaper, domestic. The message was we can do this now, here's a car, and the message was we don't need new technology, we can use better technology, but it's good enough now, and we don't need a new infrastructure, we don't need technical breakthroughs. This plug got a lot of laughs at the House Science Committee, and Jim Woolsey later said

yes, every family will have to invest in the new infrastructure -- they'll have to buy an extension cord.

So our mission has evolved since then to successful commercialization as soon as possible, and each of those has a significant meaning. We are going to see an explosion of plug-in cars of all kinds between 2010 and 2012, and we think after -- since working on this since 2002, it ought to be even sooner. And when it comes, it should not be a dribble into the marketplace. It ought to be really massive because we don't have time to wait. We can't let this happen slowly. We want it to be successful, and we want to work with the carmakers to give them whatever they need to make it successful. We want to find whatever encouragement and whatever methods can do that.

We're also internationalizing the campaign. Outside you can see this book, The World Wildlife Fund's report by an Exxon Energy specialist about the

international implications of plug-in cars. It's a great book and you can get a copy.

We're basically moving from simply talking about plugging in cars to that broader message that it's time to electrify transportation as much as possible. And what that means is something -- in addition to getting carmakers to build new plug-in cars, something that we have really only begun to think about, and we think there are enormous business opportunities and enormous opportunities for government -- which is to do something about the 950 million cars on the road today, the internal combustion engine cars. What if we could take 20 or 30 percent of those cars and power them partially by electricity? In terms of -- comparing that to the market penetration of new plug-in hybrids -- that would have a much faster petroleum displacement benefit. And so we're looking at that and there are a lot of good solutions. And we have a new recruit to the cause of plug-in hybrids this week -- Andy Grove, the former chairman of Intel. He has been talking

enthusiastically about that, and you can get his article, which is going to be in the *American* in a couple of weeks, outside. And he's going to become a real strong advocate for that particular point, which is how can we convert those cars that are on the road today to a combination of energy service companies, federal incentives, and so forth?

And the last thing is what are we going to do about this Presidential Campaign and what's going to happen in it? The model I have is really -- I'm not a lawyer -- but the model I have is a stipulation. We are working -- we hope that the candidates will agree, just as they have about Darfur, just as they have about the California emissions -- that plug-in cars will not be a campaign issue; that they agree on it. And that the carmakers of the world need to get the message now that whoever is the President next year, the whole situation's going to change. There are going to be massive new promotional programs, incentives, and so forth. We hope it's along the lines of what David Sandalow has presented in his

points in the book. But we think that if the carmakers knew that now, their business models would have to adjust to take that into account now, not next January. And a year makes a tremendous difference in terms of energy security and CO_2 emissions. Thank you.

MR. KUHN: It's hard to follow that, I ought to just say "me, too."

You know, when David first mentioned this conference to me, I don't think either one of us would have envisaged the great crowd of people that we have in this room and the enthusiasm that we have behind this mission and cause. And I think that answers your question about, you know, can we do this thing? Can we do it? I think absolutely, positively, and it's coming. I talk about the two transformational technologies in our business -- and I think Peter Darbee did a great job on that -- and that is the "smart grid." You know, we're going to have smart meters, we're going to have ways that communicate with you and allow you to use your electricity a lot more efficiently in the future, and we're going to have

plug-in hybrid vehicles. And those things are going to transform our industry, but they're also going to transform the automobile and transportation industry. I think it's going to transform energy security in this country, as well as the environment. And we are very very dedicated in the electric utility industry. We think that time has come.

You know, it's -- you can go back to Thomas Edison's time and actually he was in favor of the electric vehicle at that point in time. A good buddy of his, Mark, was Henry Ford, and Henry Ford -- Thomas Edison went out to do the utility industry, Henry Ford went off to do the auto industry and obviously chose a different path. But I think that, for various reasons now, we see ourselves coming very much back close together. I think that -- you know in 1994 I signed an agreement with Al Gore, which was the first voluntary program to reduce global climate emissions, and it's still the largest and most effective in this country. But one of those programs we set up just as a long-term program -- we didn't think it'd have any

short-term effect -- was a program called EV America and it was a partnership with the auto companies and the electric companies to help develop the electric vehicle. Well that was 1994, and Chelsea, I know you wrote the book, I mean the movie, the great movie "Who Killed the Electric Car?" But quite frankly, I think it's like Mark Twain. The report of his death was very premature. Nobody actually killed the electric car because it made progress, we made progress in the electric drive, we made progress in the batteries, we're making progress in a lot of the technology, and right now we've got a whole different conception of what may be offered to the public.

So, I think that right now we have the political support for this, there is tremendous political support. There's support from companies right now, there's support from the auto industry right now, and I think that's going to change this whole dynamics in a major way. People in this country are mad, and previously when they were mad they came up with things like the Mothers Against Drunk Drivers

and that transforms society in a lot of ways, certainly from the time that I was growing up. And I think they're mad right now and I think they want to get off OPEC. As Jim Woolsey said, I think we're going to see signs out there that say NOPEC -- No On Oil and Purchase Electric Cars. NOPEC -- "No On Oil and Purchase Electric Cars."

MS. EILPERIN: Good job! Alan?

MR. MADIAN: I'm going to address the question of how long it will take for plug-in hybrids to have a significant impact on oil usage. You might want to write down your own estimate, and then I'll go through the analysis. The short answer is quite a long time unfortunately. The long answer involves an analysis with three elements: Assumptions, facts, and forecasts.

Let's start with assumptions. On defining displacing a significant amount at 10 percent of the liquid fuels that are being used by the vehicle fleet -- and I'm assuming that hybrids are operating two-thirds of their miles electrically. Many of you

picked up a data book that I put together with some of my colleagues. There are some tables in that book that you may find useful when thinking about this presentation.

Next are the facts. The number of light vehicles in service in the United States now is about 250 million. And it's growing about 1.75 percent per annum, which means approximately 4.3 million additional vehicles each year. The size of the fleet is important because plug-in hybrids will need to be at least 15 percent of the market in order to displace 10 percent of the liquid fuels. Since plug-in hybrids are likely to disproportionately replace smaller vehicles, their fleet share may have to be a little bit higher than 15 percent. Annual new vehicle sales are 15 to 16 million vehicles. As you all know, annual sales of new vehicles are profoundly affected by demographics, by consumer sentiment, and by improved vehicle durability, and the choice of vehicle obviously is often affected by the price of fuel. Now if we look at what's happened with hybrid vehicles to

date in the United States, approximately 1 million have been sold, and that's over a period of in excess of 10 years, and we're only to 1 million. And the expectation is that this year we'll sell 400 thousand, which is approximately 2.7 percent of total sales.

And now we come to forecasts. With 400 thousand 2008 sales and a 14 percent compound annual rate of sales growth, hybrid sales have recently been forecast by Morgan Stanley to grow to 2 million by 2020, which is about 13 percent of sales. Morgan Stanley's estimate for plug-in hybrids for the period from now to 2020 is 3.8 million plug-in vehicles, which leaves a 2020 hybrid fleet with no attrition at 1.2 percent of the total fleet. If Morgan Stanley is right, and they're frequently viewed as being unduly optimistic, and we further assume a robust 15 percent compound annual rate of growth in hybrid market penetration for the 2020-2030 decade, we would get to 27 million plug-in vehicles or 7.3 percent of the fleet in 2030. With another six years at 15 percent compound annual growth, our estimated plug-in vehicles

reach 68 million in 2036, which allowing for fleet growth, represents about 16.4 percent of the light vehicle fleet.

So we have our answer. Given the assumptions, we can expect to see a 10 percent light vehicle liquid fuel displacement in about 28 years from plug-in hybrids. But note, while we have forecasted achieving at 10 percent displacement of liquid fuel at present growth rates, the light vehicle fleet will have grown from about 250 million vehicles to 413 million, or by 66 percent.

So unless substantial efficiency gains are realized simultaneously through the use of other technological improvements, the liquid fuel alternatives or plug-in hybrid penetration that vastly exceeds the optimistic assumptions I have utilized, we may be using more liquid fuels and possibly even more petroleum in 2036 than we are now. If we are to curtail our petroleum use, we will have to wage the battle broadly on multiple fronts. Plug-in hybrids can make a significant contribution, it’s a wonderful

technology, but they can only gradually provide a small part of the solution.

MS. EILPERIN: Okay. Following those bracing comments, Bill gets the chit.

MR. REINERT: So when we start to plan a car, we start five years out and work inward, and pretty much then my team gives up two years from production. So that's pretty much how it works. On other cars like plug-ins or fuel cells, sometimes we'll start much further out and work toward a product. So we're looking into the crystal ball at what the customer's going to want, what the economic situation's going to be like, what the energy situation and the regulatory situation's going to be like. And, of course, today it's different than it's been in the last five or ten years, and we see tremendous volatility in oil prices. They're not going to just go up all the time; they're going to come back down, too. And when they come back down, we're going to find out do we have economic elasticity compared to oil or demand destruction. Sure there's a

lot of people going to the smaller cars, but is that -- if oil and gasoline -- if oil goes down to $60 or $70 a barrel and gasoline gets back to $2.50 a gallon, and that very possibly could happen, will that demand stay the same or will we shift back up? Okay, so that's something we need to look at in our crystal ball.

What will happen to cap-and-trade CO_2 systems as we start to reduce the carbon? When we talk about these plug-ins being a lower carbon solution -- and I'd say that's questionable, we'll have to talk about that -- but if they are a lower cost solution, who owns that carbon? Who owns that cost of carbon reduction for that electric-miles traveled? Do I own it at the tailpipe? I think I do, but then that puts the burden on the electric industry because they're burning coal to get that electric-miles traveled. So I think we need to have these discussions about that because that affects the cost of my product going out.

The other thing is how do I design the product to get the right price? As you've just heard,

we don't need tens of thousands, we don't need demonstration fleets, we don't need government subsidies, none of that's going to work if you're looking toward millions and millions and millions of cars. If you really want -- forget the U.S. market. We've got a 1 billion-car world fleet that's growing rapidly in India and China and Russia and the Arab countries. So forget the U.S. because whatever we do to reduce oil consumption, it won't make a drop in the bucket with the increase elsewhere.

So those are the kind of issues we need to really affect. We've got to put mass cars out on the market, not just in the U.S., but in Asia and Europe and developing countries. The cars have to have 150 thousand mile durability. No mistakes. Don't kid yourself, no mistakes. And they're going to have to give the consumer what they want. We can -- yes, I can drive our plug-ins and we're bringing them in, and we've bringing -- we've got another wave coming that's more advanced, then another wave behind that. And just because Toyota doesn't talk about that doesn't

mean that we're not doing it. But the fact of the matter is, is there's a huge variability in the gas mileage you get -- I see 100 miles per gallon here -- and yeah, you can do it if you're driving 35 miles an hour. But if you're on the 110 Freeway going to Pasadena where you've got an on-ramp that's not even as long as this stage, you've got to run wide open throttle to get into the lane and not get killed. And when you start doing that, you know, what you started out with a 20 mile range becomes a 5 mile range, and what you start out as 110 miles per gallon ends up being more like the common Prius. So you got to worry about that kind of stuff because you don't want to send mixed messages out to the customer. You also don't want to say it's always going to be cheaper to drive than a gas car. It may not be. My Prius gets 53 miles to a gallon on the 405 everyday. At $5 for gas, that's about 10 cents a mile. If I'm driving my car hard, I'm getting on electricity, those costs go up. So you've got to be careful about that, okay?

And the final thing I'll say you've got to be careful about is the packaging on the car. I fought like Hell to keep leather out of the interior of the Prius and almost lost my marriage out of it, so --

MS. WRIGHT: Well, in Mary Ann's world, being a vegan, there is no leather in your cars anyways.

So before Johnson Controls entrusted me with building their hybrid battery business, I had a previous life at Ford Motor Company where I worked for Mark. And probably the greatest achievement I had in my career was being the chief engineer of the Ford Escape hybrid -- engineered in the United States, manufactured in the United States, and a really great performing vehicle. I personally have a passion for it and you'll probably see me jumping out of my chair.

But we're all going to see probably four things that we want to talk about. You know, the technology roadmap, how are we going to commercialize it in terms of infrastructure and cost. What's the

government's role going to be in this? I think what I'd like to spend a minute talking to you about is the technology roadmap. And I think it's really important that if you walk out of this room with one message from me, that is understanding the difference between a hybrid and a plug-in. And when you look at hybrid technology -- and let's migrate from nickel NI hydride, which Bill and I have a lot of familiarity with -- and we're migrating to lithium-ion, which is the technology of the future. When you look at hybrids, I will tell you, those lithium-ion batteries are ready to go into production, and in fact they will be going into production. Johnson Controls-Saft will be putting lithium-ion batteries in the Mercedes S-Class next year. They meet all of the rigorous automotive standards around safety, reliability, performance, and useful life. Now having said that, plug-ins are a different cat. You're managing a tremendously more significant amount of energy, a very different usage profile. Now the cool thing is, we're taking the learnings out of our hybrids and we're

going to be able to transition that and accelerate it by -- in our PHEV and our EV applications. And as a matter of fact, through those learnings, we now have the confidence -- Mark told you we're partnered up with Ford on a plug-in hybrid Escape fleet, getting out on road later this year. We've got plug-in fleets with Chrysler, the Sprinters. We actually did a fuel cell plug-in for Shanghai Automotive that is being put in the vehicle now and the GM Saturn Vue. So the technology is getting to a point where it's good to get it into a vehicle and find out what's going to happen when you get it out on the road so that we can have the same level of confidence we do in hybrids.

And so I think what I'd like for the group here to recognize is that we are making significant strides in the technology. It's very promising, and we're getting to a point now where we'll work through those technology challenges. We've got to also turn our focus to how do we make these things affordable so we can make a lot of them. We can develop a diverse supply base because I've got to be honest with you, as

much as I love my Asian partners, I want to see the United States once again be considered to be a dominant force in advanced technology, relevant technology. We'll have to be developing our supply base here in the United States. We've got to establish our manufacturing infrastructure. We can rebuild it, and we're going to have to build new skills. So I think there's a lot of potential. I think there's a lot of reason for us to be optimistic, and I think there's a lot of reason for us to believe that, irrespective of the numbers of how much oil will be displaced, that we're on a path. And we're on a path that we need to accelerate and focus and work together. And clearly government is going to have a significant role in that in terms of providing incentives, not only for the customers to buy it, but for manufacturers to want to do it here and to build that infrastructure and build that capability here in the United States.

And I believe I've stayed with the rules in three minutes, right?

MS. EILPERIN: That was fabulous. Let's give her a round of applause for staying within the three-minute limit.

I'm going to start out with a question from the web. This is from Stephanie Cohen, who's a local freelance reporter, and the question is "Will GM's Volt promise for 2010 be successful in the U.S., and more broadly what will determine whether an American automaker can be successful in mass producing plug-in vehicles to U.S. consumers?" So even though obviously we don't have GM, I'd just be interested if, you know, particularly on the end whether, you know, Bill or Mary Ann can speak to -- you know, what will determine success for companies that are particularly marketing plug-in hybrids for American consumers?

MR. REINERT: Internally, and I'll tell you is you hit your numbers. You're going -- you go into this and set your plant up and your supplier base -- it's extraordinarily complicated to make a car -- and you want to hit your numbers. If you say 60 thousand or if you say 40 thousand, you want to hit 40

thousand. I almost lost my job because we said 20 thousand on the Prius and we hit 50 thousand. That's as bad a problem as missing your numbers low. So that's number one, do they hit their numbers?

Number two, does the product increase at a rate that makes it -- gives a reasonable payback? Do they hit their numbers on the price? Do the customers buy it? And does it increase and cause other products like it to hit the market? So that's what I say, do they really hit the numbers from a pure product point of view? And do other people adopt that type of -- it's a series hybrid, we use a series parallel, they're using series hybrid, and will other people go toward a series hybrid?

MS. EILPERIN: Okay. Do you have anything else to add?

MS. WRIGHT: Well, I mean, clearly we want it to be a success, right? I mean, none of us benefit if it weren't to be a success. But I think number one, you could call it an early success in that it has really instigated a lot of enthusiasm in the market

for a technology. And around the potential of a technology and a really sexy car that offers a lot of flexibility around fuel usage and the potential for reducing fuel consumption. So I think -- you know, Bill, I absolutely agree with you, but I think we also have to look at how is it -- is it invigorating the marketplace? Clearly the battery suppliers are going to have to be able to demonstrate capability to deliver a battery that will meet 150 thousand miles, ten years. And I would go back again and say we've got to get vehicles out on the road. We have to understand what the usage profiles are going to be. We have to be able to design systems around them so that, yes, they can be robust.

And one last thing, and then Felix, I know you want to jump all over this, but one last thing. I mean, if you took a look -- Alan talked about selling hybrids over the last ten years -- think about a hybrid even four years ago or five years ago, you're like, you know, I'm going to wait for a year or so until they get the bugs out of it. The fact is the

vehicles that are out on the road with nickel NI hydride perform extremely well. They're very reliable, high quality, and they're safe, and that's enabled us and given us permission to go forward and move forward with the technology. So I hope and I, you know, I continue to work with my partner GM. I want them to be successful. We need them to be successful. Just like Bill needs to be successful, and Mark needs to be successful.

MS. EILPERIN: Okay. And Felix, and then we're going to go to questions.

MR. KRAMER: I think GM's doing a lot of things right; I don't know that they're going to succeed. Their Board of Directors has made the Volt, turned it from a concept car to a production vehicle a week ago. They have said specifically a couple of real important things. They said we're taking a leap of faith on this car because we think this is the direction the world is going. They're saying, in other words, it's the end of business as usual. And that *Atlantic* article that's out there talks about

that in depth. And they're being very transparent about it. They're saying -- they're opening up everything that's happening, which means that they get the American people on their side to help them succeed, and hopefully they get all the resources they need to get them to succeed.

One other thing that they're doing, which is really important, is they understand this thing that we talked about this morning, about dollars per mile. If you switched miles per gallon around and you do gallons per mile, then you realize the bigger the vehicle, the better the benefit in electrifying the car. That's really important.

MS. EILPERIN: Okay. Now that we've learned that opposing leather interiors is dangerous for your marriage, and underestimating car sales is dangerous for your career, let's go to the mike. And anyone who wants to ask questions, we have 15 minutes for questions. Let's start with this gentleman. And if you could identify yourself, it would be helpful.

MR. JUNG: Sure thing. My name is Michael Jung. I work for Silver Spring Networks. We've heard about how important the "smart grid" is for making a plug-in hybrid electric vehicle world possible, and I think we understand that plug-in hybrids and other electric vehicles are a killer application for the "smart grid." Sort of like word processors for computers, let's say. How important is it that the endpoint become a ubiquitous, totally open, inoperable network of fueling stations, quote end quote, just like fuel pumps are today or are wall sockets are today for electricity? How important is it that they become a ubiquitous and open standard, and are we going uphill given that state-by-state jurisdiction is where we're at right now as opposed to a unified federal perspective on this?

MS. EILPERIN: Okay, looks like Bill?

MR. REINERT: That's really hip that you understand that. I'm a contrarian. I don't believe in nighttime charging. I don't believe in charge discipline. I don't believe you ought to do that

because if you start doing that, one is you start making the battery too big, the cost of the car gets too heavy. And two is, you start trying to force consumer behavior into a narrower band and less people want to get the car. So if we have ubiquitous charging -- like you say, kind of like the web -- where you've got an avatar onboard your car that I might want to use coal, electricity. Jim Woolsey might want to use solar, so we've got different price points and we can negotiate with the grid to do that or charge roaming, just like your cell phone. I don't want to care where I plug my car in, and I don't want to have to swipe a credit card, or if I can call my car up on my iPhone and have it turn on the air conditioner or the heater, and take that hotel load off the car so I could have more battery for traction, that's why I think it's really cool what you're talking about.

MS. EILPERIN: Tom or Alan, did you have --

MR. KUHN: Well, I think the smart technology that you mentioned is coming on a whole

different front other than the electric vehicle because it makes sense to the consumer from the standpoint of every usage you could have for electricity. But I do think that for the vehicle, it's going to offer multiple opportunities. And I think whatever batteries we choose, customers will choose to, in many cases, to charge their cars, you know, on off-peak power. Because the price differential is going to be so incredibly different, it will be amazingly different. And for our industry, it -- the reason we'll be able to do that is because we are probably one of the more inefficient industries because we can't store electricity. If we were in the hotel business, we'd probably be close to bankruptcy because from a capacity factor, you need to fill up those power plants. We don't want to build additional power plants. We won't need to with the electric vehicles if we can get the power charged overnight.

MS. EILPERIN: Okay, can we go on to the next question. Thank you.

MR. WOOLSEY: Jim Woolsey, Vantage Point. I have a question for Alan Madian about the study he described and whether it assumes, as most studies do, that the average cars they do today coming into the fleet in the U.S. will stay in the fleet 15 years or so. Is that one of the assumptions of what you did?

MR. MADIAN: Unfortunately, the durability has increased significantly and we're now looking at an average of about 18 years and growing, which is a further problem which I didn't go into.

MR. WOOLSEY: Let me make an observation. If any of you has been to Japan recently, you will know that all the cars look new. The reason is all the cars are new. The reason is the Japanese have incentives to trade in your car quickly and so innovations get introduced into their fleet a lot faster than they do here. These are choices we make as a nation, whether to have incentives like that, as Japan has, or not to have such incentives. We can choose to be as smart and aggressive as the Brazilians, and go in two years from having 5 percent

of our new cars being flexible-fuel vehicles to 75 percent being. Or we can take our time about it and say, gee, it's really hard because we're Americans and we aren't as smart and quick as the Brazilians or the Japanese. Do you think it is possible for us to be as smart and quick as the Brazilians and the Japanese?

MR. MADIAN: Having spent time in both Brazil and Japan, I have little doubt we can be as smart in terms of any group of us discussing it. I think politically, we may not have the capability, but I hope I'm wrong about that.

MS. EILPERIN: And Jim Woolsey can discuss that with John McCain next time he's out on the campaign trail. Is there a next question?

MS. DUXBURY: Good afternoon. My name's Peggy Duxbury and I'm from the other Washington, in the Pacific Northwest. And I work for Seattle City Light, the municipally-owned utility for Seattle. And we're in the process of converting thirteen of our Priuses in our fleet to plug-in with "smart grid." And my question really is for Tom Kuhn, which is I

think a lot of us in the utility are ready to become the gas station of the future, but I think there's others that are very nervous about it and reluctant to take that on. Can you give us some recommendations on regulatory, either state or federal regulatory, ideas that we can start to undertake as a country to make us feel more confident that the utility sector can take on this new responsibility?

MR. KUHN: I think you've addressed an important issue in Seattle, Seattle City Light, Austin, and there's a lot of -- and the public power movement that have the leadership in this role, too. We have a lot of companies that are moving ahead -- PG&E, Excel, Edison International, you could go on, Progress Energy, where I could talk about the folks with real passion in this. There are people out there that are saying well, I don't know, it didn't happen last time so is it really going to happen this time. I think that's changing very very rapidly, though, and I think that people are saying well, we see the reality of the auto companies talking about really

producing these cars. We have to work with our, you know, with our government, state and local officials, our regulatory utility commissioners, who I think are going to be very very excited this thing, to address those infrastructure issues. We've got to start pumping this up very quickly and strongly. I think we're going to do that, again, with EPRI and EEI and others working together. So, I see it happening and I think those city electric companies and public power are going to continue to be major leaguers.

MS. EILPERIN: Great.

MS. WRIGHT: One comment. Brian Wynne and Genevieve Cullen, are you in the room? Okay. We have an organization called Electric Drive Transportation Association, which we sit on the Board, and it's an industry association that truly is an industry. The car companies, the suppliers -- I know Ric Fulop from A123 is here -- the utilities, we all come together as concerned stakeholders to try and find solutions for exactly what you -- the question you just asked. It's unified standards, it's compatibility around

infrastructure developments, how we're going to measure all the things that Bill talked about. I would encourage you to get informed and perhaps join here as your campaign, Brian, in terms of what we're trying to do with EDTA, because we go as a group as we try to help influence policymaking around building a truly unified position for the United States.

MR. KUHN: I would second that motion. EDTA is going to be a great organization to help us get there.

MS. EILPERIN: Next question please.

QUESTIONER: Hi. Jack Hidary, Service Chairman of Smarttransportation.org. Alan, your bracing, bracing numbers I think are a good antidote to some of the hype around the industry, and given that, I want to build on Jim's comments. The fact is in this country we have done programs where we've changed out fleets. The fleets in those cases were air conditioners and refrigerators. We did have massive nationwide programs with rebates, with incentives, that said bring in your air conditioner,

bring in your refrigerator, we'll give you a rebate, we'll get it off your house, and we're going to get you into an Energy Star-compliant device. If we were actually to construct such a policy in this country for fleets -- because Alan, your numbers dictate very clearly that the sooner you do this, the better, given the growth rates and given the oil usage -- what would some of the key elements of that be? And by the way, one of the key items that is hurting Detroit right now in terms of jobs is that we're stuck right now at about 15 -- just over 15 million new car purchases every year. We used to be about 17 million, now we're at 15. And there's really no way to bring back Detroit unless we sell more new cars. Well, one of the facts in this country is that how many used car transactions do we have? We have 45 million used car transactions in the country, three times the number of new car transactions. So for Ford and Toyota and all the different car manufacturers to really get back up to speed, we need new car transactions. And, of

course, a rebate program properly constructed would help do so.

I guess, asking the panel, what are some of the key elements you would want to see in such a policy that would encourage people to get some of these new cars -- obviously only eligible for these new plug-in hybrids or other high mpg cars -- and what kind of timeframe do you think is realistic to put out there? Thanks.

