THE BROOKINGS INSTITUTION

# PLUG-IN ELECTRIC VEHICLES 2008:

# WHAT ROLE FOR WASHINGTON

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**Welcome:**

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DAN REICHER
Director, Climate Change & Energy Initiatives
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**Remarks:**

JIM WOOLSEY
Partner, Vantage Point Venture Partners

PETER DARBEE
Chair and CEO, PG&E Corporation

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.