MR. MADIAN: Well I think there are a couple of issues here that you've got to look at very closely. And I think there's no question we want to have a program of incentives, but we want to have it timed simultaneously with the development of the supply chain. So at this point, one of the questions is how many of these can we build with batteries which will have, let us say, a 40-mile capacity? In what timeframe? And let's assume that we can get to 100 thousand in 2011, which may be slightly heroic. And how fast can we ramp that up? I mean, obviously Toyota sales last month of the Prius fell 23 percent.

My assumption is that was the result of their having sold out of inventory in April, and having run out of inventory at the end of April, and not having the inventory in May. If you have capacity constraints and you put incentives in place, the result is a lot of frustration. So I think what we have to do is figure out a very complex program of incentives that are phased with capacity. And we basically have to make it clear that those incentives will be there, possibly even escalating. You know, for example, if one is talking about fuel taxes as a negative incentive, which however will induce a great deal of purchasing. So one has to basically say okay, what do we do that lets the companies know it's safe to make the investments, and the customers know that it's going to be advantageous to buy the vehicles. But I think even, you know, if we do that, we're still looking at a very long timeframe. If you look at what happened with SUVs, the compound annual growth rate for SUVs from the time they got to, you know, some modest threshold, 2 or 3 million to the present, is

approximately 9 percent per annum. The numbers I gave you were 15 percent per annum assumed. So it's an enormously difficult challenge. And I think it's worth tackling, but we have to tackle it from a realistic perspective.

MR. KRAMER: Alliance Bernstein projected two years ago that in 2030, 72 percent of the world's fleet and 85 percent of new cars would be hybrids and plug-in hybrids. That posits end of business as usual. And inspired by Jim Woolsey again, if the big -- can you imagine a situation where we wanted to do this and we said sorry, we couldn't do it, we couldn't scale up motors and batteries. I mean, you know, we can do that if we want to. Let's go back to 1943 when the President said to the auto companies, we're not building any more cars and trucks, we're going to build planes and tanks, and next year I want you to build 15 thousand planes. And they said, we can't do that, and they built four times as many in a year. We can do that.

MS. EILPERIN: Next question, go ahead.

QUESTIONER: Hi, Constantine Samaras, Carnegie Mellon. I research plug-in hybrid economics, policy, and lifecycle emissions. I'm glad that everybody wanted to talk about Alan's numbers, and that really emphasizes the importance of scale in this world, and the importance of designing policies to have plug-in hybrids' scale at the rate that we want. Now they talked a little bit about the supply push, but I wondered if the panel could talk a little bit about the market pull, and demand pull forces, that might be able to encourage plug-in hybrids to get the type of scale that we all want. And with respect to Alan's study, sometimes in innovation and adoption, we see S-curve adoption where there's rapid adoption in the mid-time of the technology because people really like the stuff. Especially in respect to batteries, I wonder if you and Mary Ann could talk about is there a batter range or a battery bogey price that might get us to that type of disruptive technology from the demand side?

MR. REINERT: First of all I want to caution the assumption that I've heard discussed in this room that plug-in hybrids or electric technology -- which, by the way, offers the lowest energy density, which means the highest packaging effort of any fuel that we can use -- that there's somehow in technology a killer app. That's a broad assumption to make, and I want to make it clear that there's other competing forces here on plug-ins. There's lightweight cars that can be done, there's 60 mile, you know, eco-boost engines, other fuels that are non-carbonaceous fuels that are being looked at right now that can be liquid and be brought to market, and not ethanol, but other fuels. So when we look at that, we can't just assume that the marketplace -- that this car will compete, is 1. benign, is 2. that we don't have a worldwide recession going on and nobody wants to buy the cars, and is 3. it is market pulled from high gas prices. Having said all of that, the interesting part of getting to the Prius and marketing that -- assuming that we have batteries and all that other stuff

solved, and probably it's going to be a smaller battery and smaller electric range than everybody wants -- assuming we've gone all through that, the issue's going to be, and the thing that we found, is virile marketing, internet marketing, that's helped us so much. Some of bad press we got when people weren't getting the 60 miles per gallon in the Prius -- that was all handled not by Toyota -- I mean, I'd love to give my PR guys a lot credit for it -- but it was actually handled by the people who liked the car. And so it's that kind of virile marketing, that kind of internet kind of boost that I think would really help.

MS. EILPERIN: And so we only have three minutes left so if we could may be just take one last question that would be great.

QUESTIONER: Paul Scott from Plug-in America. This is for Mary Ann Wright. Mary Ann, a lot has been said by the OEMs that the batteries are not there yet. And I'd just like to know from you specifics on cycle life, calendar life, and the price per kilowatt hour of your batteries today, and in

quantities of 100 thousand units going forward, and when can you get the ramp-up to those quantities?

MS. EILPERIN: Save the tough questions for the end! Go ahead Mary Ann.

MS. WRIGHT: Well, those are good questions, but I will be honest with you. I'm not in a position to answer those today, unless you want to come and buy 100 thousand from me, in which I have a private room in which we can meet!

No, your question is exactly right, and I will tell you this with as much candor as I can. We meet with our global customers all the time. And I will tell you a year ago, my discussions with my customers really focused around can the technology do it? Okay? That was the question, and then oh by the way, we're going to have to talk about cost. We've gotten to a point where we're ramping up our first manufacturing plant, and I will tell you, every single conversation that I have with our customer now has turned into how am I going to get these a whole lot cheaper? And I would be happy to share with you; we

have put a cost roadmap in place, and I've shared it with my customers. I'm not in a position to just share it openly here, but we've put in a cost roadmap, for both HEVs and PHEVs, which we believe represent a significant quantity and affordable business model. And -- and it assumes a lot of scale, supplier diversity so that you don't have somebody holding you hostage over supply, and manufacturing infrastructure and development. But we have been spending probably the last six to eight months on exactly that in terms of developing our business case. And I'm not trying to evade you, but it's just something from a competitive standpoint. Ric Fulop is in the crowd here. I'm not going to divulge that.

MS. EILPERIN: Okay. And I hope that all of you will join me in thanking just a really expert panel with a lot of knowledge.

MR. SANDALOW: Let me just say a word about what comes next. First, please take everything; don't leave anything here because this room is going to be completely redone for the evening banquet dinner. We

have a reception starting at 6:00 next door, and a 7:00 banquet dinner here. Here's the warning. We have had an astounding turnout here, a lot more than we anticipated. The Fire Marshall absolutely will not let us seat everybody who we think might show up for the dinner. So, if you -- we'd love to have you for the dinner. Please come early, if you're really committed to getting a seat, reserve it, you know, grab a seat, and we'll just see what happens -- fight for it. Thanks very much everybody.

MR. HORTON: In my opinion, to a large degree because we've been living in a values crisis for the last thirty years or so, primarily because the dominant value during that period of time has been market value with all other values coming in at a distant second in subject to that one value. And, you know, there have been plenty of examples of the price we've been paying for that, all the way from the tobacco hearings to Enron to global warming, even to the current struggles with the mortgage crisis. But that's just the tip of the iceberg; we've been feeling

it throughout the fabric of our whole society. We even feel it in my business where there used to be a fairly healthy balance between art and commerce in the film business. And now there's not a whole lot of art left. As one friend of mine likes to say, it used to be the tail was wagging the dog, now there's no dog there. Terrorism, a war that doesn't seem to have an end, an economy where the gap between rich and poor is just turning into a chasm. I read recently that the CEO pay today is 600 times that of the average American worker, compared to 40 times back in 1980. And now even the environment, which, you know, its reliability, its sustainability, is something we took it for granted for long as time as existent, and suddenly even it's shaky. And not just in one section, but the whole thing. And I think people are getting, people are getting frustrated. People are -- there's a hopelessness about it right now.

And by now you're probably wondering what all of this gloominess has to do with this conference and while you're trying to eat. Wherever I would

drive that car, a crowd would gather around, and they would ask questions. They would look at it. They would want to touch it. And, you know, of course, there was the expected novelty of it, there was an excitement about that, but there was something else on their faces. There was a look on their faces that was much more pronounced, which was -- there was a wonder and a hope that right there, right in front of them, was tangible evidence of the possible. Almost like an early rain promising the possibility of a downpour. The possibility that in spite of all the bad news and all the dire predictions that they're getting today, that in spite of the sluggishness of all of our systems, our business and governmental, that in spite of all of that, that may be our higher natures might prevail and that the human race may not only come up with the technology, but the will to push back. They might value life and quality of life enough to actually change it. And that for me, that symbolism and that message for me is as important if not more important than the technology itself.

So, in closing, I just want to commend you all. I really do; not only for your pragmatic work in doing what you do, but for your relentlessness, your determination, your tireless optimism, because in that -- in the middle of that, is your message of hope and people are getting it, they're feeling it. And I for one am truly grateful to you for it. So, thank you.

DINNER REMARKS

DAN REICHER: Could I have everyone's attention please? Could everyone sit down please? It is my great, great pleasure to introduce Senator Lamar Alexander who chairs the Senate Republican Conference and serves on committees overseeing clean air, highway, science, appropriation and the Tennessee Valley Authority.

The only Tennessean every popularly elected both as Governor and U.S. Senator. He has a very distinguished record in and out of Tennessee and most relevantly, he recently issued seven grand challenges that need to be addressed to secure our energy future.

At the top of his list -- plug-in vehicles. It is my great pleasure to introduce Senator Lamar Alexander.

SENATOR ALEXANDER: Thank you. Thank you very much. Well, first I want to congratulate Brookings and Google for hosting this. I understand it's been a terrific day. Congressman Dingell, Chairman Dingell is coming, and he has an affliction that all of us have in the Senate and the House. He has votes. So when he comes, I want to make sure you have a chance to hear him and I'll wind down. But I wanted to drop by and I appreciate the invitation just to tell you how important it is, what you're doing.

Let me start with a story. Some of you may remember how Ross Perot first made his money. It was in the 1960s in Dallas and Mr. Perot noticed that the banks were locking their doors at five o'clock and they locked their big new computers at the same time. So he went to the banks and he said may I buy your unused computer time at night? Then he came to states like Tennessee, before I was governor, and said I'd like to make a contract to manage your Medicaid data

at a cheaper cost. So the banks made a little money. The states saved a little bit of money. And Perot made a billion dollars.

Now, the analogy of that today is the unused electric capacity that we have in the United States at night. The Tennessee Valley Authority, where I live in Tennessee, is the largest public utility. It produces about three percent of all the electricity in the United States. Its managers tell me that at night TVA has the equivalent of about seven to eight nuclear power plants worth of unused electric capacity on most nights. Now if you stop and think about that, what that suggests to me is that in our region probably the most important unused asset that we have is that amount of electric capacity.

So on Monday, Congressman Bud Cramer and I -- he's a Democrat, I'm a Republican -- we're co-chairmen of the TVA Congressional Caucus, are hosting in Nashville a hearing, a Congressional hearing on our plug-in electric vehicles -- one of the answers to high gas prices. We'll have 11 vehicles there. Many

of your companies will be represented there and it will be a way to help make the public more aware of these things.

As was mentioned, I went to the Oak Ridge National Laboratory about four weeks ago and I suggested to about 200 scientists there that we needed a new Manhattan project for clean energy independence -- that that would make a lot more sense than dueling poster boards on the United States Senate floor about who did what to whom. And I said we should start by doing the things we know how to do which would be exploration off shore, new nuclear power plants -- but then we ought to pick seven grand challenges of things we don't yet quite know how to do and give the same kind of focus to that that we gave in World War II to splitting the atom and building a bomb.

That was a tremendous effort at that time. It drafted some of the most important companies. It spent $16 billion in today's dollars. It had the best scientists in the world. It had an Army Corp of Engineers General in charge and it had a focus. And

among the grand challenges I suggested, were three already picked by the National Institutes of Engineering. One of those is carbon recapture. One of those is help make solar power more competitive cost-wise with fossil fuels. But one I picked was help make electric vehicles commonplace within five years.

I want to congratulate Mr. Sandalow for his work at Brookings on this and in my brief comments tonight, I want to try to answer the question what should the Federal role be? If I were to suggest a criteria or two, these are the things I think we have to watch out for when the Federal Government -- which as big as it is, is relatively small in our big economy -- begins to get involved in the marketplace. One is to watch out for the rule of unintended consequences.

For example, the effect of support for corn ethanol on food prices -- maybe it's exaggerated, but our focus, we didn't think about that as clearly, and our focus I believe ought to be on advanced biofuels

which would include crops that we don't eat. I think we have to watch out for -- we're not Japan and we don't have industrial policy in the way that they do. And picking winners and losers in the marketplace doesn't always work right. Support for cellulosic ethanol, which I think is very promising, might have some effect on the forests of America. It might drive up paper prices. It might put into place a subsidy that interferes with an algae solution to carbon capture because it doesn't have the same kind of support.

And then, as we've seen with support for wind, which is now well developed, a subsidy that we put in in 1992, grows and grows and stays in office and begins to squeeze the money out for other renewables or other promising technologies. So keeping that in mind, here, in quick order, are some of the things I think the Federal Government could appropriately do and I've listed them in the order that I think are probably most appropriate in terms of Federal interference with the free market. And if

someone will let me know when Chairman Dingell comes, I'll be glad to make sure that he's not late to his vote and that you have a chance to hear him.

First, I think one thing that we could do, we've already done. And that is the fuel efficiency standards last year. The Oak Ridge National Laboratory scientists told me that was the most important thing we could do. It's a 40 percent increase. You know all about it. But, the advantage to that is that doesn't pick winners and losers. It just says this is the standard. If you want to engineer your conventional -- your internal combustion engine -- so that it gets 50 or 60 or 70 miles a gallon, or if you want to add some form of ethanol and take it on up a little further, or if you want a pure electric car and try for 100, that's up to you, but we'll set the standard.

We won't pick the technology. So fuel efficiency is done, and we will be considering further efforts at fuel efficiency standards as time goes on. Second, a low carbon fuel standard I think makes a lot

of sense for our country in dealing with carbon. I'm not -- I support cap in trade for power plants. I'm not ready to support it for the whole economy. I'd rather put caps on power plants and a low carbon fuel standard on fuel. Again, that is the kind of Government action that doesn't pick and choose winners. A third way that is beginning to pick and choose a winner, but I think is very appropriate for us to do, would be for the federal government to purchase, to put out a bid and say that of the 65,000 non-trucks that the government buys each year, a certain percentage of them will be electric vehicles and see what kind of bids come in at what cost and give that a way to get started.

Next would be battery research. Batteries, lithium (inaudible) batteries are very important and the question would be how should the government get involved in it without interfering with what private businesses are doing. One way, of course, to do it is through the new Energy DARPA that was enacted last year, like the DARPA in the Defense Department or

through our national laboratories, some of which are already deeply involved in that.

A fifth thing that would be important would be accelerated depreciation for smart meters. If you're going to put together an electric car with night time electricity, it helps if the consumer understands the smart meter. I drove one of A123's cars today. He told me -- the driver told me -- that he gave it charge for less than a dollar at night and by doing that, with his basic plug-in Prius, he took his car from 40 or 50 miles a gallon, to over 100 miles a gallon. But if we can say to Americans, TVA can say plug-in at night, fill up your charge for a dollar or two instead of 70 or 80 or 90 dollars, and we'll charge you a little more between four o'clock and ten o'clock, we might be able to electrify a big part of our workforce of our fleet without building new power plants.

Next, carbon capture. Carbon capture is essential if we're going to continue to burn coal, which if we're going to electrify the fleet, we must

do in the near term. We all have a vision of an energy future that doesn't burn so much fossil fuel, but that is some way off and we need a bridge to that future. And if we can find a way to deal with carbon -- we already know how to deal with sulfur, nitrogen and mercury -- then we can use our coal and we can still be more independent in terms of our energy sources. Finding ways to deal with carbon capture -- not just putting it in the ground, but algae solutions or other chemical solutions that might develop is essential, it seems to me, if we're serious about electrifying the fleet to any great extent.

And then in terms of coal plants, we might as well bite the bullet and say on their fortieth birthday, all the old dirty coal plants ought to have to meet the higher standards for clean air and -- but use them, but use them and helpfully show the rest of the world how to have a coal plant that doesn’t pollute. Finally, I know many of you support the idea of tax credit. Senator Hatch has a bill like that that has good support in the Senate. That's a little

more intrusive, I would say, with tax credits.

What we ought to try to do is make sure that we think of tax credits or direct government support for technology as something we should do for a limited period of time and not as a permanent subsidy. And then there are the questions of the battery guarantees. We've had some discussion about that. Mr. Sandalow has talked about that in his book. It's an interesting idea as well. It's a little more complicated for the government to be involved. Now there are a number of suggestions for plug-in electric vehicles, but my main message tonight is that this is a time when we ought to be working together.

I'm working with Bart Gordon, the House Science Committee Chairman. He's a Democrat. I'm a Republican. Jeff Bingaman, the Senate Energy Committee Chairman. Pete Dominici. What we're trying to do is see if we can put a consensus together of what you call at a moon shot or a Manhattan project -- some way, with the advice of scientists, to say what grand challenges should we undertake in order to put

ourselves within the next five years firmly on a path to clean energy independence. And if we can do that by this fall, then perhaps we can say to the new President and the new Congress let's do that, let's do that. And I'm sure that it would do that plug-in electric vehicles will continue to be at the top of my list. Thank you very much.

DAVID SANDALOW: Well, if ever there was a man in this town who needed no introduction, it is Chairman John Dingell who we are honored to have with us here tonight. John Dingell is the longest serving member of the U.S. House of Representatives. He is actually the second longest serving member in the history of the House of Representatives. He is the Chairman -- he is the Chairman, of course, of the House Energy and Commerce Committee. He has, in more than five decades of legislating -- written a remarkable record of laws on a variety of issues including on energy and environmental issues that we're discussing tonight -- the Clean Air Act, NEPA, the Endangered Species Act -- and I am delighted to

say is my hometown Congressman, comes -- represents Washinaw County, Monroe County and from the great state of Michigan, ladies and gentlemen, John Dingell.

SENATOR DINGELL: I have a nasty pinched nerve is the reason why I need these darn things. First, for that gracious welcome, thank you all. Second, David, thank you for your very gracious and kind introduction. I'm grateful to all of you for your kindness and I hope that when I'm done speaking you will not be disappointed. In any event, we're here to talk about things of great importance to the country. And I want to thank Brookings Institution and Google.org for providing a forum where we can continue to expand this important discussion on a matter of great concern to our people.

First, I want to recognize Maria Thompson, President and CEO of TJ Technologies. Maria, it's good to see you back here again. TJ Technologies has taken a lead role in developing lithium battery technology which is critical to the development of the transportation sector in ways that we want, including

the development of the Chevy Volt. Last but not least, TJ Technologies is located in the 15th Congressional District which always makes me feel good. I'm very pleased to be part of the conversation tonight and I'm delighted to share the stage with my distinguished colleague and friend Senator Alexander. As always, I look forward to seeing friends and I must confess I'm not disappointed. I'm heartened to see the wealth of experience and expertise that has gathered here tonight to talk about something which is very important -- plug-in hybrid vehicles. And as we discuss the future, I hope that we can recognize our limits on the power of prophecy. When the very first administrator of the Energy Information Administration, Lincoln Moses, appeared early in his tenure before a Senate hearing, one of the Senators became frustrated with the careful responses and caveats that Moses used to condition EIA's projections.

The Senator demanded that Moses skip the hypotheses and get down and just give him the facts

about the future. Moses responded in what I think is a very good way. He said, Senator, there are no facts about the future. I think we do have some facts in hand concerning the present and we have hopes about the future. First fact, our dependence on oil is a matter of major national security concern. Now, we import less oil from the Middle East than 30 years ago, but the world still relies on oil extracted from dangerous and unstable parts of the world. And our military is regrettably and unfortunately placed in the position of being the guarantor of the world's energy supply.

Two, the demand for oil is increasing and while there may be a temporary slackening of demand, or while the up and down movement of the price structure may go down a little bit, it is very clear that over the long term it will only point up with China, India and the rest of the undeveloped world driving, so to speak, the way.

Three, our petroleum supplies and petroleum refineries are vulnerable to natural disasters and

accidents. We only need look back a few years to see what Hurricane Katrina and Rita did to impact upon the price structure of oil and energy in this nation. Four, we must act upon climate change and upon our vulnerability to oil and energy supply disruptions.

These four facts drive us to important conclusions. We need to consume less oil and we need to do so more efficiently. We need to find new technologies that don't rely on oil and we need to find alternatives and substitutes for oil. Now there are ways in which we can achieve these goals. We think we know some of them. We hope that we find and develop more. The energy legislation that Congress has passed last year and that the President signed into law requires automobile makers to improve the fuel economy of the fleets by 40 percent -- 40 percent over the next 12 years. Now that's an imperfect tool.

And, indeed, as we find, it isn't the best mechanism for achieving some of the nation's goals. To be precise, corporate average fuel economy which uses the metric of miles per gallon is far from the

best way to manage or reduce carbon emissions and indeed it is only a part of what it is we must do. From a policy perspective, let's ask one question that might help us understand where we are. First, which is better -- a car that gets 40 miles per gallon running from Middle Eastern oil or a car that gets 25 miles per gallon running on a domestically produced carbon neutral biofuel?

And we should then begin to craft our energy policy response in a way which considers that kind of question. I hope we can develop a better system in the context of comprehensive climate change legislation upon which our committee is working and upon which the Senate, as you will recall was working until just a little while back. And I think that we ought to understand that perhaps a low carbon fuel standard to account for what goes in the fuel tank is as important as what comes out.

But I would also like to observe that in promoting fuel efficiency, the market can be a much more strong and a much more effective force than any

regulation by law. And if you look at how the automobile market has changed since gasoline hit $4 a gallon, you will understand that the market is a powerful tool to address these questions -- much more so than the statutes enacted by humble men. I've been around long enough to have achieved the burden of memory. In 1976, gas was selling for 60 cents a gallon. It had just gone from 38 cents a gallon. In 1979, when the Shah of Iran fell, gas prices began a long, inexorable and continuing price increase.

In 1981, Americans were shocked when domestic gasoline prices exceeded a dollar per gallon for the first time. Unfortunately, that year the average gasoline price would reach $1.35 per gallon. How did the nation respond? Between model years '79 and '80, corporate average fuel economy jumped by three miles per gallon -- a 15 percent increase in only one year. It wasn't because of the government requirements. It was because consumers were induced by the market to go out and buy more efficient vehicles.

Last year, for the first time, gasoline prices, adjusted for inflation, exceeded what Americans paid in 1981. And, as noted, the consumer is responding -- $4 a gallon focuses the mind wonderfully. Last month marked the first month since December 1992 that a car, not a truck, was the country's top selling vehicle. The cars we're buying today are more fuel efficiency. There is now a shortage of batteries for today's hybrid cars and indeed the wait lists for the fuel efficient vehicles is increasing while the difficulty in giving away the fuel inefficient vehicles is making real problems for the industry.

We are beginning to look at mass transit and indeed Americans are taking more mass transit and driving less. In fact, Americans drove 11 billion fewer miles in March compared to a year earlier. We all recognize that there is real distress in my home state of Michigan -- plants closing, workers laid off and production is being curtailed with all kinds of consequences to our economy and to our society. Many

people blame the automobile manufacturers for these woes and I won't deny that they've made their share of mistakes. But those who are most critical of the auto industry often forget one thing.

For many years, in order to stay in business, our automobile manufacturers have given the American public exactly what they wanted. As was said in a recent column by Walt Kelly, the legendary author of the Pogo comic strip, we have met the enemy, and he is us. No one ever has forced the American consumer to buy an SUV. What pulled the American consumer towards larger, less efficient vehicles can be summed up in two words -- cheap gas. And the consequences were that the natural instincts of Americans to drive in more prestigious, larger, more comfortable vehicles took over. There is going to be an adjustment.

What has happened is behind us. But what is now before us is to confront reality and it has significantly impacted the effort of American automobile makers and automobile workers and manufacturers around the world to improve fuel

economy. A critical part of the race is going to be development of electric vehicles and plug-in hybrids. Like many of you, I was pleased with last week's announcement that the Chevy Volt is on track for a 2010 launch. Good news.

But there are lots of things that we need to do and we must do to promote the development and deployment of this and other new technologies -- not the least of which is to note that the solution of our energy problems lies not in one technology, but in a broad mix of many. We also have to recognize our need to encourage this new technology. Last year, Majority Leader Hoyer and I wrote a bill and a law to encourage this new technology. But we do have limits. Congress can pass any law it wants, but we can't repeal two very important laws -- the law of supply and demand and the laws of physics -- to which we are committed to obey whether we like it or not.

If the Chevy Volt proves -- and I hope it does -- to be commercially viable and technologically feasible, meaning that its cost is not astronomical

and its batteries are workable, it won't be because elected officials or bureaucrats have done something special. It will be because of our talented engineers and scientists and that they have made something which appeals to the American consuming public. But here again we must learn from our past. The idea of plug-in hybrids is not new.

As *Atlantic Monthly* reports in its current issue, a bright young engineer at General Motors came up with idea in the 1990s. But at the same time the company, like all of the auto makers -- and I hope you're listening to this -- was struggling on how to meet a mandate Congress placed upon that company and the industry in the 1990 Clean Air Act Amendments. The Amendment, or rather the language of the legislation, called for zero emission vehicles and a plug-in hybrid using small engines to generate electricity was not a zero emission vehicle, although it was probably better in terms of meeting the needs, desires and demands of the American consuming public -- you can feel free to interrupt with applause any

time you're (inaudible).

The company needed to devote its resources to a zero emission vehicle, which I might note it ultimately developed, but which I think we could all agree did not meet our needs as nicely or as well as does this kind of vehicle that we now discuss. With the zero emission mandate, Congress effectively legislated that the perfect should be the enemy of good. And that's a mistake I don't want to replicate again. If the Chevy Volt does prove viable -- and I hope and I think that it does and will -- motor vehicles will become the first sector to solve its carbon problem.

In fact today, though admittedly flawed, the café system is going to be something which is going to continue to regulate the industry and it will be the only industry that operates under a carbon constraint. As for the other sectors of our economy that emit greenhouse gases, let me say this -- we're going to get you next. In that vein, Energy and Commerce Committee is working to prepare legislation to

establish an economy-wide program to limit greenhouse gas emissions in the United States.

The cornerstone of that program will probably be a cap and trade system. As we cap and trade and as we craft this legislation, we're going to give careful consideration as to how the electric utility industry is going to be effected. And I want to say parenthetically, I'm telling my friends in industry -- all industries -- we're going to write a bill -- when we get to it and when we get an understanding of all the questions that we confront if we write this -- that will, first of all, be a bill that industry will hate. But I'm telling industry, industry we're going to try and see to it that if we do this, it's a bill with which you can live because the importance of this is the difference between a viable economy and a descent standard of living and a way of life for our people and something far worse.

The industry -- industry faces the daunting challenge of maintaining reliability and affordability while at the same time offering a commodity that moves

with the speed of light -- I'm talking about the electrical utility industry -- and which is impossible to store in any meaningful way, at least until there is a widespread development of hybrid electric vehicles. We are told that electric cars could, along with smart grid technology, allow electric utilities to use car batteries to store electricity in ways that help them meet critical peak loads and avoid the current astronomical costs of critical peak power. Even more exciting, we could fill up the batteries in these cars at a cost equivalent of 75 cents per gallon of gasoline. There would also be a net reduction in carbon dioxide emission if cars shift to a power system bottomed on the use of electricity.

So clearly the electric utility industry has reason to be as excited about the emergence of hydrogen, rather of hybrid electric vehicles as the transportation industry. As we move forward on the legislative process, I hope the electric utility industry will be engaged as the transportation industry has been to this point. Developing climate

change legislation that is comprehensive, reasonable and effective is no small challenge.

You will note that the Senate had an opportunity to learn this hard lesson this week. Already the Committee on Energy and Commerce has had 20 hearings on the issue during this Congressional session. We have also scheduled two more hearings on legislation now pending. We have heard from policy experts, environmental advocates and industry leaders. As part of the legislative process, we are also issuing a series of white papers that identify issues on which further information and discussion is desirable. And I would tell you that I would appreciate anyone here who would have a look at these papers. We've been criticized on them because it was said, Dingell, you have not come forward with these papers with a solution and we have said we are not presenting a solution. We are seeking discussion to lead us to a consensus and to a way of working together towards the resolution of perhaps the largest single environmental problem that we confront in this

nation today.

This month, as mentioned, we're going to hold hearings on bills pending. We will include in that the Lieberman-Warner Bill as well as others. These hearings will be conducted in a way to examine the strengths, weaknesses and practicality of pending proposals and to enable us to prepare our efforts to move forward with a concrete legislative conclusion. I want to end by saying how pleased I am that you're holding this conference. I want to tell you how flattered I am that you would have me here to speak to you tonight. I want you to know that electrical vehicles and plug-in hybrids have the potential to revolutionize not only the American automobile industry, but our entire energy mix.

At the same time, however, we're going to have to consider not only the advantages of electric cars and plug-in hybrids, but we're also going to have to keep in mind the source of electricity for these vehicles. And I would urge you to ask yourself are we going to better our self significantly by moving from

gasoline to coal-fired plants, or are we going to have to use new things such as again returning to the development of nuclear power to provide us with the resources we need to make this part of our energy and transportation system in fact work.

If every new vehicle sold in the next decade is electric, we will confront a situation where we're going to have to ask have we simply pushed the source of carbon emissions upstream. How will we meet then this new demand for electricity? Will we burn more coal? Will carbon capture and sequestration be ready? And will we, as I have mentioned, find it useful or necessary to return to nuclear power? All of these ideas will require honest and open and frank discussion. And they require us to have an honest willingness to come to a consensus because they're going to affect the quality of life, the future, the hopes, the dreams and expectation of every American. But I can say this with more than a little certainty -- none of these things will be a reality and there will be no legislation enacted which will really

address our national problems until we have a new administration that brings real vision and real vigor and real leadership and fresh thinking to our energy policy debate.

Like many of you, I am excited about that and I hope that this new administration which lies before us will portend a real and a vigorous approach and real and vigorous leadership to our desire to address a major problem and I'm sure that everyone in this room, including this speaker to you, are anxious not only to see that event occur, but very frankly also to be a participant in the undertaking. Thank you very much.

(Recess)

REMARKS AND CONVERSATION

MR. SANDALOW: Well, hello everyone. I hope you are enjoying your meals. I hope you are enjoying your meals, and we have a very special dessert to offer you tonight. Thank you everybody, I hope you are enjoying your meals.

And I am delighted to welcome to the stage, yet another extraordinary leader of American business. Fred Smith was a Marine in Vietnam and came home and went to Yale, and he had an idea. And he turned that idea into a little company called Federal Express.

In doing that, Fred Smith didn't just create a business. He created an industry. Before Fred Smith, there was no such thing as reliable overnight delivery service, but Fred Smith made that happen. And he has built FedEx into an extraordinary company, into an extraordinary brand, but he has done much more.

Not only has he built this amazing company, but he has taken on leadership on the issue of oil dependence and in a quite remarkable way. He is Co-chair along with General P.X. Kelley of Securing America's Energy Future, and the Energy Security Leadership Council. Whose work was absolutely instrumental to the congressional success on energy efficiency and fuel savings over the course of the past year. And it's because of really Fred Smith's

tireless work that some of those really important legislative victories happened.

So we're thrilled to have him here tonight. Here's a –- Fred is going to talk for a few minutes, then we're going to have a dialoge for a few minutes on stage and then he is delighted to take questions from the crowd, eager to do that. We have a microphone over here, and so if you want to ask a question, as we're kind of winding up our dialogue, please go stand at the mic and delighted to have a conversation with the room. So, ladies and gentlemen; Fred Smith.

(Applause)

MR. SMITH: Well, thank you very much David. I appreciate those kind remarks.

One clarification, I went to Yale first, then I went in the Marine Corp., and kindly David did not bring up the subject of the poor grade in his view I got, for the term paper I wrote about FedEx when I was at Yale, in the mid 1960's.

So, I do always in front of an audience like this, erudite and familiar with urban legends like

that, provide a clarification about that term paper because I'm quite sensitive about it. And I want everyone to know that I was very happy to get a C grade. That was a very good grade for me indeed. So, I appreciate your not bringing it up.

All kidding aside let me congratulate and commend everyone in this audience for the important work you're doing in this important complication here.

Google, one of my favorite companies, I applaud the leadership they're demonstrating, in this particular sector.

Now let me do two or three things very quickly, and then listen to my drill instructor over here, and sit down and shut up and take some questions.

Let me tell you a little about FedEx, and why we're interested in energy. FedEx has become, from its start up some 35 plus years ago, a very large transportation and business services entity. Revenues almost $40 billion. We operate 700 aircraft, almost 80,000 vehicles, we serve 200 and I think at last

count 222 countries and territories around the world. It's the largest transportation system, ever put on the planet.

We burn a lot of fuel. Not nearly as much as the passenger airlines. Because our business is not one that depends on frequency. You don't care how many times a day we go from New York to Washington, or to L.A. So, our airplanes tend to get bigger and fatter and fortunately for us, over time, much more fuel-efficient. And we also, as I mentioned a moment ago, operate about 80,000 vehicles. And between that fleet of 700 airplanes, and 80,000 vehicles, we burn about one and a quarter billion gallons of aviation fuel. And hundreds and thousands of gallons of diesel fuel.

So, I'm interested in energy and conservation for a number of reasons. One, I'm interested in it, because I'm a citizen of the planet, and I think it's the appropriate thing to do.

But I can assure you there is a lot of self-interest involved here. And we've tried to be as steely eyed and objective and as quantitative as we

could be on this matter. And in that vein when Robbie Diamond of SAFE; the umbrella organization that spawned The Security Leadership Counsel came and asked if I would participate, in Co-chair it along with General Kelley I was happy to do so.

One, because of the outstanding scholarship and analysis that SAFE had done on this particular issue. And demonstrated through it's now famous oil shockwave simulations. The profound economic and security risk, as Chairman Dingell mentioned a moment ago, that would face us in the future if we didn't have to address this. And this is even before we get into the environmental considerations. It seemed to me to be an important endeavor. And so, I signed on.

For those of you who don't know the ESLC is a group of CEO's of transportation generally companies, or energy intensive companies. Like FedEx; UPS; Southwest Airlines; Royal Caribbean Cruise Lines, and so forth. And about 10 four star Admirals and Generals that had the responsibility again as Chairman

Dingell mentioned, of protecting this vast oil network, that supplies our daily needs.

And we developed a recommendation to the Congress that had as its bedrock foundation, three interrelated recommendations.

The first of which, as was mentioned that the United States, would reinstitute for the first time in many years, new fuel efficiency standards, but in a different manner. Basing them, not on averages, but on attributes: category attributes.

Second, that the country would promote and otherwise incent people to produce alternative bio-fuels to the extent that it was technologically and economically feasible to do so.

And third, which may not be popular in this particular audience, to increase domestic petroleum production in Alaska and the Outer Continental Shelf to displace imported oil as we move away from a petroleum based society, in order to lower the balance of payments, the deficit that we're currently seeing,

to minimize the potential for more conflict like we've seen so graphically in the Middle East.

Now, as you know, the legislation passed last December. The grand compromise that we recommended did not take place. But better to have I suppose two loaves, then no loaves at all, even if you can't get three. And we did get the new Fuel Efficiency Standards. Which is you might have gotten a little flavor there weren't popular in every corner of the country. Certainly some of our automotive customers let me know that very directly. But it seemed to us that this was such an urgent problem, that the consequences of that had to be put aside for the greater good. And I do think that the institution of these Fuel Efficiency Standards; whether directly or indirectly, will have profound effects on our becoming more energy efficient, as a society.

I don't think it's by accident, that within 90 days of the passage of that legislation a plethora of announcements were made about new electric, and plug-in electric hybrid vehicles. Somebody had a lot

of work going on, and a lot of places that wasn't exactly getting a lot of press releases.

So, I believe that has appropriately incented automotive manufactures everyplace to bring these very important vehicles on the road.

And let me just say a couple of things about our Energy Efficiency Initiatives, and then I'll sit down and do what David told me to do.

We have for a long time been trying to improve our energy footprint at FedEx. We've made multi-billion dollar investments in new more fuel-efficient airplanes. Our new 777s will come in will be 25 to 30 percent more fuel-efficient then the MD-11s.

And in fact aviation has an extraordinary record of improving its fuel-efficiency over the last 30 years. If the rest of society had, had the same relative improvement, we wouldn't be sitting here -- quite frankly -- and having this conference.

And the other thing we did along with the Environmental Defense Fund and Eaton Corporation is we put together the first commercial hybrid vehicles. And

these vehicles have about 90 percent less emissions than the conventional diesel powered trucks that they replaced. They have about 50 percent more fuel-efficiency.

The problem was because the only people that were buying them were FedEx, is the capital cost of the vehicle was about $90,000 as opposed to the capital cost of a regular diesel of the same size at about $55,000 a 700 cubic foot pick up and delivery vehicle.

But now with diesel fuel not far off $4.50, guess what the ROI that you can achieve by going to a hybrid pick up and delivery vehicles, and hopefully soon; plug in all electric or hybrid electric vehicles offers stupendous returns on investment, and all of the environmental benefits and profit and loss benefits you get, not for free but on a cost effective basis.

So we are completely committed at FedEx with the tens of thousands of vehicles that we buy to

moving to a new paradigm, which is directly on point with the focus of this conference.

And we look forward to working with many of you and the ESLC, I can promise you will promote to the maximum extent that any credibility we might have, with any constituency to the maximum of our ability.

The movement towards this type of technology that moves short-haul transportation, into the electrified realm. And I hope we'll see in a few years, a much less serious economic and national security challenge because of the good work that's being done by this group. Look forward now to taking any questions you might have.

(Applause)

MR. SANDALOW: Thank you very much. Thank you, thanks a lot folks for those remarks, and for all the leadership. I want to start by asking about transformation. Because there are a lot of people in this audience that would like to change the world.

And we heard this afternoon -- I think -- a lot of good reasons to change the world along the

lines of electrifying transportation. But we also heard a lot about the challenges of doing that, and we're talking about changing cars in ways that haven't been done ever, with changing powertrains. We're talking –- the speaker said that we have adequate electric generating capacity, but it may take significant changes in the way utilities do business with time of day metering, but –- and other types of changes.

You have changed the world. And when you look out at the challenge that's involved with electric vehicles, and the types of changes, that are needed to be done -- the kind of big picture transformation here. Do you have any thoughts for an audience like this about how to address a challenge like that?

MR. SMITH: Well, I think in my career day that I've watched many, many innovations and concepts, which most everybody agrees are good to struggle, and many times there are casualties along the way. And all of a sudden, something happens, and to borrow the

quote of the famous book from about the Silicone Valley or the IT thing. “The product crosses the chasm” and all the sudden it goes up on that fantastic S-curve and what seemed to be strange, different, it becomes acceptable.

And I really think that that’s where the electrification of short haul at least transportation is. If you remember, I’ve been through this four times. FedEx was almost killed in its cradle, because of the first oil embargo. Then through ‘79 and ’80, then through the ’90-’91 a period, and now this in 2000 really four through 2008.

And there’s a very big difference today. And that is that the technology that’s available, both in the automotive and on the battery side of the house, is robust. You’re no longer talking about experimental things, and battery technology that is really not viable.

It’s as best I can tell at this point and time, an issue of scale. And we were talking at the table here. We would have no compunction what so ever

to buy thousands of all electric plug-in pickup and delivery vehicles. They originate and terminate at the same location. The management of the battery issues and all is really quite simple to us.
So, I think that you see a lot of people in that point of view.

And the second thing: on the production side. There is a huge amount of industrial, intellectual capital going towards this business problem now. Some in this audience. Lots of places around the world. So I do think that it's a lot different than it was in '79 and '90 because you're talking about real technology that can be brought to market at scale, and have a incredible effect on planet change, but reducing CO2 emissions, and by improving our dependence on imported petroleum.

Now you get to the upstream issue and that's a different area, but I do think there's hope on the horizon there too.

MR. SANDALOW: So you mentioned up at the podium, something about doing what David tells you to

do. And I like the sound of that. So, with that in mind –-

MR. SMITH: Only for tonight, David.

MR. SANDALOW: Well, okay. With that in mind, let’s talk about FedEx procurement practices.

MR. SMITH: Okay.

MR. SANDALOW: I mean you started to get into it just a moment ago. But, you’re obviously –- you’re keen to work on this, and let’s say you decided you wanted to buy 5000 and 10,000 plug-in hybrid trucks. To do that type of short haul distribution you’re talking about.

MR. SMITH: Or all plug-in electrics, it doesn’t have to necessarily hybrid.

MR. SANDALOW: Thank you. Thank you. I stand corrected. So what does that look like from your standpoint? What would be the constraints in getting it done? And how could people in this audience help you overcome those constraints?

MR. SMITH: Make us an offer. We would –- if we had a credible manufacturer, that could produce at

scale. Plug-in all electrics or hybrid electrics. We would buy them. I mentioned the joint venture we have. The partnership we have with the Environmental Defense Fund, and Eaton, and FedEx. And we now have 300 of them out there. We've gone over two million miles, and that's a regular hybrid.

But again, it seems to me that the plug-in is where you need to go. The recharge cycles are getting better and better. The batteries are getting better and better. As most of you know who are the automotive side, if you go to all electric the different –- the freedom in design parameters are fantastic. It particularly lends itself to commercial vehicles. So, what we need is some manufacturer that wants to get into this space, and we would go out and make a substantial commitment if we could get those kinds of vehicles.

Now, we run a business that depends on reliability. I mean from the get go. FedEx was all about absolutely positively. So, the one thing we're not going to do is to put our customers interests at

risk. And we're not going to do something that makes us uncompetitive by paying two and three times for a unit of capacity, that a competitor can produce that's not as sensitive, if you will or is interested in this area.

But, that's why I made the point about "crossing the chasm". I don't think you have to make those compromises anymore. I believe that with the lithium ion battery technology and other things that are out there. And what's been learned about this in the last few years, it is now possible to build these types of vehicles on a commercial scale level.

(Applause)

MR. SANDALOW: I've got one more question for you, then if anybody wants to go to the microphone. We'd love to take questions from the crowd. So how about policies? We're here in Washington. We're here at this conference to talk about the types of policies that Washington should implement to help start this revolution. Yesterday on the floor at the Senate, we

saw really pretty stark partisan divisions on this whole energy area.

Specifically with regard to plug-in electric vehicles: Are there bi-partisan approaches that you think could win the day? Are there any approaches that you think we should be taking forth to Capital Hill this year and beyond in order to make this revolution come quicker?

MR. SMITH: Well, we were talking at dinner down here. This might surprise you. I'm not an expert on Cap and Trade, and I gave you the scope –- scale of our consumption of petroleum based products. But if I were a policy czar, or whatever wizard that had the capability to come and put a policy in place. My belief is that the best policy would be a carbon tax. Because it's simple, it's efficient, it doesn't get into the gaming that would necessarily go on, and I understand in general and I checked it before I came up here with a very smart lady.

I understand the rationale for Cap and Trade, but I've been around Washington long enough to

know, when you have something that is many moving parts, you have a real opportunity to have a lot of unintended consequences.

(Applause)

MR. SMITH: So, a carbon tax to me; gradually phased in. So everybody knew what the name of the game was. This year it's X, next year it's X-plus, one thing another. Then this is most important. Those monies that are collected by the carbon tax don't go into anybody's agency. What they do is go straight back to reduce carbon consumption, through incentives or production subsidies or whatever the case may be.

Or, if you didn't want to do that, just give it back to people in reduces FICA taxes. So you tax the bad, the things that are creating the national security risk, the economic risk that safe and or a shockwave. Shows so shockingly we're on the horizon and now my goodness we're way beyond what even our worse fears are.

And I think there's a lot of empirical evidence. I believe it was Denmark or one of the --

you know, when you have the money straight from the carbon side to reducing the carbon, it works pretty well. It's when you get in to all of the political log rolling that I'm afraid of Cap and Trade.

(Applause)

MR. SANDALOW: I have just one follow up and then I want to go to Professor Frank. Many, many members of Congress have signed no tax increase pledges. Which limit their flexibility to do what you just suggested. I mean is it safe –- would you like to tell them in your view at least, the type of rules you just made should be viewed as an exemption or shouldn't be prohibited by their no tax pledge?

MR. SMITH: Well, the biggest mantra on the Democratic side of the house is income and equality. And as someone who employs almost 300,000 people I can tell that employment taxes are a disincentive to employing people. And in fact corporate taxes are a disincentive to employing people. All of the studies show that if corporate taxes go down, and the United States is not competitive in this area.

70 percent of the income goes to the wage earners in that corporation. Now you can get all up in arms because there are some fat cats that you know benefit too, but the majority of it goes to the wage force.

Now with that understanding, there's a relatively simple solution to your problem. That's why I put point B there. Just take the tax increase on carbon, which is bad and take it directly into people's pocketbooks into reducing FICA. Take it from the IRS and put into Social Security.

So you achieve what you're trying to do, which is less carbon intensive society, and you reward work by making you know the taxes on employment less. It's very straightforward.

(Applause)

MR. SANDALOW: Please.

PROFESSOR FRANK: My turn?

MR. SANDALOW: Your turn, thank you.

PROFESSOR FRANK: Thanks. By the way, FedEx now has hybrids from Eaton and I know it's a good program, and of course it's saving fuel. But the main question is; are you going to let a RFP out for a plug-in hybrid? If you do, I'd like to know about it.

MR. SMITH: Well, let me ask you this much –- you know it takes two to tango here. Do most of the people here that know what their talking about, believe that industry could produce plug-in hybrid pick up and delivery vehicles now at scale at a production competitive price? I mean do we? Well, I'm not being rhetorical, I'm asking. I'm asking the question. Do you think so? Then we might do that.

PROFESSOR FRANK: Let's put it this way. I've been building plug-in hybrids for almost 15 years. And I've built pick up trucks and I've got a medium duty FedEx truck, essentially, for another customer on the works right now.

And we're only a university. And it could be done. It could have been done five years ago ten years

ago. What Eaton has done is a good start, but it's got to go to the next step and that is –- .

MR. SMITH: Well we might just do that, I mean if we can ascertain that people can actually meet that requirement, that might be an excellent suggestion Professor. For us just to come out with an RFP.

PROFESSOR FRANK: That's what I'd like to see.

MR. SMITH: Yes, okay. We'll do that I promise.

PROFESSOR FRANK: If you do that, we'll bid on it.

MR. SANDLOW: If you can identify yourself. If all the questioners would identify themselves. And thank you very much professor.

MR. SMITH: Yes, thank you.

MR. HEITMANN: Yes, my name is Paul Heitmann with Comverge. We're a demand response provider. First I want to thank you for all the innovation that you've brought, particularly as an eBay user the package

tracking is my favorite. Being able to find where your package is, is a simple but phenomenal thing.

Now my question is along the lines of you described your value chain of your transportation segment, but you also have building facilities, and package processing etcetera.

What's your view on the integration of the electric grid and service to those buildings? And any solar panels etcetera; that the roofs might support? And their integrating with their transportation assets? And also, how do you view that as giving you some business flexibility and variability when times are slow and you're not using the cars as much, you might be able to plug them in and use them for revenue generation along with the building?

MR. SMITH: Well, regarding the fist. We have two massive solar installations in California. We put solar panels on our big hub in Oakland, California. And I believe I'm correct that almost all of the power, I'm sure there's some surge or so forth that's

not covered by the solar production. But it's produced by solar power.

We did the same thing down near Los Angeles; I can't remember where it was. I think it was Fullerton, but I may be off base. Which we just opened up about three weeks ago. We're looking at a similar situation at Woodbridge, New Jersey. We have a concept with Bloom Energy, some of you know then, to put their equipment in one of our hubs.

So I think that our position on that is if we can get close on the economics. Solar and locally powered is where we want to go. Through the excellent work that Robbie Diamond and his folks did, and some other papers I've read. I believe that for a pretty good while, we could produce in the off peak hours a lot of electricity that is otherwise is simply going to waste.

I think if we had a national initiative to modernize the electrical grid and make it more efficient. We could produce even more power. Now obviously, using the unit of capacity as a storage

unit for back and selling back, I think that's great too I'm just not a knowledgeable enough to comment on that.

As far as upstream, I personally believe and again somewhat maybe you all like the off shore production, may not be popular with everyone, but I don't think you can keep nuclear power out of the equation. It's the only completely carbon free power generation system we have.

Tonight after I leave here, I'm going to get on a plane and go to Paris, where we have our largest European hub. 80 percent of the power in France is produced by nuclear. I think there is very exciting nuclear technology on the horizon, developed by our government at Sandia in Los Alamos which will allow you to substantially mitigate the perforation risk and so forth. Make small and pocket sized nuclear devices.

So I think if there's a commitment to the electrification of a lot of transportation. The up screen thing can be solved either with clean coal, or with nuclear. I don't think you can do it without both

of those obviously. Without having carbon affects that nobody wants.

MR. HEITMANN: Thank you very much.

MR. SANDALOW: We're running short on time, so three quick questions please.

MR. JUNG: My name is Mike Jung, I work with Silver Spring Networks. FedEx is probably one of the smartest companies out there. Like the previous questioner said, you know where your package started, where it is right now, when it's going to get delivered. You also talked about a smart grid that would provide that equal level of information, for the electricity that gets delivered to your company and others. What would you say is one of the biggest most geographically diverse companies? How important is it to FedEx that the smart grid become interoperable and universal, so that you have essentially one standard that you can plug into as opposed to having a different standard in every place you serve?

MR. SMITH: Well you're getting way beyond my technical knowledge. I appreciate the comments about

FedEx, but as I understand it, it is technically achievable it's simply a matter of national will, and policy. So you asked as to what one of the policies where it would seem to me that, that's something that the federal government could actually do, if it just had the kind of support that Chairman Dingell and our own United States Senator Lamar Alexander, who's a wonderful man by the way. If we could put behind us.

So I see no reason that, that could not be done. And it's not like we don't have the power right ways. You know it's an easier problem then citing a nuclear –- a new nuclear plant or some of the other issues we're talking about. It's just a matter of national will.

MR. JUNG: Thank you.

MR. BERKOVICH: Hi there, David Berkovich from Google. Thank you so much for coming. It struck me when you were making your introductory remarks that I also wrote a term paper on FedEx at Yale.

MR. SMITH: I hope you got a better grade then I did.

MR. BERKOVICH: Well, I did. So, I don't know what that says about Yale's grading system, because your paper is probably better than mine.

MR. SMITH: But you're obviously a lot younger than I am, and I can promise you the admission standards were quite different when I went there.

MR. BERKOVICH: Anyway my question is –- first of all thank you so much for your leadership and great talk tonight. You know I think one of the things that a lot of us in this room are pondering, is how do we bring the business community along. Whether it's a carbon tax or Cap and Trade, or you know the system that we need to reduce carbon emissions.

You're taking a very long view that something that might be painful in the short term but is going to be fruitful in the long term. And how do we get other businesses to think about this that way?

MR. SMITH: Well first of all remember the examples that I gave you. We had a little bit of pain, because we did some R & D on hybrid vehicles. Quite frankly, we're like every other for-profit company,

there’s a limit to what you can spend without a return.

So that’s why I said it’s a matter of production of scale, or the price of fuel making it an ROI project. The airplane decisions were real easy, because you could see the bottom line effect. And the solar installations that I mentioned to you, well they were right on the borderline. So we push it as hard as we can. But not to the point where we would put at risk our fiduciary duties to the shareowners or to the team members.

But that’s why I made that point about “crossing the chasm” here. I think there is getting to be near unanimity about this problem. Let’s face it. Both the Republican nominee and the Democratic nominee have both said that global warming is a big problem. That’s -– that hasn’t been the case in this country. I think you are seeing people who really know what they’re talking about; many people in this room. They’re saying that battery technology and plug-in all

electrics and hybrid electrics are real technologies that can be deployed.

One of the big heads of the automotive manufactures recently spent about two hours at our headquarters. And he told me that no question, the recharge cycle on some of the vehicles they're going to be putting out here in just a few years are less than an hour. So when you have that kind of utility and product improvement. It's just amazing to see this entrepreneurship. I'm very convinced that we're on the edge where you're going to see the marketplace take over here.

MR. SANDALOW: All right, we have time for just one more question, my apologies on that. We have a hard stop.

MR. LATTO: My name is Joseph Latto, I'm just a local.

MR. SMITH: I was hoping you weren't going down. You have the best tie by far.

MR. LATTO: Well thank you. Thank you very much. The question I wanted to ask you is. Are you

familiar with Plug-In Partners, and are you a member of Plug-In Partners?

MR. SMITH: I'm not familiar with it.

MR. LATTO: Okay, Plug-In Partners is a coalition of industry of companies that are interested in purchasing plug-in vehicles. And basically it's a soft commitment to purchasing plug-in vehicles for industry. You go to their website and you sign in.

The reason I wanted to mention them is you talked about scale, there are about 30,000 members now I think that belong to Plug-In Partners that are industry. And I think that it would be nice to switch from the soft commitment that they have with Plug-In Partners to actually starting to get down to the nitty gritty and actually brining a large number of them together and say okay what can we actually provide for you, and let's get it all together and place one large order, to basically bring the cost down, and bring the ROI.

MR. SMITH: Well that's a very good idea, and just like the first one. The suggestion put an RFP out

there. If you'll email me I'll give you my card before I leave. And tell me how to put –- and we'll take a look at that too.

MR. SANDALOW: Thank you sir.

MR. SMITH: No again, I just congratulate you for the conference and thank you very much.

OPENING SESSION

MR. SANDALOW: Good morning, everyone. Good morning.

SPEAKERS: Good morning.

MR. SANDALOW: What a day yesterday. We had huge crowds, a great dialogue, fun videos, and exciting new cars. I just want to start this morning by thanking some of the people behind the scenes who made it all happen, starting in particular with Michael Terrell of Google. There is nobody smarter, more level-headed, or harder-working than Michael, and without his hard work, this conference would not have happened.

Also, Jim Merlino, who's done an extraordinary job running the logistics of this

conference and an amazing team of dozens of people at Google.org and Brookings. So, let's give him a big hand, please.

(Applause)

MR. SANDALOW: I then need to share some sad and disappointing news, which is we were told late last night that the Senator Kerry has had a death in his family, a cousin, and he's had to return to Boston for that, and, so, he will not be able to be with us this morning.

We're delighted that Congressman Jay Inslee, who's been a visionary leader on this issue, has written a great book, is going to be here, and is going to talk in his place at 9:00 this morning.

And it is now my great pleasure to introduce somebody well-known to all of you, Senator Orrin Grant Hatch. First elected to the U.S. Senate in 1976, Orrin Hatch is now in his fifth term as Utah senator, he is a leading advocate on energy policy, and, in particular, on the topic of plug-in electric vehicles. He's the author of the CLEAR Act of 2005 law that this

crowd knows provides incentives for hybrid-electrics and alternative fuel vehicles. He is a widely respected member of the Senate, admired by his colleagues.

Ladies and gentlemen, it's my great delight to introduce Senator Orrin Hatch.

(Applause)

MR. HATCH: This is a great honor for me to be here with you today. You folks are at the cutting edge of some of the most important technology in our country's history. I do believe that we've got to get that Tesla so that I can afford it.

(Laughter)

MR. HATCH: It's a beautiful, beautiful vehicle, as are the others, as well.

I want to thank Brookings Institution and Google for sponsoring this very important conference today and for inviting me to participate in it. And for those of you who are out of town, welcome to Washington. It's really nice and warm here so you don't have to worry about the cold anymore.

When the conference sponsors began organizing this event, they probably didn't count on it occurring with the backdrop of $4 gas prices. Actually, more than $4. I think I paid $4.24 or something like that last time I filled up a couple of days ago. But these gas prices certainly contribute a level of urgency to our subject matter today. I think we all know that 97 percent dependence on fossil fuels for transportation is not sustainable. The lack of diversity in our nation's transportation fuels has been troubling me for a number of years now.

My first legislative effort to address it was back in 1999, almost a decade ago, when I introduced the Alternative Fuels Promotion Act along with Senator John Rockefeller. The bill offered tax incentives for dedicated alternative fuel vehicles, alternative fuel sold at retail, and alternative fuel infrastructure.

At the time, the alternative transportation fuels most available were natural gas, E-85, and that appears to still be the case today. At the time, the

only hybrid-electric vehicle commercially available was the Honda Insight, and because my initial focus was on fuel diversity, I only provided credits for hybrid-electric vehicles if they ran on alternative fuels.

By the next Congress, environmental advocates convinced me of the benefits of hybrid-electric vehicles. They argued that hybrids would reduce emissions and reduce our dependency on foreign oil, and they also promoted some of the technologies that would make hybrid fuel cell vehicles more viable. I began to see hybrids as intrinsically good for their immediate benefits, but also for the bridging of technologies that they would bring to our transportation sector.

So, I added hybrid-electric vehicles to the legislation and introduced it, as has been said, as the CLEAR Act. Now, it took us five years to get the CLEAR Act through. It shows how ridiculous Congress can be. But, of course, you know that.

(Laughter)

MR. HATCH: And CLEAR stands for Clean Efficient Automobiles Resulting from Advanced Car Technologies. Now, I certainly didn't do it alone; Senators Rockefeller, Jeffords, and Kerry were among very early and strong co-sponsors.

My cosponsors and I worked hard at promoting it. We were able to get it into the Bush Administration's National Energy Policy Report in 2001, and we were able to get it included in the Omnibus Energy Bill considered in Congress that year.

The omnibus didn't pass, but we got it in the energy bill the next Congress, and then the next Congress after that, until finally the CLEAR Act credits for vehicles and infrastructure passed as part of the Energy Policy Act of 2005, and the fuel credit passed in that year's transportation bill. I was allowed in both conferences.

From the beginning, I attempted to align the CLEAR ACT with certain key principles. First, I chose market incentives over mandates. I believe that the success or failure of alternative fuels and

technologies is best decided by the free market, and, so, I focused these incentives on the market, which I consider the most powerful engine in this country.

In most cases, incentives cannot reverse market trends, but they can help to fuel a market that already exists, and it seemed that genuine interests existed among the people for better answers in our transportation system in America.

Second, I made sure the taxpayer was getting a bang for his or her buck. The incentives apply only to vehicles and fuels that are actually purchased by consumers and to infrastructure that is actually installed or actually being installed. I also made sure the incentives provided were scaled to the level of benefit that was being provided by the system to society.

For instance, hybrid vehicles using the most and best technologies receive proportionally larger incentives under the CLEAR Act.

Finally, I wanted to solve the chicken and egg problem with regard to attacking the market

obstacles to alternative vehicles and fuels. For that reason, I made sure to cover the three legs of the stool: vehicles, fuels, and infrastructure all at once.

Now, I believe the CLEAR Act has been a big success, and I think most everybody else does, too, that know anything about it. Already, the move toward hybrid-electric vehicles has helped to reduce the demand for liquid fuel in this country. Today, there are dozens of models of hybrids from which consumers can choose. And we're already seeing mass production of hybrids, which was a central goal of the Act.

But one of the most exciting aspects of the success of hybrid-electric vehicles is the groundwork that they lay for the logical next step: plug-in hybrid vehicles.

Now, it seems to me that the progression from hybrids to plug-in hybrids is not a giant step. However, in terms of energy policy and the potential to shift transportation away from liquid fuels to the electric grid, plug-in hybrids may prove to be nothing

short of revolutionary.

The idea was first brought to my attention by Raser Tech out of Provo, Utah. Not so little right now, but Raser Tech developed a new, very powerful AC induction motor that could be used in electric and hybrid vehicles. I had been working on the CLEAR Act for a number of years, when Raser visited me here in Washington to tell me that I ought to be supporting incentives for hybrid-electric vehicles. They were so new that I hadn't even heard of them at that time, and they didn't even know that I was the sponsor of the CLEAR Act.

(Laughter)

MR. HATCH: Neither have any of the environmentalists known that.

(Laughter)

MR. HATCH: Why didn't they come up with these ideas?

It was during that first meeting in 2004 that they shared their vision of a plug-in electric vehicle that could average 100 miles to the gallon or

better. I was smitten by the possibility of shifting our transportation fuels away from liquid fuels and toward the electric grid.

During an early press conference on the introduction of the CLEAR Act, I displayed a poster of a large oil vessel in the ocean heading into a gigantic storm. I argued that our nation was heading toward a global oil crunch, and finding alternatives was imperative for our nation's economic health and national security.

Most folks didn't realize what I prophet I was, although, I think you folks probably did.

SPEAKER: (Off mike)

MR. HATCH: Okay, I heard that.

(Laughter)

MR. HATCH: We are in the middle of that storm right now, and I don't see it breaking any time soon. We may not be facing actual shortages in the world right now, but we do have a very low level of spare capacity, and that's done a lot to raise speculation on the future's market. When spare

capacity is so low, any major disruption in supply could actually lead to shortages. Investors need to know that we're finding a new barrel of oil for every barrel we sell, but that's not what they're seeing; at the same time they're seeing that ethanol has major limits as a replacement fuel.

Ethanol makes up only between 1.5 and 3 percent of our transportation fuels, and we're learning that there are real costs to increasing that percentage. I don't support mandates for ethanol, though, as you all know, I've led the fight to provide incentives for it through the CLEAR Act. But I'm also a realist about the fact that ethanol cannot put a major dent in our need for fossil fuels at this time.

Corn needs a lot of water. In fact, it needs about 780 barrels of water for a barrel of ethanol, and more than 1,000 barrels of water for the equivalent of a barrel of oil. Then it needs another three barrels to turn the corn into liquid fuel.

Now, that's a huge amount of water, but it works out all right so far because corn is grown in

already wet areas or rainy areas. But if we were to increase the amount of ethanol available, we're going to have to move into drier areas and rely more on irrigation, and there will be limits to how much more we can afford to grow.

It also uses a lot of land and potential wildlife habitat. One acre of corn produces 7 to 10 barrels of ethanol or the equivalent of 5 to 7 barrels of oil. Now, that’s a lot of land, and it would take a lot more to make a real dent in our energy supply needs, and we all need to grow up and realize that. And I’m for ethanol, by the way.

A lot has been said about cellulosic ethanol, but a cellulosic ethanol plant would cost about five times as much as a corn ethanol plant of the same size. We are also learning that ethanol production has an energy balance that is not that attractive, and now some are saying it has a greenhouse gas footprint, and that is troubling.

I’m not here to trash ethanol, because we need it, and I support it, but I and I think you ought

to recognize that it has limits.

I may be the only one in this room who believes so, but I feel very strongly that we must also increase our domestic production of oil and natural gas to keep things running in this country. We've run on oil, but it's obvious to me that we must aggressively promote alternative transportation fuels at the same time.

So, where does that leave us if the most significant alternative transportation fuel has so many problems? It leaves us with the alternative transportation fuel that has the greatest potential, but gets the least amount of attention. In other words, the electric grid.

The electric grid is so well established and has been around so long that it can seem like a pretty mundane topic. However, if you begin to add up the various benefits the grid could provide as an alternative transportation fuel, you can't help but get excited.

I've heard plenty of policy makers and environmental groups point to the need to promote solar, wind, and geothermal energy as an answer to high gas prices, and there's a gradual movement by some environmentalists towards nuclear as one of the cleanest sources of energy. And especially if we want to go to hydrogen, and we have about 9 million tons of hydrogen in this country, but to have a hydrogen car system work, you'd have to have at least 150 million tons and the infrastructure. Well, we don't have that today. We do have the ability to develop hydrogen cars, which, as you know, are very clean.

Well, obviously, cars and trucks, they don't run on electricity, so some of the arguments that have been used really follow, but what if we changed all that? What if I could begin to apply hydroelectric, solar, geothermal, nuclear, and natural gas, generated electricity to our to transportation sector? Talk about adding diversity to our transportation fuels. Even when it gets its electricity from a coal-fired power plant, a plug-in

hybrid provides an environmental improvement over a conventional gasoline vehicle.

Almost immediately after the CLEAR Act was enacted into law, I began the effort to draft S.1617, the FREEDOM Act, which stands for -- are you ready for this -- the Fuel Reduction using Electrons to End Dependence on the Mid-East Act of 2007.

(Laughter)

(Applause)

MR. HATCH: Now you all know why I wear a Mickey Mouse watch here in Washington.

(Laughter)

MR. HATCH: It became quickly apparent to me that, in terms of technology and industry focus, the United States is positioned to lead the world into the future with plug-in electric motor vehicles. The FREEDOM Act would help our nation to take up that position by helping to develop the market, the technology, and the domestic production capacity needed to fulfill that role.

The FREEDOM Act's goals -- and I hope you'll all advocate for it while you're here -- would be achieved through four strong tax incentives.

First, a tax credit for consumers who purchase plug-in electric or plug-in hybrid-electric vehicles. Second, for a limited time, a tax credit for consumers who convert their hybrid vehicles to high quality plug-in hybrid vehicles. I shouldn't say "electric," but plug-in hybrid vehicles, which will include electric.

Third, a strong tax incentive for the U.S. manufacture of plug-in vehicles and of major components of plug-in vehicles, such as batteries, electric motors, and electronic controllers. And, finally, a tax credit for electric utilities that provide rebates to customers who purchase plug-in electric-drive vehicles.

Now, FREEDOM Act consumer credits would promote the consumer purchase of vehicles which use batteries and which plug into the electric grid for at least part of their power. This would include plug-in

electrics, plug-in hybrids, and others. The amount of the credit would be based on the kilowatt hours of the vehicle's battery pack, with a cap of $7,500 for passenger vehicles. The same is true for heavier-duty vehicles, except that the caps are scaled up for each vehicular weight class.

FREEDOM Conversion Credits would go to hybrid-electric vehicle owners who choose to convert their existing hybrid vehicle to a high quality plug-in hybrid-electric vehicle. These credits would also be scaled to the kilowatt hours of the new battery installed in their vehicle. Only high-quality conversion kits, which are certified to meet all highway safety and emissions standards, would qualify for a FREEDOM Conversion Credit, and the credits would be available until the market transitions to commercially available plug-in hybrid vehicles. When we transition to that, that's when the credit would be mostly available.

Now, this particular provision is strongly supported by my friend, Senator John Kerry, who was

planning to speak to you following my remarks. And Representative Inslee is a great leader on Capitol Hill. I think you'll really enjoy his remarks.

As you have probably heard, due to important personal matters, Senator Kerry won't be able to make it today, and, in his absence, let me just say that Senator Kerry has been one of my strongest allies on the Senate Finance Committee on all of these proposals we have discussed this morning.

The FREEDOM Act also offers first-year expensing for companies setting up production capacity in the United States for plug-in electric-drive vehicles and for major components of those vehicles.

Finally, in the case that an electric utility in the U.S. chooses to offer rebates to customers who purchase plug-in electric-drive vehicles, the FREEDOM Act would reimburse that utility or those utilities for part of that rebate in the form of a FREEDOM Utility credit. The amount of the government reimbursement would be based on the rate of greenhouse gas emissions for each utility.

Based on our recent findings about ethanol, there really isn't a major alternative transportation fuel that can reduce greenhouse gases. But the electric grid is 30 percent renewable today. Today. It's going to take some work to continue to make the electric grid cleaner and greener, but it is already way ahead of transportation fuels, and it has much more potential for further improvements.

An element of the national grid that I really appreciate is that it is domestic. That's a key thing.

(Applause)

MR. HATCH: You won't see our president flying to the Middle East begging the Saudis to send us more electrons.

(Laughter)

MR. HATCH: And if you think Bush can beg, wait until you see the next president. We'll just make all of these electrons ourselves. And we can make a lot of them. The grid does not suffer from the

same supply constraints faced by conventional oil development.

Finally, in terms of energy policy, plug-in hybrids have one of the most important elements you can find, and that is strong, bipartisan support. It's taken some of us to prod and push and shove and get people up to speed on this. With your help, we can really get them up to speed.

In Washington these days, energy policy is mired in partisan debates. Whether it's about climate change, gas prices, energy futures, or windfall profits, it's mostly about pitting one group against another and demonizing American oil companies that really only have about 6 percent of the world's oil production. Most of the production is by government-owned, huge ventures. Not our government-owned, other governments.

You have to search pretty hard in this city though to find even one negative comment about plug-in hybrids. If the FREEDOM Act were brought up today as a stand-alone bill, I believe it would pass easily.

But it hasn't yet had that chance because it keeps getting lumped in with these other very controversial issues.

Now, I am very confident that political acceptance of the FREEDOM Act will lead to its eventual passage, and I'm counting on each of you to make an effort to see that that's brought about. You're doing it not only for yourselves, but for the welfare of everybody in this country and I think really welfare of everybody in the world.

The consumer acceptance of the hybrid-electric vehicle has already proven a benefit to our nation's energy security, and now I believe that consumer acceptance can also be transferred to plug-in hybrid vehicles. I see the day that plug-in hybrid-electric vehicles become mass produced in our country and your average citizen can drive to work and back using little or no gasoline. And, boy, that'll be a wonderful day as far as I'm concerned.

By the time that occurs, we may very well have commercially viable hydrogen fuel cells and a

hydrogen fuel infrastructure so that we can disconnect these vehicles from the grid and begin a new age in transportation with much greater freedom of movement and freedom from dependence of foreign oil.

Now, I admire you folks in this room, and I've worked very hard in the high-tech industry for all of my time in the United States Senate. Now, you in this room, you are leading our nation in this direction. And, for that, I congratulate you, and I want to thank you, and you can be assured that I'm going to be here in Washington at least the next four years supporting you.

This is the greatest country in the world and we're on the verge of losing that greatness, and its energy that is a big part in our failure to do the things that have to be done in energy that are big parts of why we're in trouble here today. But it's not just energy, it's a big, big issue today, and it's one that we're got to get people of good will on all sides to come together on. Medicaid, Medicare, Social Security are running out of control and energy is

running out of control, too. We've got to get those four things in order. We're going to have wars no matter what we do. And, let's face it, there are a lot of evil, bad people in this world who will continuously test the United States. We have to be ready to handle these problems, but these four things are the things we absolutely have to help solve. It's going to take some real bipartisan effort to do it.

In that regard, let me finish by talking about Senator Kerry's partner in the United States Senate.

It's no secret that Ted Kennedy and I are called the Odd Couple. We all know who the odd one is, don't we? I mean, we --

(Laughter)

MR. HATCH: I always point to him and he always gives me that dirty grin. But the fact of the matter is that we've worked together across party lines, and he's one of the people and the few ones on the democrat side who really does come across party lines trying to work with republicans.

And it's hard for some Republicans to work with him because Ted is the leading liberal lion in the Senate, but it's never been too difficult for me. We fight each other about 95 percent of the time, and they're knockdown, drag-out battles. But there's a great deal of affection between us, we're like brothers, like fighting brothers, and I have to say that I pray for him every day multiple times.

I hope all of you will, as well, because I have to tell you there is not one other person on the democrat side in the United States Senate that has his capacity to bring people together and to try and bring together solutions to some of these problems. Now, there are some people coming up who have great potential, but there is no one that has that ability to garner all of the Democrat machine aspects and bring it together to say this, we have to do this with Orrin or with whomever. I think in all, whether you're Republicans, Democrats, Independents, whatever you are, we'll all be praying for Ted Kennedy. And Arlen Specter. And Bob Byrd.

(Applause)

MR. HATCH: Well, thank you, and let me just say how important Arlen is to the United States Senate, as well, and he's had a recurrence of Hodgkin's disease. As you know, he beat it before. And I saw him yesterday, and, naturally, we get together quite often and we sit by each other on the judiciary committee. Arlen's one of the true great Senators in the Senate, like Ted is. And Arlen, I said how are you feeling? He said I feel pretty rough today. But the rougher he feels, the more enthusiastic he gets because he believes that a positive attitude is what will help him through, and that's Ted Kennedy, as well.

So, I just want you to know how deeply I feel about both of those Senators and how important they are to this country, to the United States Senate. But, having said that, the most important people in this particular area I think happen to be you, and, so, that's the reason why I'm here this morning, and, as busy as I am, I just jumped at the chance to be

able to come and chat with you for a few minutes about some of these things that are so near and dear to my heart and that we're fighting for right know and sometimes against odds that shouldn't be there. You can help change that. People believe in you, people have great respect for you. I think it's important to be bipartisan in these efforts, I think it's important to realize that there are Republicans who really do have their heads screwed on right, and, well, I even find an occasional Democrat who does, and that's the way it is.

(Laughter)

MR. HATCH: Let me close with this since I've been complimenting you. Around the turn of the last century, the Mormon Church, to which I belong, had about 25 general authorities who ran the church, and one day they decided to call this old mule Skinner to become a general authority. Now, he was 6'4'' tall, he was 147 pounds. He was tough as nails. And he had a spiritual dimension that was really profound, but he had one defect, he could never quit swearing.

He had been swearing at those mules, at all those mules. He would stand up in the Mormon Tabernacle out there and just give them all heartburn. He'd stand up and swear at people in the Mormon Tabernacle, and they're all are just sitting there like that, and a person in the church would pull on his coat and say Elder Kimball, Elder Kimball, and he'd say to the person you can't get too mad at me because I repent too damn fast, and he'd say things like that, would just put a chill on you.

(Laughter)

MR. HATCH: Well, finally, they called him and they said Golden, we have a special assignment for you. We're going to send you to this community down at central Utah where, believe it or not, there may be a case of adultery, and there may even be a couple of cases of fornication, and, terrible as it may seem, some of the people have been using spirits. That's what they called alcohol in those days.

So, Old Golden, he gets in his Model A and he gets down there and he gets up in front of these

people, and people would come from miles around to hear Jay Golden Kimball speak. And got up in front of them and he has these sheet of papers in his hand and he was emphasizing every swear word that he yelled at them, was swearing at them and calling them to repent and yelling at them, and they're all sitting there like this, and he talked in a high-tone like this.

And, so, right at the end of his speech, he said I bet you're all wondering what I have in my hand in these sheet of papers. I bet you'd like to know what's written on them, wouldn't you? They're all nodding. He said, well, I'm going to tell you. It's the Lord's shit list and you're all on it.

(Laughter)

MR. HATCH: Well, I want you to know that none of you are on my bad list, okay? Good to see you.

(Applause)

MR. SANDALOW: Thank you, Senator Hatch. That was a wonderful presentation, and we really appreciate your remarks and your humor.

It's now my great, great pleasure to introduce Congressman Jay Inslee. As you heard, Senator Kerry is not going to be with us today, and with Congressman Inslee will have a two-for. He's not only going to give us remarks right now, but he's also going to serve on the next panel, so, we really appreciate both of those.

Congressman Inslee represents Washington's first congressional district in the House, and he's done so since 1999. He's focused on protecting the environment of Washington State and has been a tireless advocate on global climate change. Representative Inslee has used his position on the Energy and Commerce Committee, the Natural Resources Committee, and the Select Committee on energy, dependence, and global warming to promote his vision for a clean energy future, the New Apollo Energy Act, and other measures that would reduce greenhouse gas emissions.

He recently co-authored a very highly regarded booked called *Apollo's Fire*, which looks at

the clean energy revolution, and he did that with a colleague of ours many of you know, Bracken Hendricks. Jay visited Google recently this past April and really, really impressed us with his vision, his knowledge, his pragmatism, and his humility.

It is my great, great pleasure to introduce Congressman Jay Inslee.

(Applause)

MR. INSLEE: Good morning. I have to tell you it's tough to find up a stand-up comic like Orrin Hatch. It's really a tough job.

You got a Seattle Mariner pinch-hitting for Boston Red Sox John Kerry today. I found out about this gig at 12:30 last night, so, I'm excited about it, and I'm excited about the topic, and it is obvious what we should be talking about today. You look at the headlines, we ask what Congress should be doing today, gasoline at $4-plus, wars in the Mid East, global warming acidifying the oceans, destroying some life off my coast of the State of Washington, havoc

economically, environmentally. It is clear Congress needs to deal with steroids in baseball.

(Laughter)

(Applause)

MR. INSLEE: Perhaps we can turn our attention to a more pressing and more promising issue, which is the de-carbonization of the United States' economy and the seizing of this greatest challenge and greatest economic opportunity that America's had since the Internet age. And I believe that is what we are facing today, and I'm very excited about the moment that you and I get to live in. This is a great time to be alive.

Today, I get to see something I thought I'd only enjoy three times in my life, and that is I got to watch the birth of my three sons, and each one of those days were special memories for me. But I believe right now we're experiencing the birth of a whole new industry, and this, people and the people in this room are involved in that conception and delivery, and I intend to be involved in some way in

both of those for the delivery of this new industry, and I'll tell you why I am so excited about it. I'm a child of the 60s, and I want to harken back to what I believe this industry, how it looks at itself in the historical context.

I want to harken back when I was 10 years of age, May 25, 1961, we were engaged in a battle with communism and a cold war, we had a young president, we were uncertain of our future, and on May 25, John F. Kennedy went in front of the Congress and he said we are going to put a man on the moon in 10 years and bring him back safely. A very, very audacious thing to say. If you will recall the state of affairs of technologically at that moment, rockets were blowing up on the launch pad, the Russians had launched a bus in orbit, we'd launched like a softball. We had not even invented Tang yet.

(Laughter)

MR. INSLEE: And, yet, this President called America to a bold vision to put a man there in 10 years. And it was interesting when he did so, the

chair of NASA, a guy named James Webb, as soon as Kennedy said that, which even NASA didn't know he was going to say this, turned to his assistant, Bob Gilruth, and said, Bob, can we do this?

(Laughter)

MR. INSLEE: And Bob said, yes, absolutely, we have to. And I believe that's the answer to what we need to do; we have to revolutionize the United States into a clean energy economy.

Now, when Kennedy said that -- I'm going to talk about plugging hybrids, a specific technology, but I want to ask you to embrace a larger vision on how we fit into the American story because I think there's a story here associated with John F. Kennedy.

When Kennedy said this, he didn't know how we were going to get to the moon. He really didn't have any idea. But he knew three things about the American character that I think you and I know and we need to make sure the rest of the world knows. And I want to harken back.

Yesterday, I went to the floor. The first issue became apparent to me yesterday. I went to the floor to give a one-minute speech, and the speaker right before me harkened back to a quote. It's in the House of Representatives by Daniel Webster, and it says America has to develop its greatest resource or greatest resources, and, of course, the speaker before said that was, of course, oil. That we just got to drill more holes in the ground, that is the solution to our energy challenge, and he harkened to Webster's quote above the speaker's rostrum.

I got up there and said appreciate the sentiment, appreciate the quote, but that speaker misunderstood the fundamental resource that America now has to draw upon. There is only one resource that America could have that is gifted that is a truly inexhaustible, infinitely renewable source of energy resource, and that energy resource is the human intellect and the power of creativity and the power of innovation that is involved in the American character, and John F. Kennedy understood the power of that

resource, and now for everything that I think we need to do, we need to inspire and enable that infinite, intellectual resource, as Kennedy did.

Second, what Kennedy understood was the power of liberty and the Americans' desire for freedom and liberty, and that animated part of his effort in his efforts against communism.

We now are involved in a struggle for liberty and freedom, as well, only this time it is freedom and liberty from the addiction and enslavement and chains of oil addiction to the Mid East, and when you are going to work in the morning, you are in the cause of liberty, liberty in the fashion that an American driver, when they want to get their car, isn't going to be beholden to someone in the Mid East and have only one option, and that is oil. We are in the business of liberty here in this room, and we should make sure that our allies know that.

Third thing that Kennedy knew, he knew about the power of competition, and he knew that Americans are competitive as racehorses. He drew on the power

of that competition against the Soviet Union in the 60s.

We now are in another kind of race. We were in a space race in the 60s. We now are in a clean energy race, and that race is to determine which nations will provide the world with clean energy technology. The race is on; it has been joined to see who will sell clean energy technology to China and India.

I had lunch with the prime minister of India the other day. He pointed out that he has 400 million of his constituents that do not even have as much as a light bulb; they have no access to electricity. India is going to demand access to electricity, and we are involved in a race with Germany and Denmark and Spain and England to build the technologies to sell to the developing world so that the world does not cook and we can get China off those one coal fire plants a week that they are now building.

And you know what? We haven't really got out of the gate on this race yet. We have not

developed a feed-in tariff like Germany has, which allowed them to leapfrog us in photovoltaic energy, and we have not embraced a national renewable portfolio standard like Denmark did, which allowed them to develop their wind power technology.

We need to get out of the gate, but I believe that the space race is a good metaphor of what we're capable of. We were late out of the gate. Those of you my age remember the shock of Sputnik, what it was to the American consciousness. We need to now overtake and surpass our international competitors on this race for clean energy, and I believe we are fully capable of doing that.

So, that's sort of where we are in the fabric of the American story.

I want to share with you why I am totally optimistic about America's ability to achieve that and to sort of tell you a story about why I'm optimistic. One, it's by nature and genetics. Two, it's by necessity. But, three, it's by my experiences in the last several years.

And I just want to share with you one day -- Tom mentioned I wrote this book *Apollo's Fire.* By the way, he said it's "highly regarded." It's "highly regarded" in the Inslee family. That's what he's talking about.

(Laughter)

MR. INSLEE: Although, my dad called me up a couple of weeks ago, Jay, I read this thing, and this sentence here doesn't make any sense at all, and I said, well, dad, we were trying to explain this concept. He says, I don't care, it doesn't make sense. You need to write these things more clearly. This on like page 280, right? So, he's on my case big time about this sentence that doesn't make sense, and I tried to explain to him what we meant. He said, why didn't you just say that, you know, Jay? Thanks a lot, dad. I wrote this book. Real kudos from my dad. And, finally, I just said, dad, I'll tell you the truth, my co-author wrote that sentence.

(Laughter)

MR. INSLEE: Backing Hendricks, who I really loved writing this book with, and he said, no excuses, son.

(Laughter)

MR. INSLEE: So, anyway, that's my adventure writing this book. But I had some great adventures. I want to share one day with you about why I'm optimistic.

I went down to the bay area in the course of writing this thing. In the morning, went and talked to a guy named John O'Donnell. John is a guy who was involved in a eight-person company in Australia developing solar thermal energy.

Now, we know -- I mean, the reason I mention this is because cars are just part of the system we need to develop. We're all focused on the car, right, because we're car junkies in America, but it's very, very important for us in the plug-in industry and the electric car industry to understand the car is just one part of the entire system that is being developed.

So, in the morning, I go meet John O'Donnell

down on Palo Alto. He had like an eight-person firm in Australia. At least we're going to rig up some mirrors, concentrate the sun's energy, heat up water, drive a steam turbine.

A guy named Vinod Khosla heard about this, the guy made a bundle at Sun, and now is looking for the next best thing, move them to Palo Alto, and, in one year, this company went from eight employees in Australia to having signed a commercial contract in Florida and California to provide enough electricity through solar thermal energy to provide almost up to 400,000 homes with electricity.

Now, why is that important? It's important to me because when I was trying to pass the renewable portfolio standard, one of my Florida colleagues said we don't have renewable energy in Florida, and I said, well, how about like solar energy? He says we can't do solar energy in Florida. I said I thought it said the "Sunshine State" on the license plate.

(Laughter)

MR. INSLEE: What's up with that? And he says, no, no, we got too many clouds; we can't do that. Well, one week after that conversation, John O'Donnell signed this contract with a company utility in Florida to provide this electricity through solar thermal power. That is not the only game in town. Companies Bright Source, there's several companies.

What these companies do, I believe they are on a path to be competitive with coal-based energy within a decade or a decade and a half, and I've looked with some skepticism, healthy skepticism on their numbers, but I believe they are going to be close to coal-based electricity very, very shortly. It is a stunning advance as soon as we can drive the scales of economy and reduce the costs of capital to get these projects done.

So, I get done talking to John, I drove over to Google, met with Dan and some others, and what does Google tell me about? You know, I wrote this book about clean energy, I kind of thought I knew everything about clean energy, but the folks at Google

tell me about a couple of their investments. They tell me about their investment in a company called AltaRock.

AltaRock is an enhanced geothermal firm, and, guess what, in Seattle, Washington. Here's this company in Seattle, Washington, literally in my neighborhood that is developing a way to basically drill down three kilometers plus, create a fracture zone, pump water down, bring it up at 300 degrees and drive a steam turbine. You don't have to depend on where the fractures of the earth are, you create your own and you bring up that geothermal energy.

Now, here's a company in my neighborhood, which according to the DoE there's enough energy available probably to drive half of the electrical grid in the United States if we can commercialize this technology, and Google is very, very excited about making that investment. Here's a technology that I really had not become familiar with right in my backyard.

I'm walking out in the parking lot of Google and the brother of one of Google's founders comes up and he says do you want to see some solar energy porn? I said solar energy porn? You know, I'm not -- it doesn't poll very well. I don't think porn is something I'm particular interested in.

(Laughter)

MR. INSLEE: And I said sure, right, let's go behind the bush and we'll look at some solar energy porn, but he takes out of his pocket, he takes out this wonderful, shiny strip of some silicone and glass-based thing. I said, great, what is this? He says, this could be the most efficient PV cell on earth using a concentrated system to concentrate the solar lens onto the most efficient PV system, which I believe is from Spectro-Vision, I think is a subdivision of Boeing, and he says I call it solar energy porn because I am so excited about it.

(Laughter)

MR. INSLEE: And here's Google making a transition from software on the Internet to clean

energy, the largest transition in intellectual and financial capital in world history that's going on.

So, then I drive up, they put me in a hydrogen fuel cell bus. Now, I think hydrogen is quite a ways off because of the distribution costs associated with hydrogen, but I get to drive this hydrogen fuel cell bus. They let me drive it around the parking lot.

By the way, I'm pretty proud of this. I'm, according to them -- and this is the first hydrogen bus in commercial usage. According to them, I'm the first member of the U.S. Congress ever to drive the hydrogen fuel-cell bus. I'm kind of proud of that. They pointed out that they had allowed George Bush, six months before, to sit in the driver's seat, but they would not let him drive.

(Laughter)

MR. INSLEE: Now, I don't know what that's about. Probably a bunch of democrats or something. I'm not sure what that was about.

So, now, they think this has application where you have feeding stations and enlarged fleets. We may have hydrogen at some point. Otherwise, I think it's a bit off.

So, then we drive back over to Stanford, and I meet a guy whose story I love, and that's Felix Kramer, who is here today. I think I saw Felix somewhere. Felix?

And the stories in our book, we start talking about who would call the CalCar boys or CalCar guys, and Felix was fundamental in that, building on Dr. Andy Frank's tremendous technological leaps that he made, and Andy tells a story about saying I'm going to go get the folks in Detroit to do this plug-in hybrid car, and they say go back and smoke your hemp or whatever you do in California and don't bother us, we know what to do with cars.

And he goes back in 3,000 feet of wire and recruits some guys on the Internet and they build a plug-in hybrid car in Costa Mesa, California, and now, of course, GM is ready to get going on the Volt, and

Toyota is active, and Nissan signs a deal with NEC, and now we see that spirit of innovation bubbling up to the people with the money that can make this thing happen.

So, that's one day in one congressman's life to see what John F. Kennedy said was possible is actually taking place, and that is why I'm optimistic about the ability to get this job done, and I've just given you a smatter. I know that when I walk out or hear somebody else say how come you didn't mention wave power and how come you didn't mention wind? There's a million technologies and there's a million flowers that are going to bloom on this. But let me suggest what is necessary here. What is necessary is to raise our vision a whole other scale of enterprise.

You know, a Stanford professor did an analysis. Obviously, we need electricity to run these plug-in hybrid cars, right? It doesn't grow on trees. We have to generate electricity.

Now, we know we have enough power to do that right now. A Pacific Northwest lab study showed that

using the existing grid and existing power plants, we could power 86 percent of the entire transportation leagues of the United States electrically without building one more energy producing plant. Eighty-six percent, without building one more plant.

Now, the problem with that is there's too much coal in there and we'll cook the planet if we do that. So, that is not a solution.

So, a Stanford professor did an analysis, it came out just a couple of months ago, who basically said using existing technology today, the United States, assuming we can build a transmission grid that actually works in this country, can power our entire electrical system by building about somewhere between 70 and 110,000 wind turbines with 126 diameters blades. Things that are in the field today.

Now, 100,000 sounds like a lot, right, and a lot of people might say beyond America's ambition or capability. But he points out that in World War II, in 1939 we built 3,000 airplanes, and in 1945 we built

enough, so, we built 300,000 in 4 years in World War II.

If we commit this country to the scale of ambition that we had in the Apollo Project or World War II, we are fully capable of providing electric grid to provide the geniuses to electrify the American transportation system, and we can do it even using today's technology.

Now, we've obviously got to build a grid, and that's one of the issues I'm working on, and I have a bill to create an electric superhighway to get this job done. So, we have to work on a transmission system. But the point is we need to think big, there is no alternative, and America, this is in our tradition to do this. It is not in our tradition to embrace timidity. It is in our tradition to think boldly, and I think this is a perfect moment to do it.

And I want to mention just a couple of things or ask a couple of questions. I want to mention the single most important thing I believe to the development of this industry. We're going to talk

about tax breaks and R&D. We know R&D is pathetic right now; we got to embrace it.

Again, this panel will talk about the specifics as to plug-ins. But I believe the single most important thing to the development of this industry is the passage of something that will level the playing field between petroleum-based transportation system and an electrical-based transportation system.

It is not a fair deal right now. The electrical folks are behind the eight ball because we give enormous subsidies to the oil and gas-based transportation system. Both in our tax code, which we're trying to repeal and shift the tax benefits over electrification from oil. We fell one vote short, one vote short in the US Senate from breaking a filibuster on that. But the biggest subsidy is the subsidy that we give the oil and gas companies to allow them to treat the atmosphere as their personal garbage dump. We do not allow people to dump their garbage in the municipal garbage dump for free. We would never allow

an oil company to take their slag from their refinery, put it in a garbage truck, back it up to the city park, and dump it in the city park for free in unlimited amounts, but that is exactly what we do with their most dangerous pollutant, their most dangerous garbage, which is carbon dioxide today. And the moment we pass a cap and trade system in America, the moment that we put a cap on the amount of carbon dioxide that goes into the air, the moment we put a price on carbon, you will see a rush of financial capital into the electrification of the transportation system that will dwarf what we'll even see now, which is a significant amount.

So, I would suggest to us that next year, in 2009, the single most important issue in the United States, other than withdrawing from Iraq, in my view, is passage of a cap and trade system that will level the playing field for the real innovators, many of whom are in this room, to get this job done.

And I want to point out the thing that will be most contentious in passing that, and that is

whether we're going to give these permits away to these polluters or whether they're going to need to pay for it, and I'm coming out to say that the polluters should pay for this, not the public. The polluters need to pay both to create a price on carbon and to create a revenue stream to be used for research and development and help for Americans through the transition we're experiencing it.

I mention this because you will have a part to play in that debate, and I hope that you will be active in that debate because I can tell you it is the key to unlock the lock of the financial wherewithal we need to get this industry up to speed at 100 miles an hour.

So, that's my request to you, that's kind of a report on a couple of things. I hope that I can stand for questions.

Do we have time for questions?

MR. SANDALOW: (Off mike)

MR. INSLEE: Take a couple of questions, somebody with a softball question here.

(Laughter)

MR. INSLEE: Yes?

MR. ROPER: My name is David Roper from Virginia Tech. You're speaking of an "electric superhighway."

When will Congress initiate an interstate electric railway project similar to the Eisenhower highway interstate project?

MR. INSLEE: Well, I declined to serve as president this year. I'm supporting Barack Obama, so, it'll be some time.

No, it's a very serious issue, and I've introduced a bill. It's called the Rural Electrical -- I can't remember if we're calling it the "superhighway" or not, but that's what we intend to mean by it, that basically will create a pool of funds to finance the creation of high-capacity, ultimately D.C. grids to move renewable energy to the portals for the electrical transportation system, and what this bill will do will basically spread the cost of the creation of these lines nationwide so that those who

build those lines can basically spread the cost across the United States. If you expect the first entity to buy that electricity to pay for the entire cost, it just doesn't get billed. And I believe this is an absolutely critical part. My bill is not the last piece of unlocking that puzzle, but it is the first piece.

I hope this year -- I talked to Chairman Boucher about this two days ago. We hope this year, I hope this year, to get a bill at least starting a study by DoE to identify what is really necessary to make that happen. Next year, to pass my bill or something very close to my bill.

So, the answer is I hope that by fall 2009 we will have in law a provision to create a financial mechanism to fund the creation of this electric super highway. It'll be none too soon, and I hope you can help me out.

Thank you.

Yes?

MR. FELDMAN: Hello. Jonathon Feldman, Stockholm University.

Senator Obama has talked about taking the savings from the Iraq War and putting it into alternative energy and alternative transportation modes, and during the last energy crisis President Carter tried to facilitate the system to take the savings from the peace dividend after the Vietnam War, these industrial resources and promote mass transportation and all kinds of alternatives.

What can we do to help the industrial veterans of America who've gotten behind this Iraq War? We don't expect to be spending billions every day in the future. How can we make this transition and support conversion to get these resources that you spoke so eloquently about into these alternatives through conversion of defense firms and things like that?

MR. INSLEE: Well, first off, that conversion has tremendous potential, and I am very excited about Senator Obama's commitment to this

cause, and I believe he is committed to this heart and soul, and he has a wonderful energy plan. You can check it out on his site. It's very comprehensive, and I'm excited to hear what he says in his inaugural address about this subject.

I will say this, however. Unfortunately, there is no real peace dividend because all of the money we spend in Iraq was borrowed from China. Okay? Every single dollar under this administration's policy has all been deficit spending.

This is the first war in America's history where we didn't raise taxes to fund the war. This president decided to fund the war just by borrowing money from China. I think that was a huge mistake, he did it because it was easy, but it was extremely bad economic policy, and it was not fitting for the dedication of the American people, and he did not ask the American people to be engaged in the financial aspects of this war.

So, because it was all deficit spending, it's not like we have a big pile of cash that we can

just take from Baghdad and transfer it here because all that cash has got to get paid back to China.

So, I think to finance this, we are going to have to look at some revenue source to finance the huge needs for R&D, to finance the loan guarantees and some of the things we need to do. That's where the auction I told you about is important. That's why having an auction of the permits for CO2 pollution in the cap and trade system is absolutely necessary because that auction, if we do auction that, will create a pool of money somewhere between 40 and $100 billion a year that can be used to finance that transition, and that's why I'm saying your engagement and this community's engagement in the cap and trade debate is absolutely pivotal to make sure that we auction those off and we have a revenue to really make that transition, and Senator Obama, I know, supports that effort, and that's one of the reasons I'm excited.

Thanks a million. I'll see you at this forum. Thank you.

(Applause)

MR. SANDALOW: *Apollo's Fire* is for sale out in the lobby. We're back here at 10:00 for the next panel. Thank you very much.

(Recess)

PANEL 3: FEDERAL POLICY TOWARD PLUG-IN VEHICLES

MR. SANDALOW: Ladies and gentlemen, it is my great honor to introduce this extraordinary panel.

Yesterday we heard two things. We heard lots of enthusiasm about plug-in electric vehicles, lots of belief that they have tremendous potential to change the world. We also heard a lot about the barriers. It's not going to be easy to puts tens of millions of plug-in electric vehicles on the road soon.

So, this panel is where it all comes together and we talk about the role that Washington can play to bottle up that enthusiasm in order to overcome those barriers. We have an extraordinary group of panelists here, starting with a man who certainly needs no introduction, Tom Friedman, a

world-renown author, foreign affairs columnist for the New York Times, author, of course, of *The World is Flat,* and he told me moments ago author of the forthcoming book, which, as people here know about, I for one just heard the title, which is *Hot, Flat, and Crowded: Why We Need a Green Revolution and How it Can Renew America.*

In bookstores in September, Tom?

MR. FRIEDMAN: (Nods)

MR. SANDALOW: In bookstores in September.

We are also honored to have Jay Inslee, Congressman Jay Inslee, who you have already heard from, author of *Apollo's Fire* and a leader on this issue in the U.S. Congress.

We have Andy Karsner, assistant secretary of Energy Efficiency and Renewable Energy at the Department of Energy, who has been an extraordinary leader on this topic over the course of the past several years.

We have John Podesta, president of the Center for American Progress, who has built an

extraordinary institution working on these issues, among many others, and who, of course, served as chief of staff for President Clinton, among many other roles in this town.

We have Sue Tierney, managing principal of Analysis Group, Inc., who has a distinguished career in federal government, in state government, and in business.

And we have Jon Wellinghoff, a commissioner of the Federal Energy Regulatory Commission, who has been a leader in this country and around the world on vehicle to grid applications and other issues.

We're going to start this panel with a short video, and, after that, we will go right to the panel.

Thank you very much.

(Video plays)

MR. FRIEDMAN: Well, David, thank you for inviting me here. This is a terrific panel.

I want to get right to the issue. I got briefed up a little bit on the discussions yesterday. Clearly, the big challenge we have around electric

vehicles is to get down the cost volume curve as quickly as possible and make these truly scalable.

So, my question to the panel is this to begin with: How soon do you think we can get these cars made in China?

(Laughter)

MR. FRIEDMAN: Oh, we don't want them made in China. Sorry.

Andy, let me start with you. Underlying my question is a question. Is there not just a technology issue here, but a strategic manufacturing question? Is this going to be a strategic industry, and, as you've said to me, climate knows no boundaries, so, why should the manufacturing of electric cars know boundaries or should it?

MR. KARSNER: Well, sir, I think you framed it exactly right. If the twin major issues that have magnitude and imperative to act are climate change and energy security, the truth is in this case, there's a tension between those two issues, and we've got to manage that tension, and you manage that tension

through managing the diplomatic relationship with strategic partners globally. It wouldn't matter if we went to zero emissions in this country tomorrow and then had unabated growth in the amount of diffusion of vehicle technologies and business as usual in China for the next 10 years or 15 years. It would not be consequential to reducing our greenhouse gases in a matter that's relevant to the problem.

So, you need China to scale this and other technologies, getting in front of coal with carbon sequestration, et cetera. We need to have relative mechanisms of tech transfer and international collaboration. I penned an agreement with the vice minister on this, and we're continuing that dialogue next week with the strategic economic dialogue.

The other tension is that we have to retain technology advantage for our own energy security interests, and, of course, that is something that we have yet to focus on with the kind of poignancy that we did when we focused on integrated circuits,

computer chips, retaining a manufacturing base here for something that we viewed as strategic.

So, even as Taiwan and Japan and Korea and others move into the IT sector, the United States has been able to maintain a lead and agility in technology proliferation. I view the battery industry and storage for energy in general very much the same way. We have got to say that markets will ultimately perform, but markets don't make national strategy, and here we need a national strategy that incorporates a manufacturing base domestically for high technology energy storage.

MR. FRIEDMAN: Sue, let me ask you this, just to pick up on Andy's point because unlike the chip industry, we had the lead and it was really about retaining it. I'm not sure we have the lead in this technology. So, we first need a strategy for asserting leadership and then retaining it.

How do you see this?

MS. TIERNEY: It's a great question. This is an opportunity for the United States to lead on

manufacturing jobs for technology. Jay talked about the importance of our intellectual resource. We have to deploy that, but we can't get there without leadership. The reason I put it that way is we can't decide whether we're the chicken and the egg in this problem, and I think we have to choose whether we are going to respond to the public in its desires for low energy prices, continued low energy prices or lead by saying energy prices are high, they're here to say. Jay, you did say that, I think you said that in a sense.

(Laughter)

MS. TIERNEY: We have to de-carbonize the energy sector; we have to get off depending upon oil in the transportation sector. This is a major, major thing for leadership that we have to grab and lead.

MR. FRIEDMAN: Jon, let me ask you this from a labor standpoint: Should we look at electric cars the way we look at Wal-Mart or the way we look at Intel? That is, is it a Wal-Mart issue, let's get the cheapest car to the most Americans as quickly as

possible and make them wherever that's necessary or is it an Intel issue, as Andy raised, a strategic issue in which we're going to have to retain this technology and have a strategy for that? How do you see it?

MR. WELLINGHOFF: Well, I think it's a little bit of both. There are a lot of cars made in North America still, and there's a reason for that, which is that we still have high levels of productivity in this country to manufacture technology of that sort.

I think that Andy raised the right issue though that the battery technology is largely, at this point, in current vehicles is made in Japan, Korea, other places. I think there's some promising aspects to innovation in the United States that could change that dynamic, but I think that we have to look at what are our kind of core national strengths, and innovation, the ability to have open capital markets, the ability to have a dynamic business enterprise are all strong aspects to the United States market, and, so, I think this is a very promising future for these

advanced vehicles being actually not just invented in the United States but manufactured here, as well.

That's on the one hand. If you look on the other hand, we've kind of -- because of lack of policy, but, largely, if you look at the photovoltaic industry, we had I think about 45 percent of the market 10 years ago. We're now down to under 10. That's been picked up by the Europeans and Japan because they, I think, invested in their own home markets and the production of -- and you had much more development in those home markets, and I think if we get the policy right, we can see the manufacturing follow.

MR. FRIEDMAN: Jon, you just came back from China. You e-mailed me from there about some of the exciting things you saw there.

Did you come back with a feeling of excitement, wow, here's a huge market that we can dive into if we achieve leadership on this electric car vehicle or did you come back with a little sense of dread, like these people are about to do for electric

cars what they did for tennis shoes, they are going to clean our clock?

MR. WELLINGHOFF: No, I did have a little bit of dread, but I saw great potential. Number one, just the issue that we talked about yesterday of can we scale fast enough and can we do as Brazil has done and some of these other places and has China has done? In the last six years, they've been able to go from virtually zero electric vehicles to 40 million. They have 40 million electric vehicles on the road in China. Now --

MR. FRIEDMAN: 40 million?

MR. WELLINGHOFF: 40 million, yes.

Now, given that they are primarily scooters and mopeds, you know, they're not cars, but they still are electric vehicles that they plug in every night, that they plug into the grid, but I think our opportunity is to demonstrate to the Chinese the technology of how that grid integration can improve efficiency with the overall grid, lower the need to have coal plants on the grid, improve the ability to

put in and integrate in wind power, for example, because we have to look at this as a system. As Congressman Inslee said in his speech, it's not just a transportation vehicle anymore, it is a grid appliance, and it's a grid appliance that we can demonstrate through our technology and help deliver that into China and make them more efficient, as well.

MR. FRIEDMAN: Jay, when I hear this discussion, and it's so exciting, but part of me wants to ask who are we kidding? Just a few blocks from here, our Congress has been debating now for well nigh a year whether and how to extend the production and investment tax credits for just wind and solar energy. You couldn't make that up.

(Laughter)

MR. FRIEDMAN: That we are still debating the production investment tax credits for wind and solar at a time when Germany has a 20-year feed-in tariff. You couldn't make that up.

Now, how can we be sitting here talking about taking the lead in what is clearly the next gen and we can't even catch up with old gen?

MR. INSLEE: Well, I think what Tom needs to understand is what Will Rogers understood, and they asked Will Rogers how do you come up with humor every single week, and he said it’s easy when you got the whole U.S. Congress working for you.

(Laughter)

MR. INSLEE: So, you got to understand our role, semiotic relationship.

MR. FRIEDMAN: That’s the ecosystem.

MR. INSLEE: That’s the ecosystem, right. Look, I’ve been working on this for -- I was just talking to Dr. Frank -- for 13 years. In 1994, 1995, I started getting involved in this effort. How are we going to develop a clean energy system to stop global warming? And in 13 years, we have made a nanometers progress, in 13 years in public policy to do this. And I have to tell you that you can ask my wife how angry I get about this coming home at night, not being

able to solve this problem, not getting these portfolio scanners through, not getting our renewable tax credits through. If you think you're frustrated, come talk to me when I see it every morning on the House floor.

But I will just tell you this: I really believe, although I really didn't like the book *The Tipping Point* that much because the title was the whole book, frankly.

(Laughter)

MR. INSLEE: But I think we're there. I mean, I really believe we're there. I really believe this is one of those magic moments in American political history and technological history, and I'll tell you why. There are three things that are happening. Starting next January, there is a burst of technological innovation that is now becoming commercially available, and this and 20 other technologies.

So, right now, we are in the cusp of the commercialization of a whole suite of technologies

that can get this job done all happening at the same time. I think that's a magic moment.

Second, the other scientific assessment is that the debate of global warming is over, in part because of your advocacy, which all of us appreciate, and many others, so, the scientific certainty is there on the need to get this done. And I do believe this January you will see the largest political change since 1994, which, frankly, will create an environmental and political environment that will allow quantum leaps rather than just nanometers.

So, it's going to be all of the planets will be aligned next January, and I'm very excited about that happening, and it's going to be a moment where all of us are going to need to be engaged and make sure that happens.

So, I got to say, next year, I think 2009 is going to be 20 years of progress in one year.

MR. FRIEDMAN: Andy, I want to ask you and John a follow-up to Jay's point because, Andy, you're in the trenches right now, you know how hard it is to

rewrite the rules, the enabling rules for this. And, John, you've been in the trenches.

So, let's just go back to this question, the point that Jay alluded to. Congress has been stuck on what should be a relatively easy thing, the extension of these critically important investment and production tax credits.

From your perspective as someone in the administration, John, from your perspective someone outside, why is it stuck?

MR. PODESTA: Do you want me to go first?

MR. KARSNER: Sure.

MR. KARSNER: I want to respond to Jay, but, first, I want to compliment him. He's on my energy committee; he's one of the great champions of our portfolios. So, that's the typical Washington technique. Compliment before the dagger.

But the answer is revealing because I don't believe that the problems that we just identified on energy, security, and climate change can remotely be aligned with biennial electoral processes in the

election calendar, so, the very nature of waiting for the right number of votes for any one action to take place really answers this.

And, so, the true answer is it has got to be taken out of the hands of Congress, and that's a very painful thing for Congress to actually accept because Congress likes to be asked and they are the representatives of the people, et cetera, et cetera, but this is a multi-generational problem with myriad faces of a magnitude un-previously faced, and when we have multi-generational problems in this country, typically we remove it from biennial election processes, from incremental, annual appropriation processes, and whether that's home ownership or whether that's student loans or whether that's putting a man on the moon or creating an atomic bomb, when we have a multi-generational process or problem to tackle, we organize ourselves and our institutions and our funding processes differently. We have not been doing that on energy.

So, policy cannot be reliant on the tax code as it was 15 years ago, and it cannot be reliant on choosing technological winners. Here's the policy for plug-ins, here's the one for wind, here's the one for nuclear, here's the one for coal. Instead, our policy has got to be permanent, it's got to be technology-neutral, it's got to be predictable for continuous and consistent capital formation, and it's got to be carbon-weighted and include externalities for our security.

In other words, we need policy that is attributes-based. What is it we want our energy portfolio and supply to look like, clean, affordable, domestic, secure, greenhouse gas reducing energy, and how do we get there? That's not going to happen through this year's election or next or last year's; it's going to happen through government -- because that relies on government scoring and OMB and CBO, where the accountants aware managing the managers and the realities of institutional mechanisms that are too short-term to give us the solutions we want. So, we

need an institutional and organizational revolution in how we phase down these things and then you will get the appropriate policies that can guide the marketplace to give us the results.

MR. FRIEDMAN: John?

MR. PODESTA: I guess I'm tempted to say I like Andy.

(Laughter)

MR. PODESTA: And I think he does a terrific job.

MR. FRIEDMAN: We all do.

MR. PODESTA: But he left one thing out. It's going to take presidential leadership, and I think that that's really what Jay was talking about.

I think at least we have two candidates -- I think they have different positions on this question, and Senator Obama leans out further, but at least they've embraced the challenge of climate change and need to cap carbon in an extremely serious way, and I think that will change the dynamic, and I think this election will be a significant election. I don't

think this just something that ebbs and flows in which politics doesn't matter.

And I think the particular example that you raise is, in fact, an example of that, where, as I think Jay noted in his opening remarks, there was a one vote margin in the Senate that filibustered a bill that could have gotten this job done, and I think that what we see now is a kind of crippling politics in Washington that needs to break apart, we need a realignment.

As I said, I think the good news is that there is a -- Jay talked about -- *Tipping Point*. I'm glad he didn't read *Collapse*.

(Laughter)

MR. INSLEE: I did read *Collapse*.

MR. KARSNER: But I think there is I think, at least in Washington, I think amongst the public more generally, there's a sense that we got to get on with this, we really need that conversion from a high carbon base to a low carbon base. That's going to take policy that's going to be formed in Congress,

they have a role to play, but what it's going to really take is leadership from the White House driving this process forward, and I think that can get done.

MR. FRIEDMAN: Let me just do a quick follow-up on that because I always kind of wonder when the leadership moment, when that tipping point is going to happen. I mean, we're just fresh from a primary campaign where two of the three candidates proposed a rollback on the federal gasoline tax, a summer holiday, which everyone knew was a completely fatuous solution. It's like when do we get to that point where we really tell the truth? It's like I've been thinking for a long time I want to write a column, it'd be called the Only 100 Days. You know that we used to say that first 100 days, but it feels like more and more that it's just 100 days now at every administration. After that 100 days, you're getting ready for the by-election. After the by-election, it's for the next presidential election. So, the first 100 days is like the only 100 days.

Has all this shrunk? When do we actually tell the truth?

(Laughter)

MS. TIERNEY: Right now.

MR. FRIEDMAN: Okay. Let's hear from you.

MR. INSLEE: Yes, right now.

MS. TIERNEY: Can I ask how many people in this audience are from outside Beltway? Put up your hands, please. Okay. Where is the action on all of these issues taking place? It's taking place outside the beltway, people are understanding that energy is expensive, that it's expensive at the gasoline pump, electricity pump. People have to lead from outside the beltway in, unfortunately. I was in the beltway for awhile, and guess where I fled, to the hinterlands.

(Laughter)

MS. TIERNEY: There is leadership in the state governors, there is leadership in state legislatures, there is leadership in state regulatory commissions. This is about being real about sending

price signals to consumers about real electricity and real gasoline prices, getting over the fact that they're not going to go down. Okay, so, I said I'd be honest, right? And I'm not running for anything, so, I can. And that's where leadership has to press into Washington, unfortunately.

MR. FRIEDMAN: Jay, do you think that'll happen?

MR. INSLEE: Yes, I think, as I said, I really believe 2009, you're going to see an explosion of both policy and technology, and as far as when it'll happen, what I would suggest is it will happen when people in leadership positions understand how to talk about this issue, connecting it to inspirational higher values in the American character. A lot of people -- and one of the reasons I think this became a partisan issue, which I think is most unfortunate and very unnecessary -- is that we got off somehow thinking of this as calling for a deprivation living in just a 50 degree house, wearing just sweaters, and having a reduced American vision of what America is

about, and it became associated with a reduction of American ability rather than an expansion on it.

MR. FRIEDMAN: Your book talks about that.

MR. INSLEE: Yes, and because people got in that sort of mindset, they were afraid to “tell the truth” because telling the truth was equated as the un-American view of pessimism, lack of expansion. It just became associated with defeat, and I think you can tell the truth with the American people, and I kind of think I’ve told as much as I can get through.

MR. FRIEDMAN: Got you.

MR. INSLEE: Is that this is associated with the higher values of America, and it’s baseball, apple pie, and innovation, and, by the way, I really appreciate you’ve been right on the money on this. So, I think you can tell the truth to the American people, which is gas is going to be ungodly expensive, and that is something that is not going to change until the basic American character of courage, vision, and innovation gives Americans an alternative to gasoline. And, so, it’s an expansive view, rather

than a contractual, and then you can tell the truth to the American people, and I think you're going to start to hear that January 20, 2009.

(Laughter)

MR. FRIEDMAN: Tom -- oh, go ahead.

MR. KARSNER: I want to get in this because as the token republican on the panel, I know Wellinghoff's independent, and most of these folks are pretty independent-minded.

MR. FRIEDMAN: Please.

MR. KARSNER: But being the one who gets to defend the administration, I'd like to take a crack at it.

MR. FRIEDMAN: Go for it.

MR. KARSNER: Now, I'm no match for the well-versed political pros up here, and I'm not a campaign giant, but I do know a little bit about the portfolio and how it's progressed and where's it come and where it started, et cetera. So, let's lay a little bit of facts on the table because leadership is more than being able to talk about a good game. It

also requires a capacity to listen, and that's actually what's not happening very well in this town.

So, if you start with what needed to happen in this town at first, it was definition of a problem, and that's why the president came out and said we are addicted to oil in unequivocal terms so that we would know in the starkest reality that which we face. Carbon-based fossil fuels have to be eroded from all sources, and in the following year from the same platform, when the president called for the most ambitious metrics of measurable reduction with enforcement by law with a mandate to reduce that oil and the first time elevation of vehicular efficiency, and then managed to pass that law within a year, it should be noted that the law that was sent to Congress was ecumenical and inclusive of all sources.

I personally fought and testified on more than 20 occasions to include electricity in that mandate, and the mandate that came back from Congress was a biofuels only mandate, and biofuels and liquid alternative fuels have a role to play, but Congress

also has to listen to the leadership, whether they agree with it. I think it was you that said the quote that some things are perfectly right, even if George Bush says them. Okay.

(Laughter)

MR. KARSNER: And that has certainly been the case on the addiction to oil and deploying the technologies that are consequential. I inherited a portfolio with zero for a budget on plug-in hybrids and zero for plug-in technology, and that's boosted up from zero and you can say it's infinite X, but up to almost $100 million this year.

Today, we're going to be announcing $30 million from not just retrofitters, but the OEM manufacturers, great companies like GE and GM and Ford and Chrysler, aligned with EPRI and the University of Michigan, A123, Johnson-Saft. Most of the people in this room -- that's my shameless plug for a press avail after this event.

(Laughter)

MR. KARSNER: But for an additional $30 million, to put out demonstration cars like the one I drove in here today that I like to call the electro-flex, to use any kind of biofuel in any blend and plugs in and won't use more than 75 gallons of gasoline over the course of an average driver's year, produced from a major manufacturer here in the United States. I don't have to tell you how sexy the Volt is. The Japanese and Chinese couldn't possibly put out something that appealing to Middle America.

So, we've got real issues on certification, integration, testing, validation, a holistic program that the next administration will inherit, so, it will be inaccurate when people look back at the facts and say did this administration act on this issue? We did.

MR. FRIEDMAN: Andy, I've been through a lot of these sessions before and until you've heard Andy debate Al Gore, you haven't lived. Okay, I've got to tell you. All right.

(Laughter)

MR. FRIEDMAN: Jon, I want to go to you.

A lot of the kind of simple assumption here is that -- I don't mean simple as simplistic, but just as part of the formula is that it's all going to work great, everyone will have an electric plug-in car, everyone plugs in at night when the grid has the most capacity and electrons are cheapest, and it works out just perfect, everything fits together wonderful.

Is our grid really ready for that many cars plugging in at night, and if it's not, what do we have to do?

MR. WELLINGHOFF: Well, first of all, it is ready. There have been two studies done that have been talked about in this proceeding, one at PNNL and one by EPRI that indicates that we can have somewhere between 70 and 80 percent of our current fleet turn over to plug-in fleet and not increase generation or increase grid capacity. In fact, it is ready from that standpoint.

I think it is also ready from a standpoint of markets. We have organized wholesale markets in

this country that, right now, are taking demand response from providers in individual institutions like business and industries that are providing services to the grid. Those services are being done through tariffs that FERC approves that allow payments beamed back to those demand response providers that you could do the same thing with a car, with a plug-in car.

In fact, I've got a chart in my pocket that shows the car out in the hallway there providing a signal back to PGM that ultimately can provide regulation service to the grid while it's charging. So, it's getting paid while it's charging. So, our grid is ready, we can make it ready for larger numbers of cars scale up very quickly, I think quicker than the automobile manufacturers can crank out these cars. I think we can scale up the grid to make it ready for what we need to do.

MR. FRIEDMAN: I don't know who wants to take this question, but it's one that's been on my mind for a long time, and it goes back to the

batteries point because over and over we hear that the battery is really the problem, but so much VC money is going into batteries, and it really has led me to ask: Is this simply kind of VC technology scale problem, just enough VC money into battery is going to give us the solution, or are we up against the laws of thermodynamics here?

Jump in on that.

MS. TIERNEY: I was going to talk about policy, not thermodynamics.

MR. FRIEDMAN: Please. Okay, all right.

(Laughter)

MR. FRIEDMAN: Anyone want to jump in on that? Andy, what have you seen at DoE? You've had to fund some of these.

MR. KARSNER: Yes. And, so, one of the other things we inherited was too much of a technology-specific approach, and, so, we were all hydrogen all the time, and hydrogen and biofuels and all these things have their place in keeping our eyes on the prize and reducing the oil, but we viewed it as

a race between protons and electrons.

Okay, so, yes, of course, thermodynamics and physics and science all have a role to play here, but the question is: Is there a preferential role for electrons based on their efficiency of delivering and storing and releasing that energy, and I think we're leaning at least on the scalable production side as to saying yes, there absolutely is. So, we measure that in, reducing the costs, extending miles, extending cycles and durability of that battery. I mean, those are your fundamental metrics that surround this question, and all of those metrics are working our way.

And, so, specifically, we think we get down to where we need to be, about $300 per kilowatt hour by 2014. And now you also have interrupted miles. That's the government in static thinking saying well, this is the car industry today, and the battery needs to last 17 years or 18 years or the life of the car because no one wants to mess with the car. Along comes Agassi and his group and they start saying well,

actually, you don't need a battery to last that long if your price signal's high enough in select markets where the problem is acute enough. You could switch out the battery and we could go back to something we all grew up with, which was a battery that said 24 months or 36 months or maybe we don't have to fill it with water and the assumption is we don't know, how will consumers react to that?

But so, you have disruptive commercial paradigms meeting disruptive technology and we don't know where that's going to end up. What we do know is that we have to elevate our game in collaborating between government, utilities, and the vehicle industry, domestic manufacturing to get a net outcome at an accelerated rate. And, so, that's going to be our goal.

MR. FRIEDMAN: Well, I propose that.

Sue, what would you like to see a President John McCain, a President Barack Obama, whichever it is, include in his inaugural speech that would truly empower this industry policy-wise?

MS. TIERNEY: Great question.

That I will meet my commitments to doing everything I can to have the nation pass as soon as possible a mandatory cap on carbon, do it in a way that is workable politically, and, therefore, we get a framework in place fast and that will allow less to work in international forum in saying America is at the table right now.

Two, I would say that we will use the money from the cap program either through options for technology deployment or circle that back into the United States as a way to provide investment in. I would encourage continuation of tax credits to get these vehicles out there. Tax credits for manufacturing, for purchase, and then I would do everything I could from the bully pulpit to ask the states to get their job right on the grid.

I think we have -- I think Jon is totally right that the grid is ready from a physical point of view. I don't think we're ready from a policy for pricing use of the grid so that consumers -- let's say all

those vehicles get out there and customers plug them in, these residential customers who see average rates across the month, they plug them in all day in the middle of the day and suck out the juice, that grid is not ready. So, we have a train wreck happening if the president doesn't say the job is at the states to get the pricing to retail consumers right on this.

MR. FRIEDMAN: John, what would you like to hear?

MR. PODESTA: Well, I think we're finally in agreement up here on this panel, but I'd add a couple of other items.

One, on day one, grant the California waive around the Clean Air act.

MS. TIERNEY: Yes. Wait, not wait. Let's have that already. Go ahead.

MR. PODESTA: You need a new president to do that, so, it has to be on day one. I apologize.

And, so, I think that would be quite important. And then I think on the other side, I think we've got -- I think Jay raised this in his

earlier comments. I think you have to think about this simultaneously with production of clean, alternative energy so that I'd like to see in addition to what we're talking about on the vehicle side and on the carbon side, a requirement that there's a renewable electricity portfolio standard, and then he's got to do -- now I can say he. He's got to do more on efficiency, in driving efficiency into the system, decouple it, trying to do as much as you can to decouple electricity rates to bring down demand on the electricity side, as well.

MS. TIERNEY: John, to get this grid to be as efficient as it needs to be, and not only to have the scale, do we need to have a truly national grid? Someone said to me that our electric grid, if it were a highway system, it would be like driving from Maine to Los Angeles using only local and state roads. We don't have a national grid. I don't have to tell you. Do we need one or can this work -- Sue alluded to this -- without a truly integrated national grid?

MR. WELLINGHOFF: I get developers coming into my office almost every week proposing a new transmission line. A transmission line, interestingly enough, in many instances for wind only, but they are dispirit and they're not integrated and they're not looking at a total system, so, I think Congressman Inslee's congressional proposal, as well as one that Senator Reid has, are ones that we absolutely have to look at.

We have to look at, first of all, our national energy plan as much as Andy's talked about that's attribute-based. But, from that plan, we then have to develop from those attributes things like a national grid, and I think we absolutely do need a national grid.

It doesn't mean we can't start putting in plug-in vehicles prior to that, but I will tell you one thing, putting in plug-in vehicles will facilitate that national grid because to do wind energy, you need to have regulation services. The State of California is going to put in 7,000 more megawatts of wind by

2012. In doing that, they'll need 1,000 megawatts more of regulation services. These vehicles, as demonstrated by the car out there by the MAGIC Consortium, can do that now.

So, ultimately, we can put the two together and marry that national grid with these vehicles in a way that can provide services for the grid and also have the vehicles available to reduce our dependence on oil.

MR. INSLEE: Can I add a couple of --

MR. FRIEDMAN: Sure, go ahead, Jay. Please.

MR. INSLEE: Yes, there's a couple of other things. Two procedural, one non-procedural to the grid. We talked about the superhighways bill that I've introduced, but we have to go to some more federal mandates on interconnection standards, we need a federal metering bill if we're going to make sure we can plug these things in and use this storage capacity, there has to be a federal requirement that we do this, and I have to tell you we're still fighting like the Civil War when it comes to

transmission issues. Every time we try to do something on a federal basis to make this industry spring forth, people are talking about this is the Civil War and we can't trample on some states' rights. We have to get some federal interconnection standards to make sure that Don Guhl or Felix Kramer can actually plug in and we can really interconnect this system.

Second, we have to have a system of decoupling where utilities are required to decouple the revenues from their sales of electricity. We have to turn utilities into exclusively sellers of electrons to restart sellers of efficiency in the electrical system, in the hybrid system as part of that. When you decouple, you give an incentive from utility to use these batteries in a more efficient way, and you can actually make revenue on that. That gives an incentive to act on this. Those are the two procedural issues, but the question was what to see in the inaugural address?

MR. FRIEDMAN: Yes, please.

MR. INSLEE: I actually believe the single most important thing in the inaugural address is to engage the emotional component of this clean energy revolution to this American vision. These are sort of policy things that may be lost on the American public and the million people on the Mall, but really calling forth a true visionary statement, I believe is the single most fundamental thinking to engage this country on a grander scheme. We think of this as sort of just a business opportunity or just a public policy here and there. This has to become a national cause. The scale of this demands a national cause rather than tinkering on the edges, and that's why we're going to need a very inspirational message.

MR. FRIEDMAN: I want to open it. We have a little time to open up to the floor. I know there's so many knowledgeable people out there. Let's try two questions.

Please. Could you identify yourself?

MR. TAYLOR: I'm David Taylor. I'm with Taylor Automotive. My video was shown last night before dinner.

And I would just like to say that I come from an automotive repair facility, so, I've felt the crunch with the gas prices going up. Our service business goes down, so, I've kind of seen the writing on the wall that eventually my business has to change if I'm going to survive. And I think this is kind of going on all over the nation.

MR. FRIEDMAN: I don't quite understand. I'm just kind of curious. You're in the automotive repair business.

MR. TAYLOR: Repair and service.

MR. FRIEDMAN: And how has your business been affected by what's going on, just so --

MR. TAYLOR: Every time the gas prices go up, whether it's 5 cents, 10 cents, consumers, if they're being crunched with their budget, groceries are more expensive, the gasoline, if they've got a choice of putting gasoline in their tank or come in

and getting their oil changed, they're going to put gas in their tank.

MR. FRIEDMAN: Got you.

MR. TAYLOR: So, I understand --

MR. FRIEDMAN: So, people delaying everything else?

MR. TAYLOR: Right.

MR. FRIEDMAN: Got you.

MR. TAYLOR: So, our business is down probably 40 percent this year in the service aspect, but I'm going to take my business into the conversion business, and this is something that can be done today. I can start converting cars tomorrow. Based on technology that is already out there, it's not perfect, it's not going to get you 300 miles on a charge, but it's inexpensive, it's something that people can do right now until the technology is there.

MR. FRIEDMAN: That's true.

MR. TAYLOR: So, my question is -- and I know this is selfish.

MR. FRIEDMAN: Please.

MR. TAYLOR: But I've not had anyone come up to me today saying hey, how can we help you to duplicate this? Do you need funding? So, how do we address that?

MR. FRIEDMAN: Sir, to elaborate, is there an enabling legislation or system to get this going before we get to big companies doing it that would enable this kind of ground up conversion industry to take off?

MR. INSLEE: Well, we do have a proposal. We passed it out of the House, could not get it through the Senate, for a $3,000 tax credit which creates a demand for the conversion right there. That's, obviously, first step. We hope to get that done fall of 2009.

MR. FRIEDMAN: Andy?

MR. KARSNER: And, first of all, David, you're both my hero and my greatest concern. And you're a hero because you're an entrepreneur, you want to do the right thing, and there ought to be a policy environment that gives you predictable pathways as a

small business person to do that, and I want to meet you and see what we can do.

In terms of the conversions, there's one word that penetrates the whole conference here that's the most important to consider: warrantee. Warrantee. Okay, and the idea of avoiding a warrantee on your largest hardware purchase that's critical to the transportation and for your livelihood for most people in America is not a realistic option. It may be if we're going to keep this into a select luxury green niche to wear a green badge of courage, but, actually, as a national vision, we want electrification of drive trains to be ubiquitous across the fleet, first for hybridization across all sources, and then to plug into our homes, and then vehicle to home and vehicle to grid.

So, we've got to crawl before we walk, walk before we run, run before we get to the decathlon, and my big concern here is, as a guy who was once a diesel engine guy, that we don't lose three decades like we lost when we prematurely went into diesel, encountered

flaws, had pushback, and it's taken us three decades to recover dieselization of the fleet.

So, certification, validation, testing with warranted batteries that people don't have to worry about from a perspective of safety and security is going to be fundamental, so, we want to work with the retrofitters, but we don't want to lose the idea that ultimately it's got to be consistent with what the automakers are putting out.

MR. FRIEDMAN: Jim Woolsey?

MR. WOOLSEY: Jim Woolsey, *Vantage Point*.

A couple of weeks ago, there was a very thoughtful, rather lengthy article in the *National Journal* called *China's Cyber Militia*, and that story lead with the assertion based on discussions with people supposedly in the know in the executive branch that not only the outage in 2003 in the Northeastern part of the United States and Eastern Canada previously attributed to tree branches falling in Cleveland on power lines, not only was that done by Chinese para-governmental hackers, but the outage in

eastern Florida in February was also from the same source.

This morning's papers talk about Chinese hacking into Capitol Hill office.

MR. FRIEDMAN: Jay's office?

(Laughter)

MR. WOOLSEY: Not his yet as far as we know from the press. But Congressman Wolf's office.

With the noble exception of the two executive branch officials on this panel, and I think John's chairman, who is seeking legislative authority to deal with some of these problems, I would say in the executive branch of the United States and in the state public utility commissions and the utilities the vulnerabilities of our grid to hacking and intentional interference have been met by absolutely full-bodied ignorance and lack of willingness even to consider or talk about the issue.

Now, I'm as big a fan as anybody of going electric with vehicles, but can any of you tell us something about somebody somewhere who is trying to

take some action to keep the grid from being taken down by foreign governments, by terrorists, by whoever, let's say 12-year-old hackers? The existing system has probably protected us pretty well against 9-year-old hackers.

(Laughter)

MR. WOOLSEY: But let's go with the 12-year-old hacker.

MR. FRIEDMAN: Jon, you're closest to that. Let's start with Jon.

MR. WELLINGHOFF: And Jim did allude to the fact that Chairman Kelliher has testified before a House committee indicating that FERC needs additional authority, as some of you may know, FERC was given the authority in the 2005 EPAct for responsibility, for reliability of the grid. That wasn't necessarily security, but, certainty, security should be subsumed in reliability, and, as such, we have developed or actually the entity under that Act, act as our organization reliable organization, the NERC has

developed standards, cyber security standards that we, in fact, have adopted, FERC has adopted.

Now, that doesn't close all the loopholes, and that's ultimately why Chairman Kelliher asked for this additional authority from Congress, and I understand the legislation is being drafted, and, hopefully, that will be expeditiously processed and will get these closed up, but Jim is correct. I mean, we need the authority to ultimately direct the utilities from FERC to do certain things with respect to cyber security. We don't have that authority yet; we need it.

MR. FRIEDMAN: Andy, and then we'll go to you, Sue. Andy, from the government point of view?

MR. KARSNER: Yes, Jim successfully scared the hell out of me last time he and Jay and I were together in California and courteously recommended that I get a classified briefing on this, and, so, the declass part that we can speak to is this isn't the cyber hacking that you think of just for passwords, this is the capacity to destroy hardware in your home,

at airports, at military bases, your car if connected through the grid, and I see that the undersecretary of homeland security for technology development is in the second row here, this is what he does 100 percent of the time, and I think that's why he's here.

But the main point, Jim, that you leave us with is security cannot be less of a concern than environment in the current context of immediacy as we plan out energy transformation, and that is absolutely true if we're talking about clean energy superhighways, which I would like to see. We have got to integrate all of our thinking about security if we want the appropriate on and off ramps at our homes, at commercial facilities, at military infrastructures.

MR. FRIEDMAN: Sue?

MS. TIERNEY: I sit on a National Academy of Science Panel with the lovely title of essentially terrorism in the grid, and we've been waiting with a finished paper on this to get it out to the public. The gist of it might say if it were ever released that, in fact, there's a lot of work going on in

security, there are significant efforts underway by utilities in advance of, in addition to getting additional authorities on this. Because of the way that our grid is designed, it would be very, very unlikely to be able to take out the grid.

MR. FRIEDMAN: It's too inefficient.

(Laughter)

MS. TIERNEY: It's too inefficient, and it's too different. There are bigger threats to the grid and to the modernization of it, and it's the aging infrastructure, it's what you all talked about before, which is these little pieces all out there. In fact, having the plug-in hybrid system designed right would actually decentralize the grid and make it more robust.

So, Jim, with all due respect, I wouldn't want to leave it out there that nobody's doing anything on this topic.

MR. FRIEDMAN: Yes.

MS. TIERNEY: I think that's not true.

MR. FRIEDMAN: John, real quickly. I want to get more questions.

MR. PODESTA: I think I wanted to make the distribution point, but I think the other thing, as Jim raises and scares us with the thought of moving to a system of transportation based more on electricity, the very real security threats from doing nothing are intense, like mass migration, weak and failing states, scarce water resources, the capacity of the United States to kind of cope with doing nothing will soon swamp even the kind of nightmare scenarios that Jim's talking about.

So, I think we've got to get on with it and we've got to move down this track.

MR. FRIEDMAN: Please.

MR. KARSNER: The point is they're not one or the other.

MR. PODESTA: Right.

MR. KARSNER: They're not one or the other. You have to incorporate the security --

MR. PODESTA: Right.

MR. KARSNER: -- as you move to the clean energy electrons.

MR. FRIEDMAN: Please. Could you identify yourself?

MS. STEVENS: My name is Pamela Stevens with *Envision Solar*. I'm a Californian. And my question pertains -- first of all, thank you for mentioning the renewable tax credit. We need that. *Envision Solar,* we need that.

My question pertains to distributed generation, and it's a good segue from the previous question about national security.

One of the concepts that was written about this past week is something that our company does, is we recover space in parking lots with solar infrastructure that protects against -- it can abate storm water, produce clean electricity, provide shade for customers, and also create a very intense utility scale distributed generation and electric vehicle charging infrastructure, and I just wanted to get some

thoughts on distributed generation and that role that that plays in electric vehicles and national security.

MR. FRIEDMAN: Who would like to take that? Go ahead.

MR. KARSNER: It's very much the same as the last question, I mean, as Jim's. In other words, he's telling you the problem, you're telling the solution, which is redundancy, resiliency, agility, and power that we're not going to be able to deal with sequentially we just have so much and just in time delivery. That's where we've been, and then throw on top of that an aging infrastructure; we're in a world of hurt.

So, we need to modernize the superhighways, the conductivity of the nation that Jay has talked to, but, at the same time, in parallel, we've got to accept and encourage and incentivize redundancy and resiliency from distribution, in addition empowering your customers to feed in and make a difference.

MR. PODESTA: The additional advantage if you think of the Internet is that also drives

innovation, you've pushed innovation out to the edge of the cloud rather than in sort of the main power producers of the country, and I think that creates its own virtuous cycle, which is also, I think, an important aspect of what you're talking about.

MS. TIERNEY: Tom, and this --

MR. FRIEDMAN: I want to get to more questions, if we could.

MS. TIERNEY: Okay, sure.

MR. FRIEDMAN: So we can get as many people as we can. We only have five more minutes, so, real quick.

MR. BROWN: Hi, my name is Carter Brown. I'm with Boulder Electric Vehicle. We build 6,000-pound electric delivery trucks.

There's one point that I feel everybody in this room is missing with the vehicle to grid idea, which is that every time you charge and discharge a set of batteries, no matter how good they are, even if they're A123s, you shorten their cycle life.

So, if you're going to take a consumer

product that the consumer takes a lot -- pays a lot of money for and you're going to shorten the lifespan of the car that they drive by 50 percent or even 60 or 70 percent by charging and discharging it on the grid every single day, there needs to be a significant either payback for the consumer or tax break or pay in from the utility company or something to benefit the consumer by killing their batteries in 3 years instead of 10 years.

I'm wondering if any of you up there have considered that or if any of you have solutions for that.

MR. FRIEDMAN: Jon and then Jay.

MR. WELLINGHOFF: Actually, this is a myth, and let me dispel the myth, and here's the chart if we can see the chart.

This chart basically shows this car out here providing regulation services to the PGM grid. It's providing them following with this red line underneath the blue line, which is the signal from PGM. The green line is charging. You can provide grid services

without ever interrupting charging at all, especially regulation services. You do not have to charge and discharge necessarily to provide those. You can, in fact, do this without affecting the charge whatsoever.

MR. KARSNER: I think, Jon, his point is making up for capital cost --

MR. BROWN: Where can I get a copy of that chart?

MR. KARSNER: I'm sorry, what did you say?

MR. KARSNER: I think his point was making up for the capital cost difference in the battery up front if want to integrate them in the vehicles today. Wasn't that your main point?

MR. BROWN: Yes, the capitalization of it.

MR. KARSNER: Yes, right.

MR. BROWN: And the consumer payback from the utility company.

MR. WELLINGHOFF: But his point though, Andy, was ultimately by doing vehicle to grid, you're going to decrease the life of the battery, and I'm saying you don't. You don't at all.

MR. INSLEE: One idea, I think eventually we need to go to a financing system to finance acquisition and maintenance of the battery separate from the car possibly, and when you do that, you give a lot more flexibility. We look at Shai Agassi's model, which because they can shift batteries around to higher and lower mileage needs a day, they can maximize efficiency to battery.

MR. FRIEDMAN: Yes.

MR. INSLEE: So, if we go to a GMAC that can finance your battery and manage your battery, it'll be much more efficient. I think that's one step.

MR. FRIEDMAN: Because there are four people left in line, if you'd each just quickly ask your question, and then we'll let everybody just bite off whichever one they want, and that'll close it.

MR. STEVENS: Bob Stevens, General Motors.

The transition from petroleum power to grid power vehicles represents a significant improvement in greenhouse gas emissions; however, the grid is still 50 percent coal. Long-term solutions are to go to

solar thermal, geothermal, or wind, and just in case the audience doesn't realize it, those are technologically and economically feasible. I point to the MIT hot rock study about geothermal potential, which is enormous in this country, and the DoE's recent report on wind.

In the meantime until we get there, have you all considered how are we going to do the tradeoff between the movement of CO2 emissions from the automotive side to the utility side and who's going to get the credit and burden for that?

MR. FRIEDMAN: Quickly.

MR. KLINE: Stan Kline.

The Congressman talked in his comments about the Europeans being ahead of us in certain activities. I just wanted to point out that our electric grid has a lot of legacy information technology in there, and I'm not talking about the interface to the home, I'm talking about the devices in the substation and so forth.

There’s an advanced automation system where the technology was developed at EPRI, but it isn't being taken up as well in North America, in the U.S., as it is being taken up in Europe, and that’s somewhat of an artifact of how the Europeans buy their substations and so froth. I think one thing that’s going to be needed is some relief.

I know that I was at a meeting having to do with the security aspect, and there was one gentleman from one major utility that’s got 400 substations, it’s going to cost $200,000 a substation at minimum to upgrade the security there, so, a lot of this, some of the state regulators are going to need to loosen up their -- or something’s going to have to happen to enable utilities to spend that kind of money to upgrade those facilities.

MR. FRIEDMAN: Good point, actually.

Go ahead, please.

MS. GOLD: Hi. Caitlin Gold, American Council on Renewable Energy, and I was just wondering

if you could elaborate on how you'd propose nationwide RPSs?

MR. FRIEDMAN: A nationwide RPS?

MS. GOLD: Mm-hmm.

MR. FRIEDMAN: Last one. Make it good.

MR. ABRAMSON: Hello, Tedd Abramson, Electrorides, California.

There's one underlying market issue that I'm sure you might be aware of, but it has to do with the distribution of electric cars mainstream. You have dealerships that are making roughly 5 percent margin on the sale of the vehicle, 35 percent on parts, and roughly 65 percent on service. That will pretty much be cut way down if we introduce large-scale electric vehicles, so, that's an issue just from the distribution point that has to be addressed economically at the local dealer level, state by state, city by city. So --

MR. FRIEDMAN: Why doesn't everybody take a minute and bite off any question you want. And, Jon, we'll start with you and we'll just work right down.

MR. WELLINGHOFF: Sure.

MR. FRIEDMAN: And, Jay, you can wrap it.

MR. WELLINGHOFF: With respect to the issue of security and cost on substations of $200,000 per substation, I've already seen technology that can do it at $10,000 per node. So, ultimately, there is technology --

MR. FRIEDMAN: $10,000 per node?

MR. WELLINGHOFF: Per node, right. So, it'd be $10,000 per substation, for example, in that particular example. So, it takes it down by a factor of 20. That ultimately can be done. And the issue of moving the CO2 to the grid, again, even with a 50 percent coal, we're reducing the CO2, and that's with --

MR. FRIEDMAN: On a wheels to wheels basis.

MR. WELLINGHOFF: Yes, on a wheels to wheels basis, we're reducing the CO2, and the grid's only going to get cleaner, we're only going to put more wind on the grid, more solar, more geothermal on the

grid, so, ultimately, I don't think that's really an issue. Those are the two I --

MR. FRIEDMAN: As Felix Kramer always says, electric car is the only one that gets cleaner the more you use it.

MR. WELLINGHOFF: That's right, absolutely.

MR. FRIEDMAN: Sue?

MS. TIERNEY: I would have everybody take a look at what California is doing to connect the dots between decoupling sales of electricity from profits, throwing financial incentives to get utilities on the same wavelength as distributed generation, efficient solutions, clean energy. There's a whole long list of other things which I will not say, but there's great lessons learned there to be followed.

MR. FRIEDMAN: John?

MR. PODESTA: Well, I think that we've talked about a lot of different things. I think the House and Senate have both passed renewable electricity standards, they just can't seem to pass

them together nationally, that also take account of savings on the efficiency side.

The federal government has enormous power beyond things that are new that Congress can enact the power to procure, the power for advanced sales, et cetera, but what this is going to really take when you think about all these moving parts is, again, a real plan, leadership coming from the White House driving this solution and driving the transformation of the economy, and I think Jay raised earlier the industrial scale of World War II. It's not far off.

MR. FRIEDMAN: Andy?

MR. KARSNER: I'm so glad I'm not part of a campaign this year.

(Laughter)

MR. PODESTA: There's room on the Obama --

MR. KARSNER: Oh God. I'm going where Sue goes, out of the beltway.

Let me talk about the things that aren't included. I thought it was a very important point the gentleman made about transformation of the economy and

unintended consequences. This is where government has a role to lead, but not necessarily be a cheerleader. There are more mundane things that a government will have to do in terms of certification, testing, validation, advancing in the R&D.

One of the things you've just said, when you heard about leaving off the revenue from the service and the repair shop and the automotive industry, people forget that we get all of our road taxes from gasoline. So, what happens is we begin alleviating gasoline at a rate that we find consequential; Congress is going to have to deal with these realities.

There are more complex components that have got to be put in here because we're not just going to let the roads and highways go to hell as we do it. These things aren't insurmountable, but they've got to be computed in every bit as much as security and environment and the other things that we're talking about today.

I want to thank the guy for the plug on the studies that our office funded at MIT for a vision beyond incrementalism for geothermal and for wind at 20 percent and for the built environment by 2015, so, that's what the new administration with all their vaunted leadership will inherit.

(Laughter)

MR. KARSNER: Is a Department of Energy that's gone beyond incrementalism and redesigning the way the portfolio has to go, and Republican or Democrat are going to work with the same civil servants that are dedicated to Dan Ryker and me and my successor. And, so, you've got to have a reality measure on this and say what needs to be done for the hard, multi-generational lifting. That's not going to be sloganeering; it's not going to be the tired, old policies that we bicker back and forth with every election cycle. It's going to be two things, a price signal that is carbon-weighted and includes security externalities that is technology-neutral and it has to be incorporated across the board in an institutional

revolution that scales capital formation to fund these industries and turn over the capital stock at a timeframe and at a scale that is of the magnitude of the challenge. Anything less is sloganeering of the past, a superficial nod to green power as a good thing.

You know, Tom, this is your deal. If it's done in scale, it's just a hobby. You need the money to scale it, not just R&D, but the things that scale capital markets. That's going to mean new institutions of the type that you and John Deutsch have been talking about, but it's also going to mean a price signal that's clean, technology-neutral, and not subject to the erratic, unreliable whims of Congress.

MR. FRIEDMAN: I repeat, until you've heard Andy debate Al Gore, you haven't lived. Okay.

(Applause)

MR. FRIEDMAN: Jay?

MR. INSLEE: I spent a week in Europe looking at their experience last summer, and what they

told us, one lesson from Europe is the price signal. I totally agree with Andy, the necessity of a price signal to dry the scale of the capital into these industries, but a lesson from Europe is very clear that a price signal is not sufficient alone. There are a whole suite of these things that we have to do. I'll just mention two of them in answer to the lady's question.

One, we need to have a price signal to distributed energy that you will have a product to sell at a fixed price, at a guaranteed price. A feed-in tariff in Germany allowed them to leapfrog us. We led in solar energy for a decade. We're number four or five. Germany has shot way in front of us because of a feed-in tariff.

I'll be introducing a bill in the next week or so to create basically a performance-based guarantee to distribute energy for a price for 20 years. That's a price signal that will attract the financial capital Andy is talking about.

Second is R&D. We've skirted around it, but I just want to say our R&D budget in the federal government is pathetic. Microsoft's research and development budget is two and a half times the entire United States' R&D budget for energy. Apollo energy R&D was 8 times our budget and it's 55 times higher in Iraq than clean energy. We've got to scale up.

Last, I just want to leave with one comment and plead to all of us in this room. There are about three dozen members of the United States Congress, about 535 of the United States Congress who have some basic understanding of the potential of electrifying the United States' transportation system. That has to get up to well over 60 percent to make what we have to have happen in Washington, D.C.

I hope that each of you will join Tom's leadership, Andy's leadership, the rest of us in educating your member of the United States Congress of the potential of this technology. If they understand the potential, we will get this job done. You are tremendous advocates. Go have a teaching day to your

member of the U.S. Congress and tell them what you're up to and we'll get this job done.

Thank you.

MR. FRIEDMAN: Just a great way to end it. David, thank you so much. It's been a wonderful panel. Please give them all applause.

(Applause)

MR. REICHER: What breadth on plug-ins from national cause to warranted batteries to cyber security to weak and failing states, we heard it all. That was really fantastic.

CLOSING SESSION

MR. REICHER: And we now have another great presentation. It is my great, great pleasure to introduce John Bryson, the Chairman and Chief Executive Officer of Edison, International, which is the parent company of Southern California International.

John joined Edison in 1984, and has been CEO since 1990. Very relevantly, from '79 to '82, he served as President of the California Public Utilities

Commission. He also was one of the founders of the Natural Resources Defense Counsel.

I want to emphasize something else about John Bryson, and that is that Edison, as a utility, has been a real leader in advancing clean energy for several decades -- solar, wind, geothermal.

And even more relevantly, Edison has been a real leader in electric vehicles for decades, literally, since the birth of the modern electric car, Southern California Edison has been there helping to move this technology forward.

And it is, therefore, with great, great pleasure I introduce John Bryson.

(Applause)

MR. BRYSON: Thank you very much, Dan. This has been an absolutely terrific conference. I think it's an indication of the degree to which that magic critical mass is coming together around electrifying the transportation system, plug-in electric vehicles.

I scratch my head. I was here last evening and this morning as to what I might add, and I think it comes to talking about what we are doing at home, what the electric industry ought to do.

I love the policy end of this. It's critically important. It's interesting to notice the number of people who stand up who've come from California to be here in the nation's capital. There are wonderful things going on in California. We could have a similar meeting in California.

I thought I'd talk to three things as I looked for what might add to what all of you know so well and what others have so well addressed in the meeting to date. And I'm going to talk about the things we across the industry need to do without reference (inaudible) term to scale. So I'm going to talk about the importance on electric systems of doing something quite simple, but that isn't much being done, and that is having metering capability to build for off-peak power to induce electric transportation. So I'll talk about that number one.

Number two I'll talk about the role that I believe the electric industry, the electric utility industry, regulated industry, partially less regulated industry, need to do to do our part to advance what is the critical technical factor on the electric vehicle side, and that is to advance battery technology, and

what I think the electric utility industry can do there.

And third, I want to talk to what I think is the probable evolution of the electric industry -- electric generation, smart grid -- over the next five and 10 years. It's not theoretical, way out, but right now.

And those things seem to me to deserve emphasis among the things that I heard were being addressed to date in this terrific conference.

So let me start with the charging capability, the metering capability, to bill customers and offer very, very attractive economic inducements on a really widespread basis in support of plug-in electric vehicles.

This seems to me to being a little bit missed in the conversation about priorities. But the reality now is a cross the U.S., for that matter across the world, and we've done electric systems in a lot of countries around the world, there's little or no capability to recognize usage patterns for billing purposes, off-peak.

And since the cost differential between the wholesale price to electric utilities are providing

rates that reflect costs off-peak is so extraordinarily more favorable than the average kind of pricing and rates that exist across the country today, that's got to change.

So how do we take advantage at scale, not to be early adopters, not to the wonderful people who are technology buffs, environmental commitments, technology and have the capacity to pay for these things to make it such that $4 dollar a gallon gasoline can be met with $1 of gasoline equivalent on electric, plug-in overnight charging.

At Southern California Edison, we are -- we're putting in five million meters. Now they are truly advanced meters. They have two-way communication capabilities. That's important for charging, by the way. But we need simple systems of some sort installed across the industry, and we need them now. And this in the industry across the country right now that is feeling severely the economic distress of aged systems that need to be replaced generally, of a poor economy, of the virtual certainty that costs be driven substantially higher on electric systems as a consequence of natural gas prices -- and

I'll say a little bit at that at the end of my remarks.

So just getting in the metering capability to bill off peak and induce electric transportation is not a simple task. And I don't see a lot of priority being developed around that. California is a leader. California has been special in this regard. But let me just give you a sense of the kind of aggregate costs that -- I just couldn't take our company, but it's not un-representative.

We have the great advantage of having Governor Schwarzenegger really, really motivated, really focused, really knowledgeable on things like stress on distribution transformers. He actually knows a lot about this.

And so we've been able, as a result probably of mistakes California made -- big reliability problems that we had in the 2001, 2002 periods -- to have the people of California want a reliable system.

So we are scaling up our level of capital investment in the system from about $800 million on average over a decade leading to 2003 to now a prospective $4 billion level of capital investment.

So we're talking big investments. The meter part of that is only part of it, but putting in meters for all our residential customers is going cost us five million meters, small business and residential, about 1,300,000,000 dollars.

And without that, I will predict that plug-in electric hybrids in the relatively near term are going to be one of these things that are nice to have, but not meaningfully at scale. You know, we've been through this before. Southern California Edison, Dan was nice to describe what we've done, and we've been 20 years working on electric vehicles, electric transportation. Ed Care -- many of you know Ed -- is with us. We have a terrific team. We have a wonderful technical center in Pomona.

But we have the dubious distinction of having lost more money in developing electric transportation I believe than anybody in our industry, because, for example, we created a business called Edison E-V that was charging station business. And we had a wonderful customer base of major employers; public entities are putting out in their large-scale parking lots charging stations substantially in

support of the GM electric car; and, of course, that finally didn't work.

And our business went down with it. We're staying with it. We see this in the long course, but I say that -- and I'll give you one other example -- we also created a business called Edison Enterprises to sell renewable energy and clean energy for a small markup, very small markup over what our utility customer paid on the standard tariff, and we got the incredibly positive survey responses from everybody, and the business had practically no customers. And we had to drop that business, and, by the way, lots of people around the country did that, too, and had fairly similar results.

So you've got to get to the economics. And we've got to get the pricing right, and then there's a fair amount of complexity that's worth good thinking about how you have not only the metering capability, but how you set up the electric tariffs in ways that really work for people.

So you've got to move from averaging pricing to selected pricing, off-peak, and that's, at least analytically, very challenging, probably politically

challenging as well. I think it can be done. So that's subject number one.

Number two subject what can the electric industry do to do its part for something that is good for the industry. This is not asking anybody in our industry to sacrifice, because there are huge economic benefits to the industry and to electric customers having better use of the grid. You know a very high percentage of what we invest in in the electric utility industry is there almost exclusively to meet a few peak hours in the year. We size the whole system, not just generation. People focus a lot on generation. But transmission sizing, distribution sizing to deal with that 10 or 20 or 30 hottest days of the summer. And that's true not just where we are in Southern California -- we have, you know, every, every year. Right now, just take our case. We serve 10 of the fastest growing counties, large counties, in the United States. They are huge counties. We see, for example, even with economic downturn, an increase in peak of about two and half percent that we've got to build for. That's -- every year that is many hundreds of millions of dollars investment that is

being made to serve only that kind of needle peak portion of the system.

So we got electric transportation, plug-in electrics, at scale that makes the system vastly more productive. In a regulated utility, the benefit of that substantially cycles back to customer, because we don't take home, in the California model, but in most models around the country, delinking is the right thing to do, but most models around the country utilities are authorized to receive revenues to cover their costs. If there are more revenues to cover fixed costs, you bring the costs down to the customer. Yet, that, in the end, is a benefit to the utility, making it a stronger, economically more attractive supplier of power.

So what do we have to do? Well, there are all kinds of respects in which I think our industry has to get together in a way that it isn't today. I chair the Electric Transportation Committee for the Edison Electric Institute. I've chaired it -- Ed Care said to me I've chaired it three times, meaning we started it. Then it kind of went away, and then we started it again. Then we start it again. Now it's

really -- I mean, now my fellow CEOs, I mean, they are extremely interested. They're extremely interested.

But we ought to be making it possible for the terrific people that are doing advanced work on battery development to find a commercial home, to find a commercial base.

So we need to make economic commitments, and there are lots of applications on an electric system that are in addition to the applications in automobiles.

So we ought to be putting in -- and we need to find economic -- this is economics -- but we ought to be putting in batteries, for example, across our system we can put them in on -- at the substation sites. And they play a role similar to what natural gas-fired peaking systems do for us, so new, highly efficient natural gas-fired peaking. It's pretty good. I'm asked the question all the time. We just announced a major solar initiative at Southern California Edison -- 250 megawatts. I'm asked all the time isn't cost effective? Does it have what people have grid parity? And the answer to that is hard to know for sure, because the path that depends on

natural gas is entirely dependent on what happens to natural gas prices into the future.

So I could say more of that, but the utilities need to get together, working with the battery manufacturers and the automobile manufacturers to have another industry titan, another massive industry, more effectively, more collaboratively, with more commitments for battery development.

Then let me turn to the third thing, and I'll be brief on this point. Questions come up two or three times when I've been here -- a gentleman from General Motors raised the question this morning in the queue, well, what about the fact that the electric industry today, 50 percent coal-fired. I think implicit in that, when I hear it is that we ought to kind of move a little slowly -- which is the cart and which is the horse here -- to have the electric system get cleaner before we as aggressively attack plug-in electrics, as we ought to.

And I had -- Chelsea Sexton gave me this nice way of describing it this morning. Coal's bad. Oil's worse. For all the things we've been talking about in this conference, and the reality is we all know, I think, is that coal's there, but coal in a

central station plant is substantially less polluting and measured in greenhouse gas emissions, measured in NOX and SOX, mercury emissions than the internal combustion engine.

So we ought to get on with this thing, even as we clean up the electric system.

And then let me say a little bit why I think the electric system will certainly move in the direction of being cleaned up and not because of just good people doing this voluntarily, but the reality I talk a lot with my fellow CEOs about how we, with utility responsibilities, will meet the electric reliability needs of our customers over the next decade. And the answer is absolutely uniform. Everybody I talk to, and we compare notes a lot on this. About the only thing that will be built in addition to enhanced efficiency in renewable programs, which will not do the full job -- won't even do a large part of the full job in replacing aged plant and so on -- all that will be built is natural gas fired generation over about the next decade.

So there's all kinds of talk about nuclear coming on, and I personally believe that's a desirable thing. But that's not going to come on until about

2020. There's lots of talk about the potential for carbon capture and storage and clean coal, and I believe there's potential there, and our company is investing in that. And we need, frankly, big demonstration grants to take that further. Maybe that will work. Maybe it won't. But all that is a ways out.

So what's going to happen? There's going to be a big, big additional demand for natural gas in the country that will push natural gas prices almost certainly more into world natural gas market prices. That means essentially higher than existing U.S. domestic natural gas prices. There will be a lot of volatility around that, but the reality is that it's going to be a huge driver in the alternatives, in the alternatives, to renewables and efficiency programs, the demand reduction programs, making them more attractive.

That's going to drive a lot of the smart, good things. I mean, we have the largest renewable base in the country at Southern California Edison, by a wide margin. We have, by California definitions, 16 percent of the kilowatt hours. We sell our renewable -- if you added, for example, the hydro we have that

doesn't count in the definition, it would be about 25 percent. You can't do any of this without smart grid. You can't deal with the intermittency at that scale without putting significant monitoring, instantaneous identification of vulnerability, instantaneous analysis of vulnerability, instantaneous millisecond response.

You have to do that. That also is a big enabler for how charging on plug-in electric vehicles ought to work. You know we ought to have -- we need to go beyond, even in the charging, what I described at the outset, just the meters -- we need to go to systems that allow charging to optimize by reading where the electric system is at any point. So charging doesn't have to be -- it's a good, good first step -- set on a meter that just runs, say, from midnight to 4 a.m. What you'd ideally like to do -- it isn't very hard to do -- this charge against system requirements, so you can establish absolutely its cost, and highest productivity of the system.

So those are three things that I wanted to underscore. I'll close with this final point on public policy, which, by the way, is not much addressed, and that is there's a lot of talk about

additional legislative steps with respect to plug-in electric vehicles. And I think we're supportive of all those, and we've been very supportive of all of it in California and will continue to be.

But I don't want to overlook a kind of key point, I think, and that is that the 2007 Energy Act, with the support of, I think, probably just about everybody in this room, really developed a huge array of fabulous authorizations. That's a good piece of legislation. So you have six kinds -- categories of R&D support, $275 million. You have several hundred million dollars of various other categories. You have the potential for tax incentives that are absolutely critical.

The problem is, with respect to those, which take the legislation a long ways down the road, no appropriations. So we've got to be focused on getting the appropriations done.

So I'll stop there. Thank you very much.

(Applause)

MR. REICHER: A couple questions?

MR. BRYSON: Sure. I'd be happy to answer any questions.

MR. REICHER: I'm not too happy with our microphones. Here you go.

MR. BRYSON: And I'm happy to talk policy matters and anything beyond what I focused my remarks on. I was just trying to find the areas that may have added something.

MR. REICHER: We have a question back there. You want to ask a question?

SPEAKER: Yeah. You've talked about distributed generation, and it seems to me that ultimately what we need to talk about to really clean up the grid is distributed generation in individuals' homes. We've already seen parking lots with Google, and all this kind of stuff. That's generation locally. If we the -- the nation -- generation. You took the utility generation distinction. Have you given that any thought?

(Applause)

MR. REICHER: Well, thank you very much, John Bryson. Really living up to your reputation and thought leaders in this.

I hope all of you saw the Chevy Volt on the way in. Have a chance -- Atlantic Monthly. We have copies of an article -- General Motors out in the

lobby. We have saved the best for last here. We are delighted to welcome Troy Clark, President, of GM North America, a group vice president at General Motors.

Troy has a distinguished 25 year career at General Motors, and is here to tell us about what GM is doing in this area of plug-in electric vehicles. Thank you, Troy.

MR. CLARK: Well, good morning. And on behalf of my colleagues at General Motors, I'd like to thank you for the invitation to address you here this morning. Electric vehicles are a topic of great importance to the future of General Motors, also to the future of our country.

I want to thank David and everyone here at the Brookings Institute, and also Google for inviting us to be a part of this important event.

And over the past day and a half, you've heard a number of interesting perspectives on how to address energy independence and climate change. There's some great vehicles on display here, not just the General Motors vehicle, but all of these vehicles probably can and will contribute to the solutions to these issues.

And I'd like to talk to you for a few minutes about General Motors' vision and why we are excited and also inspired to help solve what we perceive to be very real, very challenging environmental matters that are facing our country and our industry.

And these issues, as already noted, by their very nature, are global in scope. So let's begin with an assessment of the global auto industry for a minute, if we could.

Despite current challenges to the auto industry here in the United States, globally our industry is in the midst of tremendous growth. There are about 820 million vehicles in the world today. Roughly 12 percent of the world's population enjoys the benefit of automobile ownership and driving.

Automobile ownership and use is a rough indicator of what some called middle-class economic status, and with rapid economic growth in many areas of the world, there are more and more people achieving this status than at any time in history.

And the personal freedom that automobiles provide is still very highly valued.

As such, we expect that at least 15 percent of the world's population will own a vehicle by 2020, and that'll bring that total to about a billion vehicles.

And, as I have seen first hand from my own experience, this expansion is really being fueled by growth in emerging markets like China and places like India.

Now, as you've already discussed, this growth has created serious concerns about the automobile's almost exclusive dependence on petroleum. This increasingly creates issues of supply and availability, sustainable growth, climate change, and even national security, as you've noted.

So as we look at this picture today and consider the future of the automobile, at General Motors when fact stands out among -- or above -- all others: going forward we can no longer rely primarily on oil to supply the world's automotive energy requirements. And General Motors firmly believes that the long-term solution involves a march towards the electrification of the automobile.

The debate has already shifted. It isn't if this is going to happen; it's really when or how do we promote it happening.

We believe there are a number of steps along this path, at least to our view, and we don't claim that our view is exclusive or all inclusive. And I would like to take the opportunity to share some of those thoughts with you.

And around the globe, there are many promising solutions to the energy and environmental challenges that we face. And General Motors is working hard on a lot of them, things like improved diesel technology, certainly advanced biofuels, broad-scale application of hybrid technology.

Now parallel hybrid automotive powertrains are an important step on the journey to the electrification of the automobile. They are really, when you think about it, the natural extension of our current mechanical propulsion paradigm, as we move to a mechanical electrical paradigm.

They are, in fact, limited range electrical powertrains that replace or supplement a conventional internal combustion engine at certain parts of its driving cycle. They contribute most fuel savings in

their current configuration during low-speed city driving conditions. GM has five hybrid vehicles on the road today. We'll offer eight models by the end of this year, and by 2012, we'll have 20 hybrid vehicles available for consumers in cars, crossovers, pick-up trucks, and SUVs.

Now a year ago, truthfully in some audiences, when I presented this data, I anticipated a lot of oohs and aahs. But today, just to show you how far this subject and our thoughts around it has come, we recognize that hybrid technology itself is not an end to our technical journey. It is simply another beginning, albeit an important one.

The electric powertrain components available or involved in parallel hybrids allow us to develop technologies like batteries, like power controls. Hybrids allow us to develop standards for the engineering of the vehicle itself, engineering methods, and engineering tools and real world validation and simulation models, which allow us, then, to shorten the development cycle for future advanced vehicles.

Last, but not least, they allow us to develop marketing, sales, and service capabilities to assure adequate levels of customer satisfaction.

But perhaps most importantly, and not to be underestimated, is it gives us an opportunity to recalibrate our engineering human capital, from a world of mechanical motion to a world of electrical motion.

Now think of that. Think of that in terms of tens of thousands of engineering and technical people at General Motors, all like myself, who grew up and learn their trade on the internal combustion engine. But I can tell you that those same folks are enthused to participate in what they see as a once in a lifetime opportunity to transform our industry.

Our hybrid efforts began very modestly, but in earnest, when we started producing hybrid systems for electric buses. City transit buses were the exact right place for us to start. Think about it from our perspective: city driving cycles, thousands of starts and stops per day, high up time in reliability requirements, and the space to package first generation, often not optimized for weight or packaging components.

This was a great opportunity to demonstrate fuel savings, real fuel savings potential, and we think we did that. Over the last five years with the systems that we've helped put into transit buses, we've helped save three -- over three million gallons of fuel more about 30,000 metric tons of CO2 emissions.

Now we applied these lessons learned with our -- what we call our two mode hybrid system that we use in transit buses; scale it down for use in full-size utilities and pickups. And, in fact, we've already introduced the Chevrolet Tahoe and GMC Yukon hybrid. We'll soon launch versions of our Cadillac Escalade. Those are vehicles that get city you'll economy that is equivalent to a four-cylinder, none-hybrid mid-sized car like the Chevrolet Malibu or the Toyota Camry. But basically, it's still a full-sized SUV package.

That does have the potential to save a lot of fuel.

And in the future, we intend to produce the Saturn Vue plug-in hybrid. It will feature an advanced lithium ion battery and potentially have

twice the fuel economy of any SUV on the road today, of any size.

And, in fact, I'm very pleased that the Department of Energy just announced this compact SUV is being considered for a funding opportunity as part of their program. We really appreciate that. It's really an outstanding example, we believe, of the kind of partnerships that will help make this technology in reality even sooner.

But again, I would -- I am reminded that these are fuel powered vehicles that get a helping hand from electrical propulsion systems. And the technology that we're here to talk about today and one that GM is -- we're working very hard to bring to market is electrically driven vehicles. And despite movie titles to the contrary, I can tell you with absolute certainty that the electric car is not dead at General Motors.

In fact, we are building on our capabilities to significantly expand our commitments to electrically driven vehicles, the level of resources we devote, the time and energy of even our leadership staff. And I can tell you that we are now in the

midst of a rapid (inaudible) transformation in our business.

We’re moving from a company that for a hundred years has been based on mechanically driven automobiles to one that will eventually be based on electricity.

It’s a big deal for us. And we think it's a big deal for consumers around the world.

The next step in our journey represents an important transition to a truly electrically driven vehicle, one that we’re working hard on to bring to market. Our efforts in this area have received a good deal of attention, and are of significant interest to you today, particularly the product that we call the Chevrolet Volt.

The Volt concept, which is on display out in front of the hotel, is the first demonstration of a new family, and family meeting more of, eventually, electrically driven propulsion systems that we call E-flex.

The “E” in E-flex stands for electric, because all E-flex vehicles will be driven by electricity, which means that there needs to be a battery onboard.

And the “flex” means flexible, because it means there needs to be multiple or quickly reconfigured sources to produce electricity to charge the battery or drive the vehicle.

So we have a vehicle here that has the ability to run off of a battery. So you’d walk out in the morning. You’d unplug it. You get into your Volt, and you start the vehicle and you begin to drive, and it’s running pure electric mode off of a battery.

The Volt operates as a traditional battery electric vehicle, and it should have a driving range -- or it will have a driving range of 40 miles. When you consider that three quarters of American drivers travel less than 40 miles in their daily commute, clearly large fleets of Volts can have a huge impact on our petroleum dependence.

And if the driver of a Volt needs to go beyond 40 miles, then an engine, a small internal combustion engine that is currently planned, kicks into supply electricity to recharge the battery and keep the vehicle moving.

This allows the vehicle to drive as much as 400 additional miles over the initial 40, while

getting significantly better fuel economy in the process, as the vehicle would cycle between pure electric mode and an electric recharge mode.

The Chevrolet Volt, supported by GM's E-flex architecture, is the next step on the journey to electrification of the automobile for us. Different than the parallel hybrid, it is an electrically driven vehicle with the more conventional powertrain as the helper, the helping hand, in times of extended driving needs.

We are very excited about this technology. It's a vehicle with the electric range of the Volt can have quite an impact on both petroleum use and tailpipe emissions. And the best part of it is an extended range of EV like the Volt can do this while saving its owner a lot of money in operating expenses as well.

A conventional vehicle that gets around 30 miles per gallon costs about $.13 per mile to operate, but when you do the math convert a kilowatt power to cost per mile, an extended range electric vehicle like the Volt will cost about two cents a mile for electricity from the grid.

So it’s not going to be difficult for customers to see the advantage in their pocketbooks of a vehicle like this concept.

And, as others have said, the key to getting the Volt on the road is really the advanced lithium ion battery. For all the potential that lithium ion batteries offer, there is really a tremendous amount of confusion associated with them.

One of the most prevalent misconceptions is that all lithium ion batteries are really alike. We all have them in our cell phones. You know, hey, why don't you just make them a little bigger? Why don't you just put more of them on there? In fact, lithium ion batteries is a family currently of over 25 different chemistries. There's that many choices you can have on the market, all with different capabilities and performance features.

The power and energy requirements for an automotive battery application differ significantly from those used in consumer electronics, such as cell phones and your Blackberry.

In addition to that, our performance and durability requirements -- 10 years of life on this battery or 150,000 miles in a very rugged and hostile

environment -- are unique to automotive applications and considerably more stringent.

Our internal tests have shown, however, that individual lithium ion cells, scaled up to a large pack level, will, in fact, deliver the required power and range.

And just a little anecdote that I slipped in here. We have a lot of reviews on these products as we're designing, and I'd like to share an interesting fact with you. It was explained to me by one of our engineers the other day.

We're sitting there, in fact, looking at this Volt battery pack, which you see in the upper left-hand corner of the screen there and you see the little cell in the lower right-hand -- and it's got a T-section.

It's about this big, and it goes from about here to the front of the stage. And it's arguably the most important and expensive component of the vehicle.

And the engineer points to it and says, "and all of that only carries the energy of one gallon of gasoline." So in the development of transportation, there's no doubt gasoline was, in fact, a very efficient way to carry energy. And I think that this

just portends that there's tremendous opportunity for the improvement of battery capabilities and battery efficiencies as we go forward.

As I indicated, we've run prototype packs numerous tests since last fall, including some pretty severe ones, and the results to date are encouraging. We've successfully driven test mules with lithium ion batteries on our test track, as you see right here. And we will get into even thousands of miles, by the way, and we will get into even more rigorous testing over the course of the summer.

And it's important to note, or this is important for us anyway, that the vehicle side of the Volt Program is actually being engineered in parallel to the battery developed. We're counting on that battery being ready.

Now, typically in the automobile industry, when we develop new technology, like batteries and propulsion systems, we do that well before we kick off a production vehicle program. To be honest, because of this parallel path, this program represents a great degree of risk for us, but with risk comes potential reward. And we believe our E-flex system can greatly reduce oil consumption and CO2 emissions at the same

time, so we are developing the Volt with all the urgency we can muster.

Just last week, the GM Board of Directors approved production funding for the Chevrolet Volt. Now what this means is that the GM management and board believe the technical goals of the Volt are not only achievable, but we believe we can achieve them by 2010, which is the goal date that we have set to get the Volt into Chevrolet showrooms.

(Applause)

MR. CLARK: That's just a year after next.

(Applause)

MR. CLARK: As many of you've seen coming in, we got a concept version of the Volt, what we call a fiberglass or a foam model. It's on display here at the conference. It really doesn't show the interior very well, but it does show what the show car was on the exterior. I hope you take the time to look at it.

But I would, however, be remiss if I didn't point out that the appearance of the production model has changed somewhat, and that is not what you saw on the tube, by the way. That was what we call a prototype mule that we really have rigged up to test the powertrain systems.

But the vehicle has changed a little bit. It still has very much that same character, but a little bit in proportion due to the fact that our designers and engineers have been working to optimize aerodynamics of the Volt as part of the quest to make this breakthrough concept car a production reality.

And I think it’s very interesting to point out: this is the -- kind of the technical transformation or the transformation of the technical community. A lot of us grew up thinking, yep, range and fuel economy is solely a function of the weight of the vehicle and the displacement of an internal combustion engine.

And, in fact, on a product like the Volt, we have to rethink. We have relearn, because there’s two other factors actually that are more important than weight, one being the electrical load of other systems on the vehicle, which tend to bleed off electrical power that could otherwise be used for motion, and aerodynamics, which then reduce the load as you're trying to push the vehicle through what is basically static air.

So pretty fundamental changes in how you have to reengineer. So even though we were really

attracted to that car, we needed to modify it for the proper aerodynamic characteristics.

As we move to production, one of my roles in particular is to create a successful business model that seizes on the consumer energy for the concept car and to build a product and brand that people can't wait to own, because, at the end of the day, we want the Chevy Volt to be a commercial success, a volume product that can have a real impact on energy dependence and CO2 reduction. We can make an environmental technical statement, but we also want a car that people aspire to own.

Now we believe that there are people who are going to want the Volt because it's a car that says so much about their commitment to the environment. And there are some people who are going to want to buy it because of their love of advanced technology or because it's a car that looks cool or potentially avoids, you know, or saves them money over time.

We’re absolutely convinced there will be people who will be proud of the fact that they never put a gallon of gas in their Volt, because they keep it in electrical mode all the time.

Whatever their reasons, we want consumers to know that purchasing the Volt is a smart choice. It is one they can feel good about, because they don't have to suffer with a lot of compromises to own a vehicle that can do all of that.

And really isn't part of that why people buy vehicles -- because, unlike many other consumer products, your car says something about who you are, when you're seen in that vehicle.

We're doing the research right now on who our Volt customers are likely to be, and we know there is a group of early adopters, but when we get through that, those are customers we need to figure out they are expectations of an extended range of electric vehicle, and we need to know that a little bit better.

And we're taking those needs into account as we develop the vehicle. For example, we think most people are going to want a radio in this vehicle.

(LAUGHTER)

MR. CLARK: They're going to want a stereo system. But a stereo system, a nice stereo system that she would find -- a premium stereo system that you would find in most cars today, if we just chunk

that into the vehicle, would take the 40-mile range and reduce it to 39.

It doesn’t seem to us like that’s the right kind of trade-off; right? So, in fact, what we have had to do is work with a supplier to develop another radio system that still provides superior sound performance -- I don't think anybody wants to go back to the days of the AM radio with the one speaker that was up behind the dash pad -- but that takes -- as a much, much lower electrical load, a significantly lower electrical load, that allows you to have your radio or your sound system, but also allows you to drive with assurance for the 40-mile range.

And we’re working with suppliers in many areas of the vehicle systems to be able to do this.

We’re about creating a vehicle and a business model that will work, and we want to make sure that we're making the right trade-offs in the customers’ eyes, because, in the long run, we believe this will lead to even more enthusiasm for this product in this technical direction.

We need to build on our positive electric vehicle momentum so that the excitement and pride around the Volt transcends the vehicle, and, in fact,

my aspiration is impacts the Chevrolet brand. The Volt is the most significant halo vehicle we have done for a long time, and eventually will impact our entire company.

We want customers to see the Volt as the game changer it is, not only for the technology, but also for business, and maybe more importantly for the way the world drives, because, once they do, we can build on that success, and we can build on it rapidly.

We need that first real success so that we can build other, creative E-flex models, maybe purposed differently, but based on the same concept and with the same promise that we see.

We need it one step at a time. The Chevrolet Volt is the focus of our energy today. We need to get that done.

Another step in the journey to electrify the automobile that has got some coverage as well is our fuel cell vehicles. Hydrogen fuel cell vehicles are, in fact, an electric vehicle. It drives on electricity that is created by the fuel cell.

So we have begun engineering a fuel cell variant of the E-flex system. Instead of having an

internal combustion engine to be the range extender, we, in fact, have an onboard electricity generator.

It's built on the same architecture. It uses many of the same components. This is good. It shortens development time, and really couples are next-generation fuel cell system with a smaller lithium ion battery, because the fuel cell is making electricity pretty much all the time to provide up to 300 miles of petroleum and emissions-free electric driving range. So zero petroleum for around 300 miles.

Right now, we're in the process of putting this next-generation fuel cell technology on the street with our Chevy Equinox compact SUVs. The Equinox fuel-cell vehicle has 150 mile range, refuels in five to eight minutes and is a full-fledged electrically driven zero emission vehicle.

And in January, we began by delivering more than a hundred of these vehicles to customers in California and the East Coast, including here in Washington, D.C. Just last month, we handed two D.C. area families the keys to the test vehicle. And two weeks ago, the Department of Energy took the liberty

of another test vehicle for employees here in Washington to use and evaluate in its fleet.

The findings of this massive test drive will help us to define our product and market introduction plans for production fuel cell vehicles at some point in time.

As I said, at GM, we believe that electrically driven vehicles are the long-term solution for addressing society’s energy and environmental concerns.

At the same time, we’re working on a range of real world, real-time technologies that will make a difference, in some cases a tremendous difference, in promoting energy security at home and addressing climate change globally.

But to do this, it’s also important that we have an honest conversation about what's required to bring these technologies to market in volume, in a big way.

And it’s really one of the reasons why I’m very glad to have seen the panel that took place before my opportunity to speak. I enjoyed that very much, because that's about as real and honest a dialogue as you can get.

And, in fact, if it's happening at this level, and if it's happening in a place like Washington, D.C., it's happening at the right time and the right place.

We as automakers need to take the lead on this vehicle side. We know that. No question. And we are by developing responsive, relevant technologies and then work hard to drive down their costs, which gets us up the learning curve, through the cycles of learnings faster. We understand this.

But there are also important roles for others. For example, as noted here today, plug-in vehicles must be seamlessly integrated with the capabilities of the utilities companies -- of the utility companies and the power grid. Regulatory agencies must be active in the development of guidelines to ensure widespread availability of safe and efficient vehicles. And the public must be educated to appreciate the benefits of plug-in technology.

And to get to the theme of this conference, what's the role for Washington? We believe government has a significant role to play. One of the things that government can do, and I'd argue one of the

things that are government must do to really promote energy independence for our nation, is proactively support the development of battery technology.

Our nation must fund a major effort to strengthen domestic advanced battery of abilities. Advanced lithium ion batteries are a key enabler to a number of advanced vehicle technologies, including these extended range electric vehicles and other plug-in vehicles.

Government could help by increasing R&D funding for this vital area, while supporting domestic manufacturing of these batteries.

You know this conference and others like it are very helpful in creating the dialogue for meaningful policies that basically eliminate the various barriers to technologies and other issues that keep these vehicles from the market.

With regards to batteries again, I also believe that there is a role for our educational institutions. We need to ensure that our country develops top notch engineers and scientists, skilled in batteries and electronic development. This is a critical skills set that General Motors is seeking to fill right now. We have open positions right today.

And it looks like we'll have those positions available for the foreseeable future.

In the same regard, we'll also need trained technicians to service these new battery and electrical vehicle systems, and it will only help advance the development and acceptance of the new technology, but also will create new career opportunities for the next generation.

You know I'd like to publicly note the Department of Energy's Challenge X Program. Let me give you a little piece of fact: our involvement with the Challenge X Program has allowed us to recruit and hire over 50 engineers, graduate engineers, who are able to leave their involvement with that program as they graduate college and go directly into our electric vehicle and our fuel cell vehicle programs.

But that's only 50, and we could use a lot more.

We also need to keep pushing forward on fuel cells. Government support is still needed to expand development and demonstration of hydrogen fuel cell vehicles. Tremendous progress has been made and continues to be made, fulfilling the promise of hydrogen powered vehicles.

The U.S. needs to stay on course on the current hydrogen program and begin to prepare for 2010 to 2015 transition to a real and volume market phase for these types of vehicles.

And finally, there should be incentives for consumers to adopt these exciting new technologies in a big way. Things like well-crafted tax incentives accelerate adoption of new technologies, strengthen domestic manufacturing by allowing us to get more rapidly through the learning curves, through the cycles of learning to more economical levels of production.

We in the industry are ready to step up and do our part, and we want to work with others. We'd like to have a seat at the table. Government, universities, national labs, we can make a difference. We get it. The change is happening. It does need to be a national cause.

And we believe that, together, we can transform automotive transportation as we know it, get our nation and the world past oil dependence on the road to significantly reduced greenhouse gas emissions and a future that is electric.

Thank you very much again for the invitation --

(Applause)

MR. CLARK: -- and thank you for your time this morning.

(Applause)

MR. REICHER: Thank you, Troy, for really frank and impressive thoughts about GM's pivotal, indeed radical, transformation from, as you said, mechanical energy to electrical energy.

We wish you the greatest luck in these critical efforts, and I have to say we really need you to succeed. We really do. And I think everyone here wants to make that happen.

So with that, I will give you some brief closing remarks, and then we will thank you and wish everyone best of luck in these critical days ahead.

First, I want to thank David Sandalow for your leadership and vision in putting this conference together and working so closely with us at Google. And thank you --

(Applause)

MR. REICHER: And I want to thank as well your many great Brookings colleagues who've worked so hard behind the scenes and made things go so smoothly.

(Applause)

MR. REICHER: I also want to thank our guest speakers, our panelists, our moderators who gave us real food for thought, and we hope action, over the last couple of days. And thank you to my terrific Google colleagues who made such a difference to this conference, including Michael Tero and Aleck Proudfoot who I mentioned yesterday. I want to recognize several of them as well we didn't recognize, beginning with our Managing Director of Google.org, Linda Segway and David Berkovitch , Nicki Fenwick , Katie Bacon , Ryan Hebert , Aleck Brooks , David Tawkin , Dan N. Sudananeth , Jennie Kwon , and Joe Sexton , and Kat Acker . A great, great team. So thank you to all of you.

(Applause)

MR. REICHER: Before we close, let me leave you with two, I think, important final thoughts.

The first I think is this conference has really confirmed what many of us have long believed

and that is that plug-ins are a real solution whose time has finally arrived.

And I think it's confirmed another important fact, and that is we enjoy serious, serious bipartisan support here in Washington for this technology.

We cannot say that with respect to several other major energy and environmental issues in this town, but I think we can say that about plug-in vehicles, and that's quite important.

The challenge now is how to build a coalition to really secure critical support for plug-ins here in D.C. -- for R&D, for tax credits, infrastructure procurement, particularly, particularly with the imminent arrival of a new administration and a new Congress.

An action item for Brookings and Google is how to build this coalition and have it ready for action by Election Day when opportunities for plug-ins will loom even larger than they do today. Please, please give us your thoughts.

My second thought is really a plea. When it comes to plug-ins, we're really on a roll here. Even without a coalition in place, there is so much each of us -- are companies and organizations, and as

individuals -- can do to advance plug-in vehicles can be created that we need to support them.

So much we can do now -- information, procurement, and, yes, building real plug-in cars, lots of them, in the near term.

The moment is now for plug-ins. With the momentum these last two days has produced, please get out there and make things happen. The results will indeed be electrifying. Thank you so much.

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I, Carleton J. Anderson, III do hereby certify that the forgoing electronic file when originally transmitted was reduced to text at my direction; that said transcript is a true record of the proceedings therein referenced; that I am neither counsel for, related to, nor employed by any of the parties to the action in which these proceedings were taken; and, furthermore, that I am neither a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

/s/Carleton J. Anderson, III

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